

*In the name of Allah,
the most gracious,
the most merciful*

Clinical Data

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What are clinical data?

- A datum is a single observation of a patient
- Clinical data are a collection of observations about a patient
- Each datum has four elements:
 - the patient (Amr Jamal)
 - the attribute (heart rate)
 - the value of the attribute (52 beats per minute)
 - the time of the observation (1:00 pm on 1/1/2011) or should that be 1/1/2011?

Types of clinical data

- * **Narrative**
recording by clinician
- * **Numerical measurements**
blood pressure, temperature, lab values
- * **Coded data**
selection from a controlled terminology system
- * **Textual data**
other results reported as text
- * **Recorded signals**
EKG, EEG
- * **Pictures**
radiographs, photographs, and other images

Use of clinical data

- * Form basis of historical record
- * Support communication among providers
- * Anticipate future health problems
- * Record standard preventive measures
- * Coding and billing
- * Provide a legal record
- * Support clinical research

Types of clinical data documents

- * **History and physical initial assessment**
 - * by a clinician
- * **Progress notes**
 - * update of progress by primary, consulting, and ancillary providers
- * **Reports**
 - * by specialists, ancillary providers
- * Typical paper chart maintains all patient notes in chronological order, sometimes separated into different components

Assessment of a stable patient

- * Chief complaint
- * History of the present illness
- * Past medical history
- * Social history
- * Family history
- * Review of systems
- * Physical examination
- * Investigations –lab, x-ray, other
- * Assessment
- * plan

Some complications of data

- * **Circumstances of observation**
e.g., how was heart rate taken? pulse? EKG?
- * **Uncertainty**
how accurate is patient reporting, measurement, device?
- * **Time**
what level of specificity do we need?
- * **Imprecision vs. inaccuracy**

Structure of clinical data

- * Medicine lacks uniform structured vocabulary and nomenclature
- * Standardization and computerization of data is benefited by standard representations (Cimino, 2007)
- * Counter-arguments are “freedom of expression” and “art of medicine”
- * Narrative information can be expressed in many ways, can be ambiguous

Personal History:

Name:

Age:

Nationality: Saudi Other:Sex: male female

Occupation:

Marital Status: Single married Other:

Residence:

Admission Date:

Admission type: Emergency Elective

Ward / Bed:

The Complaint:

Complaint(s)	1.	2.	3.

History of Presenting Illness:

History			
Presenting			
Illness			
Onset			
Duration			
Course			

We need better access to clinical data

- * Missing clinical information during primary care visits (Smith, 2005)
 - * Information reported missing in 13.6% of clinical visits
 - * Available but outside system in 52% of instances
 - * Estimated to adversely effect patients 44% of time
 - * Unsuccessful searching for it took >5 minutes 35% of time
- * Physicians have two unmet information needs for every three patients (Gorman, 1995; Ely, 1999)
- * Secondary use of clinical data (Safran, 2007)

Data entry

- * General categories of data entry:
 - * **Free-form** entry by historical methods:
 - * writing
 - * dictation
 - * Typing
 - * **Structured** (menu-driven) data entry by mouse or pen
 - * **Speech** recognition for either of above



ORCA CPOE order screen

The screenshot shows the ORCA CPOE order screen for a patient named 'zztest_cpoe'. The interface includes a top navigation bar with patient information (EPIC: Unknown, 22 years, DOB: [redacted], Allergies: No Known Allergies, PCP(s): TTBret) and a 'Refresh Button' in the top right. Below this is a 'Menu' section with 'Menu - Inpatient' selected. The main area is divided into three panes: 'View Pane' on the left, 'Orders Pane' in the center, and a 'Status Bar' at the top right. The 'View Pane' contains a tree view of 'Orders' categories, with 'Code Status / Precautions' selected. The 'Orders Pane' displays a table of orders with columns for Order Name, Status, and Details. The 'Status Bar' shows 'Status' as 'Meds History' and '5 minutes ago'. The bottom right corner features 'Initiate and Sign buttons'.

