

Secondary Uses of Clinical Data

James J. Cimino

Departments of Medicine and
Biomedical Informatics
Columbia University

Reusing the Data

- Room assignment
- Billing
- Utilization review
- Summary reporting
- Automated decision support
- Information retrieval
- Infobuttons
- Expert systems
- Research subject recruiting
- Epidemiologic studies
- Syndromic surveillance

The Real World

- Data are captured using local terms
- Vendors and users don't know how to translate to controlled terms
- Vendors and users don't know how to aggregate local terms into useful classes
- Result: terminology use is hard-wired

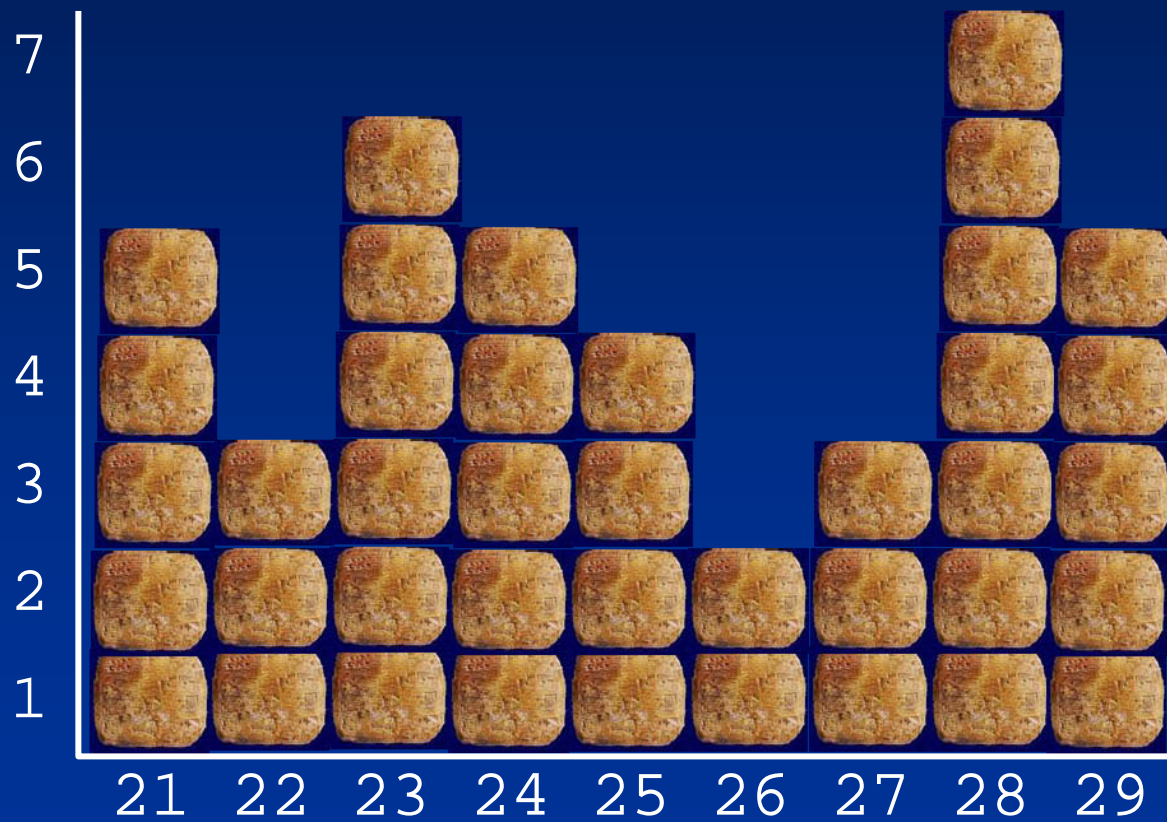
Examples of Hard-Wired Terminology

- Summary reports have explicit lists of codes for aggregation into columns
- Order entry systems have explicit lists of codes for order checking (e.g., duplicate orders)

