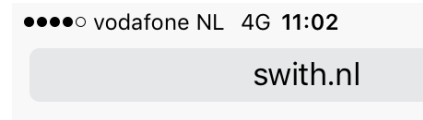


An experiment

- Go to www.swith.nl/expo
- Use provided login information
- Search / enter 4 cases
- Confirm by 'save case'



ITEM DiTo

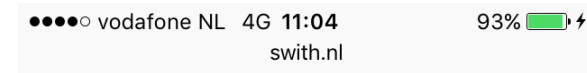
Experiment

You can log in here:

Username:

Password:

Login



ITEM DiTo

Prototype 23-10-2015
Source: SNOMED CT, IHTSDO
Version: 31-07-2015

Experiment

Logout (Ronald)

Case:

(1/4)
Cryptococcal meningitis

Diagnoses:

Save case



How graphical user interfaces impact registration time and data correctness for SNOMED CT data entry

Nicolette de Keizer ^a & Ronald Cornet ^{a,b}

a. Dept Medical Informatics

AMC - University of Amsterdam

b. Dept of Biomedical Engineering at Linköping
University in Sweden



From free text to structure and codes

Physician *D. Buzzard*
House Physician *D. Goellands* Ward *Morgan*
Name *L. C. [redacted]* Clinical Clerk
Occupation *g. s. 3 y. Pte. S. Staffs.* Married or Single *Age 17*
Address *Potters Lane*
Wadsworth Lane
Staffordshire

Admitted	Disease.	Result
<i>8. 12. 15</i>	<i>Shell Shock</i>	<i>2 months</i>
<i>Discharged 21 - 8. 16</i>	<i>* Venous Thrombosis L. Leg.</i>	<i>healed</i>