Menu

Add button to add an order

Med Recon

Refresh Button

Status Bar

Orders Pane

Clinical Categories

View Pane

Initiate and Sign buttons can be found in the lower right corner of the screen.

Order Name	Status	Details
Code Status / Precautions		
<input type="checkbox"/> 60 Code Status	Discontinued	07/14/11 9:36:00, Code Status: DNR / DNI
Diet / Nutrition		
<input type="checkbox"/> 60 Full Liquid Diet (Diet Full ...	Discontinued	07/12/11 13:53:00, SEC DIET TYPE: Carbohydrate Managed Diet
<input type="checkbox"/> 60 Clear Liquid Diet (Diet Cl...	Discontinued	07/12/11 13:51:00
<input type="checkbox"/> 60 Clear Liquid Diet (Diet Cl...	Completed	07/12/11 13:29:00
Medications		
<input type="checkbox"/> 60 prasugrel	Discontinued	10 mg, PO, Daily, Start: 07/15/11 9:00:00, Tablet
<input checked="" type="checkbox"/> 60 NonFormulary - Med (Lipitor)	Ordered	Lipitor, PO, Daily, 07/11/11 13:16:00 pt to take own meds
Lab / Path		
<input checked="" type="checkbox"/> 60 Complete Blood Count (...	Ordered	07/18/11 16:56:00, Routine, Stop: 07/18/11 16:56:00
Diagnostics Other		
<input type="checkbox"/> 60 Lung Volumes	Deleted	DX: Abnormal Chest X-ray, QUESTIONS ANSWERED: asdf, METH-
<input type="checkbox"/> 60 Spirometry	Discontinued	DX: Pleural Effusion Pneumonia Unspecified Preoperative Respira
<input type="checkbox"/> 60 Somatosensory Evoked ...	Deleted	
Scheduling		
<input checked="" type="checkbox"/> Schedule Laboratory Or...	Ordered	Priority: RT, Any
<input checked="" type="checkbox"/> Schedule Chemo Teach	Ordered	Priority: ROUTINE, Any



PSR 233222
 8-watch
 15 unerupted
 Patient wants his work all done before the middle of July!!!!
 Talked about whitening

Patient Info

ABCO	A
Billing Type	Standard Account
Referred From	yellow pages
Date First Visit	03/17/2005
Pri Ins	Delta Dental of CA. (pending)
Sec Ins	
Med Urgent	
Medical Summary	Acid Reflux High BP
Service Notes	No Flo
Medications	none

Enter Treatment

Missing Teeth Movements Primary Planned Appointment Show

Diagnosis
 None
 Caries
 Recurrent (Car)
 Incipient (Car)
 Defect (or miss fill)
 Missing (tooth struc)
 Irrevers. Pulp.
 Revers. Pulp.
 Necrotic
 Apical Perio
 Abscess
 Carious Pulp Exp
 Cracked Tooth