Reuse of Data



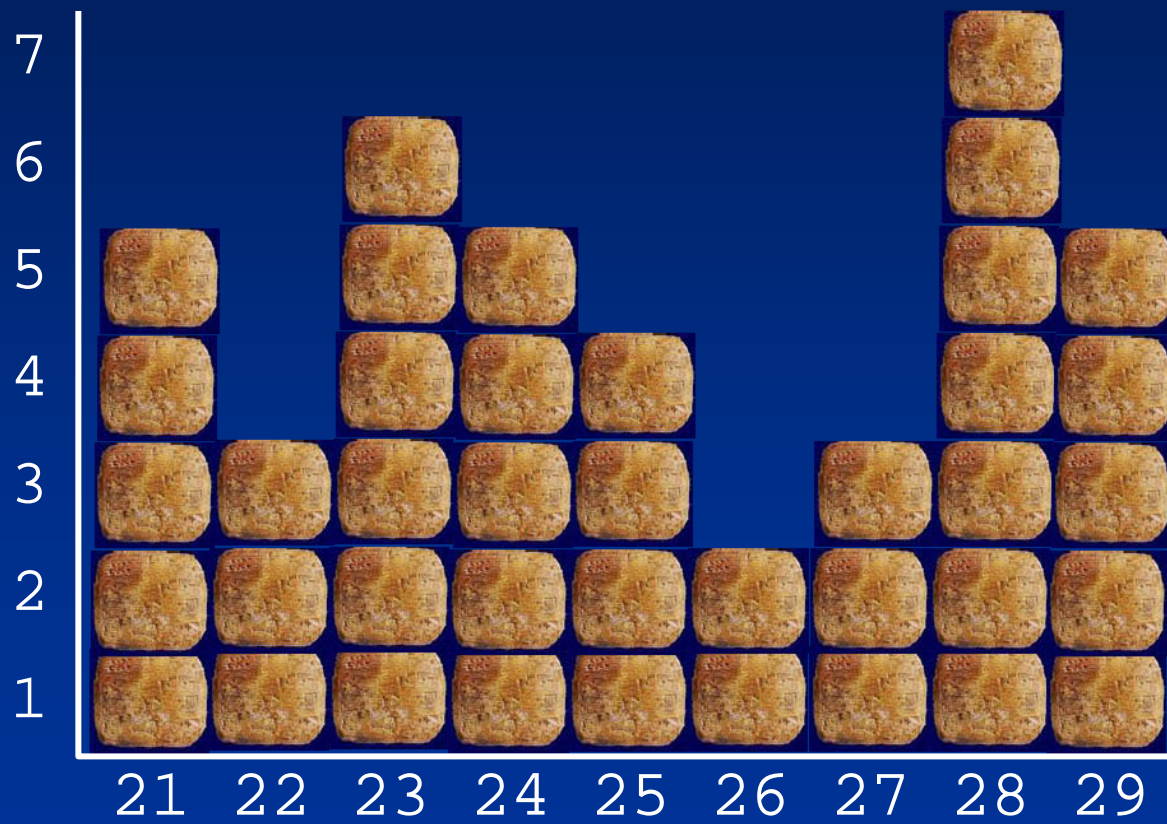
Reuse of Data



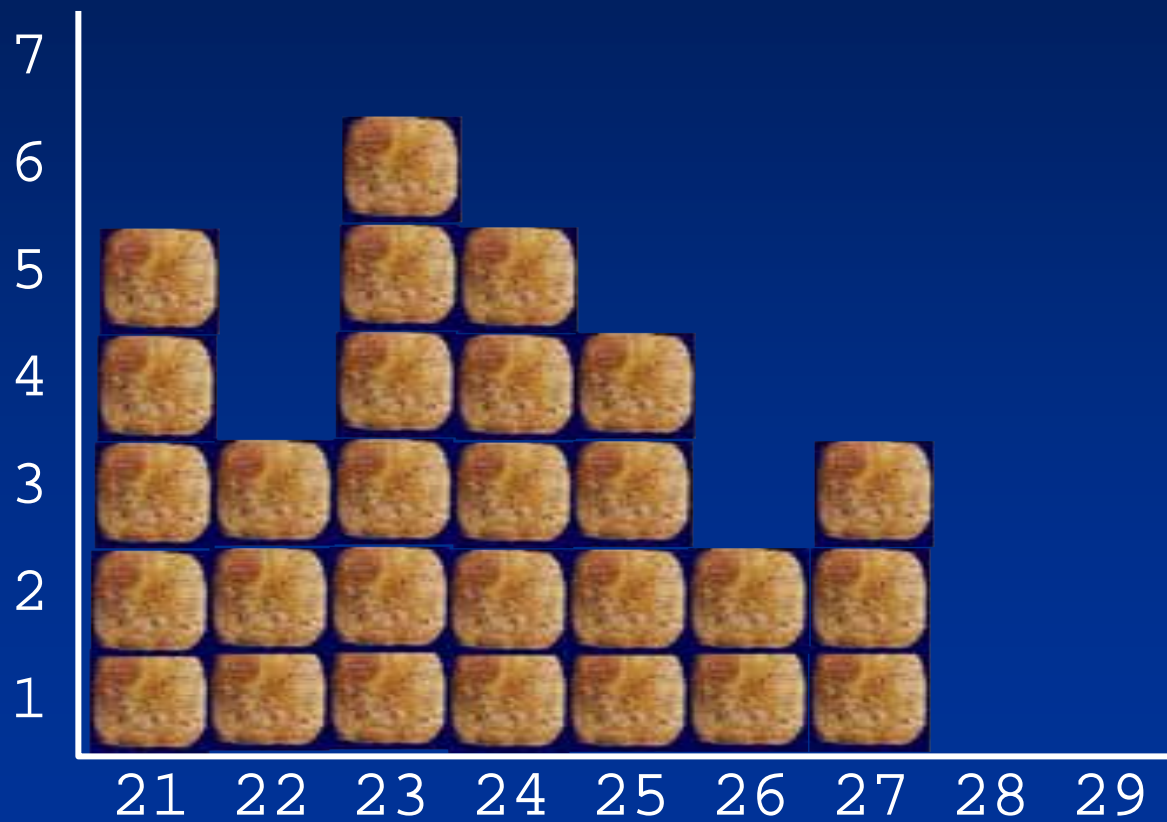
When Lab Summaries Break Down

- Labs use local terminologies
- Summary reports map local terms to columns
- Changes to laboratory terminology do not automatically transfer to report program
- This leads to a breakdown in reuse...

Reuse of Data



Un-Reuse of Data



	08Sep05 12:59	08Sep05 13:37	08Sep05 14:04	08Sep05 17:25
Lytes				
Lytes				
Alkaline Phosphatase				
Calcium Level				↓ 7.4
BUN				↓ 4
Chloride				103
CO2				↓ 24
Creatinine				↓ 0.3
Glucose Level				72
Potassium				3.7
Sodium				136
Blood & Coags				
Blood & Coags				
APTT				↑* 53.7
Hct (HCTM)				1.74
Phosphorus Level				↓ 2.2
zzPt				↑ 21.2
CBC				
CBC				
Rbc (HRBC)	↓ 3.09		↓ 3.05	↓ 2.99
% Basos				
% Eos				
% Lymphs				
% Monos				
% Neutrophils				
Absolute Nrbc Count	0.00		0.00	0.00
Hgb (M)				
Hct (HHCT)	↓ 26.1		↓ 25.6	↓ 25.2
Hgb	↓ 9.1		↓ 9.0	↓ 8.9
Mch	29.4		29.5	29.8
Mchc	34.9		35.2	35.3
Mcv	84.5		83.9	84.3
Void	Void		Void	Void
0.0	0.0		0.0	0.0
Net Estimate				MRK...
14	14		12	11
Rdw	↑ 19.5		↑ 19.6	↑ 19.5
Wbc (H WBC)	↑ 10.0		↑ 10.2	↑ 10.2
Blood Gases				
Blood Gases				
Glucose, Whole Blood				

Glucose Level

Hct (HCTM)

Hct (HHCT)

Glucose, Whole Blood

When Order Checks Break Down

- Catalogue of orderable items lacks classes
- Checks (e.g., duplicate orders) use explicit lists of terms
- Lists may be incomplete
- Lists become outdated
- No mechanism for knowing how, or even when, to update list

Terminology Solution

1. Standard terminologies with clinically useful terms
2. Local terms map to standard terms without substantial loss of meaning
3. Standard terminology provides aggregation classes that support reuse

