

*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

Date:

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

History of Presenting Illness:

Onset

Duration

Frequency

Time

Severity

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

zztest, cpoe x

EPIC: Unknown; See Alerts / Adv Di... Selected Encntr: UWMC 2-UWMC Emergency Dept: Emergency: 04
22 years DOB: ... Allergies: No Known Allergies PCP(s): TTBre

Menu

Menu - Inpatient

- Clinical Notes
- Orders + Add
- UWMedicine Notes
- Document Viewer
- Chart Summary
- Status / Plan Summary
- Alerts / Adv Dir / Code
- IVIEW & PowerNote
- MINDscape
- Epic Web
- Results Review
- Result Search
- Lab
- Lab Cultures
- Lab Organism vs. Drug
- Radiology
- Pathology
- Diagnostics Other
- I&O Results
- Med Profile
- Med Admin Sum (MAR)
- Med Admin (MAR)
- Immunizations
- Med Reference
- Demographic Info
- Visits
- Allergies
- Diagnoses & Problems
- Form Browser
- Links and Reports
- Advanced Growth Chart

Add button to add an order

+ Add Document Medication by Hx

Med Recon

Reconciliation Check Interactions

Status Bar

Status
✓ Meds History Adm. Meds Rec Disch. Meds Rec

Refresh Button

Print 5 minutes ago

Orders Pane

Displayed: All Active Orders | All Inactive Orders | All Orders 5 Days Back

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

Clinical Categories

View

- Orders for Signature
- Plans
 - Document In Plan
 - Medical
 - Central Venous Access Device (CV
 - NonFormulary (Initiated)**
- Orders
 - Communication
 - Admit / Tx / Disch
 - ☒ **Code Status / Precautions**
 - Vitals / Monitoring
 - Pt Care / Nursing
 - Respiratory
 - Activity
 - ☒ **Diet / Nutrition**
 - Infusions / TPN
 - ☒ **Medications**
 - ☒ **Lab / Path**
 - Radiology
 - ☒ **Diagnostics Other**
 - Consults / Therapies
 - DME / Supplies
 - ☒ **Scheduling**
 - Non Categorized
- Medication History
- Reconciliation History

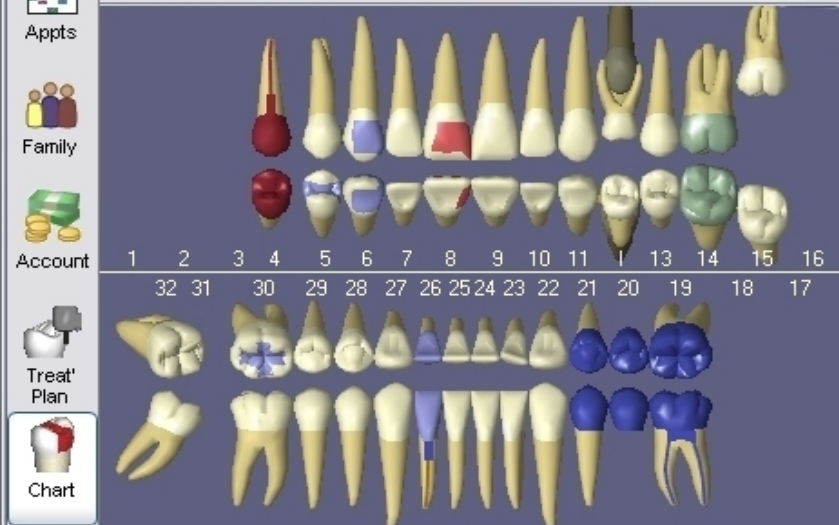
View Pane

Diagnoses & Problems
Related Results
Formulary Details

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

Details
Dx Table Orders For Nurse Review

Sign



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

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

Procedure List
Or Type ADA Code
OK

Entry Status
TP
C
Ex Cur
Ex Other
Referred

Or Single Click:
Amalgam
Composite

☒ 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, PO 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. PO 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, PO 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 99%

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: 68 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”

Current Encounter: 06/26/2007

Alerts Patient Service info

F/U ☐

Add to today's assessments ?

06/26/2007

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

Respiratory Support

CPAP /5 , FIO2 29

Fluids / Feeds

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

Jaundice

09/03 SBr 135 Biliblancket
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



Add Twin

local form

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

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

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)

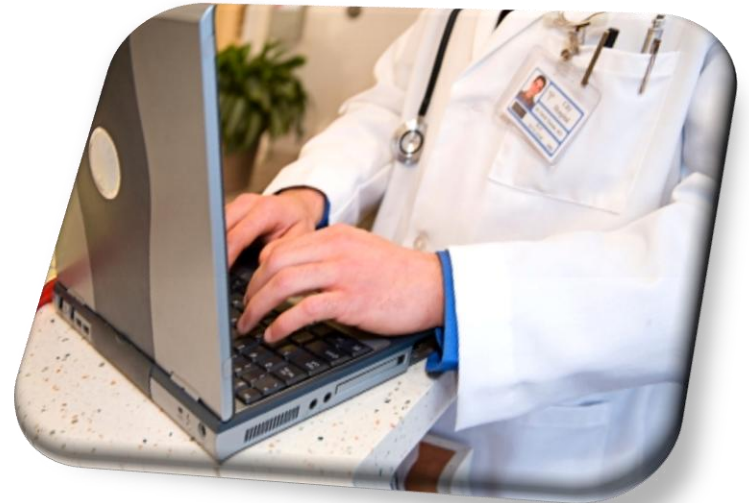
Hospital Episodes	MRN	Admitted	Discharged
Liverpool Hospital	123432	28 Feb 2008 16:30	
NETS	PD12345	28 Feb 2008 15:00	28 Feb 2008 16:30
Campbelltown Hospital	222222	28 Feb 2008 13:00	28 Feb 2008 15:00

Add Another Admission

**Delete MRN .. then click again to
Delete Episode**

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