Procedure List
 Misc
 Exams/Cleanings
 Fillings
 Dentures

Or Type ADA Code
 Or Single Click:
 Amalgam
 Composite

Entry Status
 TP
 C
 Ex Cur
 Ex Other
 Referred

Today
 04/20/2006

Priority
 no priority

Progress Notes

Date	Th	Surf	Dx	Description	Stat	Prov	Amount	ADA Code
04/05/2005	26		R	PFM Crown	C	DOC1	740.00	D2750
				bs.3 Carps 2%Lido/1:100k epi. Blue bite for temp. Prep. Integrity. 1/4 carp 2%Lido/1:50k epi around tooth, #2 cord, triple tray with PVS putty, PVS light body, Tempbond, PD instr, Shade "A4"				
04/21/2005				Clinical Note	EC	DOC1	0.00	Zclin
				In-Dup pano and bws for?				
04/26/2005	26		R	PFM Seat	C	DOC1	0.00	N4118
				Adjusted, polished, showed to pt, FujiCem. PD instr.				
05/03/2005	8	MF	R	Composite- 2 Surf, Anterior	TP	DOC1	140.00	D2331
				br...2 carps 2%Lido/1:100k epi. L-Pop. Z-250, Shade "A3.5"				
05/17/2005	5	MOD	R	Composite- 3 Surf, Posterior	C	DOC1	160.00	D2393
				In-3 carps 2%Lido/1:100k epi. L-Pop. Z-250, Shade "A3"				
05/17/2005	6	MFL	R	Composite- 3 Surf, Anterior	C	DOC1	175.00	D2332
				In- L-Pop. Z-250, Shade "A35"				
05/24/2005	19			Bridge retainer-Porcelain Fused to Noble Metal	C	DOC1	710.00	D6752
				In-3 Carps 2%Lido/1:100k epi. Blue bite for temp. Prep. Integrity. 1/4 carp 2%Lido/1:50k epi around tooth, #2 cord, triple tray with PVS putty, PVS light body, Tempbond, PD instr, Shade "A35"				
05/24/2005	20			Pontic-Porcelain Fused to Noble Metal	C	DOC1	710.00	D6242
05/24/2005	21			Bridge retainer-Porcelain Fused to Noble Metal	C	DOC1	710.00	D6752
06/07/2005				Clinical Note	EO	DOC1	0.00	Zclin
				In- Dup BW of #19-#21 for ins co.				
06/07/2005				Comm - Insurance				
				mb//sent xray along with claim requested by insurance for issue of pymt to be processed				
06/14/2005				Bridge Seat	C	DOC1	0.00	N4127
				br...Fuji Cem II, Fit Checker.				

Structured or menu-driven data entry

- * Many attempts from old (Greenes, 1970; Cimino, 1987; Bell, 1994) to new (Oceania; OpenSDE – Los, 2005)
- * Can be done via mouse or pen, with typing
- * Benefits
 - * Data codified for easier retrieval and analysis
 - * Reduces ambiguity if language used consistently
- * Drawbacks
 - * In general, more time-consuming
 - * Requires exhaustive vocabulary
 - * Requires dedication to use by clinicians
- * Alternative: Processing free text with natural language processing and tagging text (in XML)? (Johnson, 2008)

Speech recognition for data entry

- * Most common use is for narration
 - * e.g., computer dictation of clinical notes
- * An advantage is instant availability of dictated content
- * Continuous speech recognition now is commercial reality
 - * Speaker-dependent systems require user training
 - * speaker-independent are systems less accurate
- * Many established systems on the market that operate on:
 - * front-end (used by clinician) or
 - * back-end (process dictations) (Brown, 2008)



iPad 1:47 PM 59%

Katelyn Gleason

Chart ID: GLKA000007 Gender: F Age: 25 DoB: 02/15/1986 555-555-5555

Chief Complaint: unspecified pain or illness

Temperature: 98.0 °F Pulse: 60 bpm Blood Pressure: 110 / 65 Respiratory Rate: 20 rpm Oxygen Saturation: 94 %

Height: 65 in Weight: 130 lbs BMI: 19.76 Pain (1-10): 2 Smoking Status: Never Smoker

Clinical Checklist

General WNL

General Comments

HEENT WNL

HEENT Comments

Skin WNL

Skin Comments

coarse hair,

Speech to text in progress

0:00:08

Tap to end

Speech to Text

dr chrono

Lock New eRx eRx Refills Chat Help



Coded vs. free-text data

- * **Coded data:**

- * Documentation of discrete data from controlled vocabulary

- * **Free text:**

- * Alphanumeric data that are unstructured, typically in narrative form

Narratives tell a story.