Lab Result Summary #1

Chen-20	C7 +	Misc.Che+	Misc.Chen	C7 +	C7	C7	C20 +	C7	C7	C7
	22:50 24 Mar 99	10:00 25 Jan 99	23:30 24 Jan 99	17:15 24 Jan 99	13:35 14 Oct 97	9:15 12 Apr 97	18:20 10 Apr 97	10:20 07 Apr 97	10:10 06 Apr 97	10:00 05 Apr 97
Na	138	138		140	142	141		139	137	141
K	4.0	4.0		4.4	4.6	3.7		4.0	3.8	3.7
Cl	107	105		107	108	114		108	107	107
BUN	16	11		11	14	17		18	13	11
Creat	1.7	1.2		1.3	1.3	1.1		1.0	1.0	1.0
Gluc	133	87		94	85	76		82	88	87
Ca	8.0						8.0			
Phos	2.8									
Chol				105 *						
Alb				3.6						
TBili				0.9						
DBili				0.2						
Tot Alk P				70						
AST				47						
ALT				22						
CK		165	155	152						

3131313 · SANDIEGO, CARMEN · 1951-05-26 · 52y F · (-) · (No attending) [MRN](#) · [Name](#) · [List](#) · [Add to list](#)

- [Logout](#)
- [Lab summary](#)
- Lab update
 - [12h](#) | [36h](#) | [72h](#) | [Days](#)
- [Admin summary](#)
- All results
- Before date
- [Laboratory](#) Apr 02
- [Radiology](#) Nov 12
- [Pathology](#) Apr 23
- [Disch Sum](#) 2002
- Op/Clinical
 - [Operative](#) May 07
 - [Consult](#) 1997
- Clin Sum
- [Eclipsys](#) Apr 07
- [Neurophys](#) 1995
- [Ob/Gyn](#) Nov 17
- [GI Endo](#) 2002
- [Cardiology](#) Apr 15
- [HEENT](#) 1997
- [Pharmacy](#) Nov 20
- [PFT](#) Nov 14
- Non-chart
 - [Alerts](#) May 11
 - [Signout](#) Apr 23
 - [Notes](#) May 11
 - [DOP notes](#) 1999

Laboratory · (1999-06-21 to 1998-03-27) · [Newer](#) · [Older](#)

TEST DESCRIPTION	DATE	TIME	STATUS
CULTURE & SMEAR SITE	1999-01-25	18:24	F
ABC	1999-01-25	17:00	F
CHEM 7 PROFILE	1999-01-25	07:30	F
PT/INR STAT LAB	1999-01-16	17:00	F
MISCELLANEOUS CHEMISTRY DISPLAY	1998-12-31	09:15	F
ELECTROLYTES, SERUM	1998-12-31	09:15	F
ABC	1998-12-31	09:15	F
HEPATIC FUNC PANEL	1998-12-31	09:15	F
ESTRADIOL	1998-09-13	19:48	C

PT/INR STAT LAB 1999-01-16 17:00			
Test	Result	Range	Unit
PROTHROMBIN	12.9	10.8-13.6	sec
INR	1.17		
Status: Final, Accno: M36016SLPT 990T			
3131313 · SANDIEGO, CARMEN · 1951-05-26 · F			

WebCIS - 3131313 (user: ciminoj) - Netscape

Infobutton Manager - Netscape

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Netsite: https://flux.cpmc.columbia.edu/webcisdev13/wc_infomanage.cgi

Questions of Interest

From the Columbia University [Infobutton Manager](#)

Concept of Interest: **PROTHROMBIN**
Preferred Name for Searching: **COAGULATION TISSUE FACTOR INDUCED.INR**
Date of Patient Data: **1999-01-16 17:00**

Frequently Asked Questions:

- [What is the NYPH guideline for managing adult patients with elevated INR due to warfarin?](#)
- [What does the CPMC Lab Manual say about this test?](#)
- [How does the CPMC Lab Manual say I should collect a specimen for this test?](#)

Other Common Questions:

- [What is the differential diagnosis when it is abnormal?](#)

Search Other Resources:

- [Lab Tests Online](#)
- [UpToDate](#)
- [Harrisons Principles of Internal Medicine](#)
- [PubMed](#)
- [National Guidelines Clearinghouse](#)

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Document: Done

1999

Document: Done

MRN · Name · List · Add to list

older

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Lab summ
Lab updat
12h | 36h
Admin sun

All resu
Before c

Laborator
Radiology
Pathology
Disch Sum
Op/Clinica
Operativ
Consult
Clin Sum
Eclipsys
Neurophy:
Ob/Gyn
GI Endo
Cardiology
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Location: <http://inonet.nyp.org/Pharmacy/Forms/Medication/INR-policy-final-adult.pdf>

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Older

TABLE 1: Recommendations for the Medical Management of ADULT Patients with an Elevated INR Value Secondary to Chronic Warfarin Administration

INR value	Clinical Presentation	Recommended Intervention(s)
INR >3 but ≤5 (assuming target INR is 2-3*)	No significant bleeding Low bleeding risk based on INR value	INR 3.1-3.9 Day 1: subtract 5-10% of total weekly dose (TWD) Weekly: reduce TWD by 5-10% Re-Check INR in 72 hours** INR 4.0-5.0 Day 1: no warfarin Weekly: reduce TWD by 10-20% Re-check INR in 72 hours**
INR >5 but <9	No significant bleeding At risk for bleeding based on elevated INR value (No additional risk for bleeding based on Appendix A)	<ul style="list-style-type: none"> Hold warfarin** Monitor INR daily until it reaches upper limit of the therapeutic range* Weekly: reduce TWD by 20-50% Re-check an INR in 72 hours***
INR > 9	No significant bleeding At risk for bleeding based on elevated INR value (No additional risk for bleeding based on Appendix A)	<ul style="list-style-type: none"> Hold warfarin** Give vitamin K 0.5 mg IV or approximately 1 mg PO (one quarter of a commercially available 5 mg tablet)** Admit the patient to the hospital Monitor INR frequently over the next 24-48 hrs (at least daily) until it reaches the upper limit of the therapeutic range* Re-institute warfarin after decreasing the TWD by 20-50% Re-check INR daily until re-stabilized, then weekly
INR > 5	Significant risk for bleeding At risk for bleeding based on elevated INR value And At risk for bleeding based on characteristics outlined in Appendix A	<ul style="list-style-type: none"> Hold warfarin Give vitamin K 0.5 mg IV or approximately 1 mg PO (one quarter of a commercially available 5 mg tablet)** Monitor INR frequently over the next 24-48 hrs (at least daily) until it reaches the upper limit of the therapeutic range* Re-institute warfarin after decreasing the TWD by 20-50% Re-check INR daily until re-stabilized, then weekly
INR >3*	Bleeding	<ul style="list-style-type: none"> Hold warfarin Give vitamin K by IV infusion ^{a, b} ADULT DOSE: 1-5 mg Give FFP^c

2 of 8 8.5 x 11 in

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Solutions via Integration Engines

- Use translation tables to convert local to standard codes
- Aggregation through translation
- But:
 - Only for extrinsic data
 - Static translation
 - Static aggregation
 - Only one aggregation allowed

Where are the low-hanging fruit?

1. Data that are captured in coded form
2. Domains for which controlled terminologies exist
3. Controlled terminologies that have clinical-level terms
4. Controlled terminologies that have aggregation classes
5. Responsive maintenance process

	Data coded?	Terminology Available?	Clinical-level terms?	Aggregation classes?	Responsive?
Lab Results	Yes	LOINC	Yes	Yes	Yes
Problem List	Sometimes	ICD9-CM	Often	Some	No
Problem List	Sometimes	SNOMED	Mostly	Yes	Yes
Medications	Yes	NDC	Yes/No	No	No
Medications	Yes	RxNorm	Yes	Yes	Yes
Allergies	Sometimes	SNOMED	Mostly	Yes	Yes
Allergies	Sometimes	RxNorm	Mostly	Yes	Yes

Where could we do with standardized Labs, Problems, Meds and Allergies?

1. Summary reports, across institutions
2. Automated billing
3. Order checking
4. Alerts
5. Expert systems
6. Information retrieval
7. Research
8. Epidemiology
9. Surveillance

What's needed to exploit of data?

- Terminologies need to be readily available
- Terminology server/services needed for:
 - mapping local data to clinical terminologies
 - mapping between clinical terms and aggregations
- Users need to understand how to use aggregation and to demand it in their systems
- Vendors need to understand the need and provide it, not just pay lip service

What can the government do?

1. Continue to support construction, maintenance and dissemination of terminologies
2. Provide incentives for mapping local data to standards in selected areas
3. Sponsor educational efforts for users and vendors
4. Support research to address:
 - Application development to use terminologies
 - Maintenance and dissemination
 - Mapping methods
 - Aggregation methods