- * A narrative tells a story
 - * See the patient through a description
 - * Complicated events are easier to describe in text
- * Undifferentiated problems
 - * Interpretation.
 - * “only a human can prioritize and determine what the chief complaint really is”



Main Office Barclay, Joseph MD Patient History Inbox FAQ Apps. Close

Patient: John Dokes **Age:** 47 **DOB:** 03/14/1960
Current Provider: Joseph Barclay MD **Gender:** Male **Current Encounter:** 06/26/2007

New patient
 Established patient

Specialty
Visit Type
Historian

[Referring MD | PCP Info](#)
[Alerts](#) [Patient Service info](#)

Reason(s) for visit	Brief Visit	Chronic Problem List	Add new problem
cough	F.U <input type="checkbox"/>	Chronic Problem	Code
headache	F.U <input type="checkbox"/>		
	F.U <input type="checkbox"/>		

[Add to today's assessments ?](#)

Vitals **Vital Signs Outside Normal Range** [Add New Vital Signs](#) [Expand Vital Signs](#)

Date / Time	Temp F	Temp C	BP	Pulse	Rhythm	Respiration	Ht In	Ht Cm	Wt Lb	Wt Kg	Conte
06/26/2007 12:00 PM	96.4		130/90	80	regular	16	71.0		216.00		dress

Medications **No Medications** [Comment](#) **Allergies** **No Known Allergies** [Comment](#)

Medication	Dose	Sig Codes	Start Date	Stop Date	Ingredient/Allergen	Brand Name
SIMVASTATIN	10MG	1T PO OD	//	//		

Health Monitor: [Set Health Maintenance Protocols](#) [Set Disease Management Protocols](#) **Tobacco User:** yes quit

	Due:		Due:		Due:		Due:
Physical Exam	//	Tetanus	//	Eye Exam	//	ALT/AST	//
Lipid Panel	06/26/2007	PSA Test	//	Foot Exam	//	CPK	//
Colonoscopy	//			HgbA1C	//	Urinalysis	06/26/2007
Sigmoidoscopy	//			BMP Fasting	//	Urine Micro	//
FOBT x3	//			EKG	06/26/2007	TSH	//
Influenza Vac	//			Stress Test	//	PFT	//
Pneumo Vac	//			Echocardiogram	06/26/2007	Chest X-ray	//

- HOME**
- Demographics
- Record Vital Signs
- Nurse Documentation
- Chart Summary
- View Results
- Allergies
- Immunizations
- Past Medical History
- Family History
- Social History
- Health Maintenance
- HPI / Problem List
- Review of Systems
- Physical Exam
- Procedures
- Assessment
- Disease Management
- Plan / Lab / OS / Diag
- Document Library
- E&M Coding

- Coumadin
 - Adult Office Visit
 - Echocardiogram
 - Nutrition Assessment
 - Stress Master
 - Stress Nuclear
- [Preview](#) [Offline](#)

Navigation pane with folders and icons:

- New
- Lock
- 06/26/2007 12:00 PM
 - Master Im
 - Master Im Vitals
 - Medication
 - Adult Office Visit
 - Disease Mngt
- Custom
- Medical icons: Home, Chart, Reports, etc.

Ian TEST DOB 28/2/2008 GA 26+2 BW 1070

Liverpool 2170

MRN 123432

Day 33 - Corrected GA 31+0 1250g on 01/04

Log Files (0) Images (2) Calculator

ATTENTION: Brain scan overdue:

Current Status

Admissions **Respiratory** **Nutrition** **Other** **Treatments** **Test Results**

Respiratory Support

CPAP /5 , FIO2 29

Admission Planning Discharge

Liverpool Hospital

Admitted: 28/02/08 at 4 hours

Admission Age 0 Corr.GA 26 Weight 1070 76% HC 25.5 71% Length 35 56%

Date & Time 28/02/2008 16:30 Hospital Liverpool Hospital MRN 123432
 Bed 01 To NICU Reason(s) for Admission Prematurity
 Consultant Ian Callander Insurance Hospital Respiratory Distress

Fluids / Feeds

160 ml/kg/day
 TPN 10% Fat 3g
 14x2 EBM 24cal (134)

Jaundice

09/03 SBr 135 Billblanket
 ceased 08/03

Other

01/03 Mod PDA
 POSSIBLE NEC

Treatments

Pentavite, Folic Acid
 Longline,

Test Results

09/03 Na 136
 09/03 Hb 135
 09/03 Plat 265
 02/03 HUS IVH II
 01/04 Eyes ROP I

Opened 01 Apr 12:27

MATERNAL HISTORY

Ann is a 28 year old G2 P1 (now) woman whose blood group is O positive. She was booked to deliver at Campbelltown Hospital under the care of Kaisher however delivered at Liverpool Hospital under the care of Dr Peter Hammill. She had a history of essential hypertension. This pregnancy was complicated by hypertension of pregnancy, fetal growth restriction, Bilateral Renal Pelvis dilatation 5 - 10mm, GBS +ve swab, fever, abnormal Dopplers, prolonged rupture of membranes for 2 days, clinically suspected chorioamnionitis. Ann was treated with antenatal steroids, tocolytics, and antihypertensive drugs. Following the spontaneous onset of labour, she proceeded to a vaginal delivery. Antibiotics were given before delivery.

PERINATAL HISTORY

Ian was born at 13:00 hours with a birth weight of 1070 grams (76th centile). Apgars were 3 at 1 minute and 7 at 5 minutes respectively treated with intubation and ventilation. The arterial cord pH was 7.24 and the base excess -6. Ian was then retrieved to

Added to Worksheet 01/03

Orders on Worksheet 01/03

This is freetext

Freetext orders (double click on text to delete)

Hospital Episodes	MRN	Admitted	Discharged
Liverpool Hospital	123432	28 Feb 2008 16:30	
NETS	PD12345	28 Feb 2008 15:00	28 Feb 2008 16:30
Campbelltown Hospital	222222	28 Feb 2008 13:00	28 Feb 2008 15:00

Add Another Admission

Delete MRN .. then click again to Delete Episode

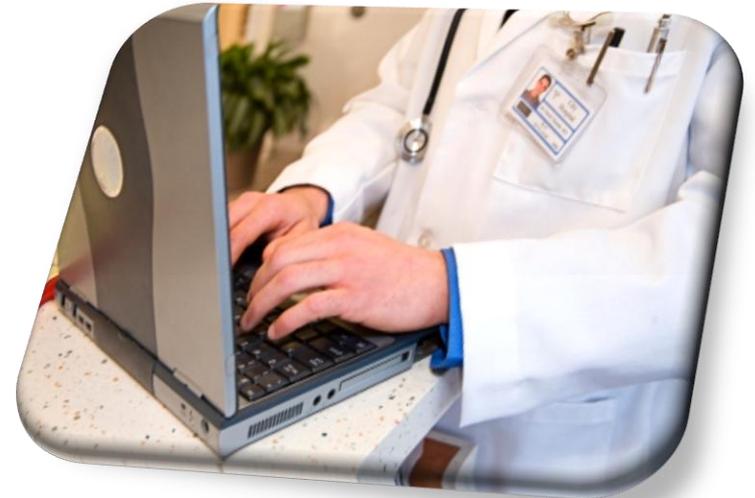


Add Twin

local form

Issues with coded data

- * “pick from a list” allows wrong selection
- * Compliance concerns
- * Over documentation for care
- * cloning



Coded clinical data enables EHR advanced functionality

- * Alerts
- * CDS
- * Best documentation practices
- * Multi-media reporting
- * Multiple output formats
- * Data mining

Questions for Discussion



- * Will work flow disruptions and time inefficiencies preclude most providers from accepting the need for coded data entry?
- * Since it is not practical to code every single data in the EHR, in what bases we can select what data to code?

In summary,

- * Types of clinical data
- * Types of clinical data documents
- * Use of clinical data
- * Access to clinical data
- * Data entry
- * Coded vs. free-form data
- * Speech recognition