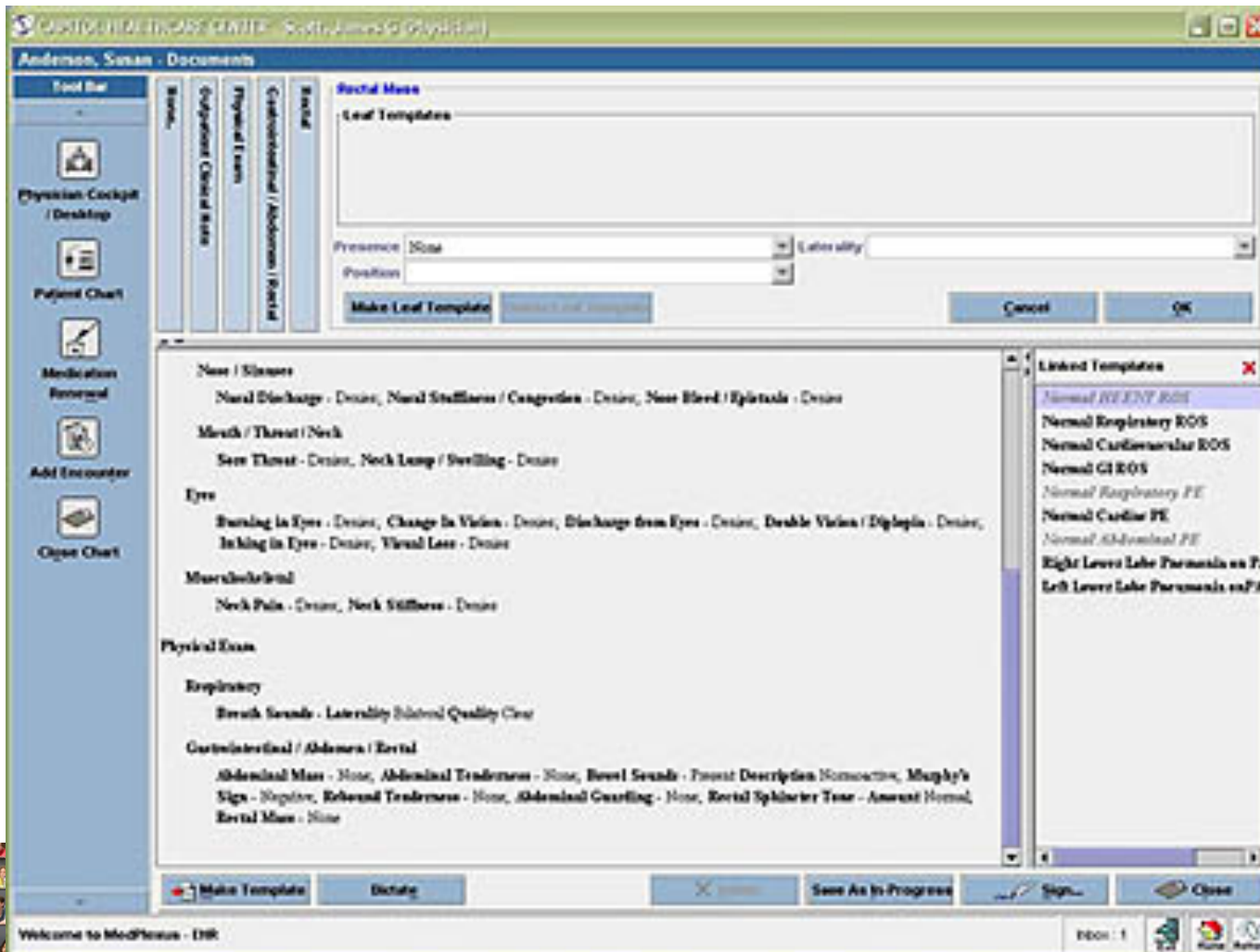
Insillolamine

41. G. & S. No. 22

Paper-based,
free text



From free text to structure and codes



Electronic,
free text


From free text to structure and codes

Admission (2004500000) Go Back

New patient Search Archive New person

:: Immunization

Admission Nr.	2004500000
Title:	Senior
Family name:	Mario
Given name:	Banderas
Date of birth:	08/07/2004
Sex:	male
Blood group:	AB



Options for this patient

- Confirmation of inability to work
- Charts folder
- Diagnostic Results
- Medocs
- DRG (composite)
- Prescriptions
- Notes & Reports
- Immunization

Date: 08/07/2004

Type: Tetagam

Medicine: Anti-tetanus immunization

Dosage: 2 mg/dl

Titer: 345

Refresh date: 08/06/2006

Application type: Subcutaneous

Application by: admin

Notes:

Save

Admission data Barcode labels Make

Search :: Immunization (Immunization) - Mozilla

Search :: Immunization (Immunization)

Please enter search keyword:

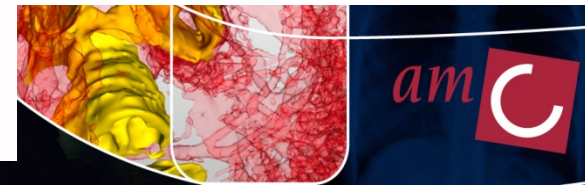
Search

Top 10 Quicklist

- Immunization
- Tetagam

Yes, this one!

Electronic,
Structured & coded



Standardization is important for reuse

Quality indicator for patients with colorectal carcinoma: number of lymph nodes examined

Microscopie

Doorsneden door de gastro-oesophageale overgang tonen een overgang van meerlagig niet verhoornend plaveiselepitheel naar maagcardiatype slijmvlies met hiertussen een klein gezien. Het epitheel is cilindrisch, eenlagig met basaalgelegen kernen. Geen kernatypie gezien. Geen cribriforme groei. In de lamina propria wordt een toename van lymfocyt epitheelveranderingen.

In coupe 14 wordt in een van de fragmenten enkele buizen gezien welke bekleed zijn met cilindrisch epitheel met stapelende, enigszins polymorfe kernen en verlies van polar. deze buizen wordt een toename van lymfocyt en plasmacellen gezien. Tevens op enkele plaatsen reactieve ontsteking, fibrose en bloedingsfoci, mogelijk bij eerdere ingrepen afwijkingen.

Coupe 15 t/m 17: per coupe een lymfklier zonder maligniteit.

Coupe 18: twee lymfklieren zonder maligniteit.

Coupe 19: drie lymfklieren zonder maligniteit.

Coupe 20: een lymfklier zonder maligniteit.

Coupe 21: vijf lymfklieren zonder maligniteit.

Immuno histochemische bepaling

P53: de atypische klierbuizen in coupe 14 toont een toegenomen expressie van P53. Een p53 kleuring op coupe 5, 6, 9 en 11 toont geen aberrante expressie.

08-03-12/S.L. Croonen/CRO

Conclusie

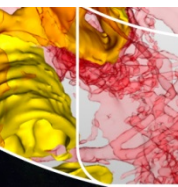
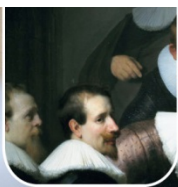
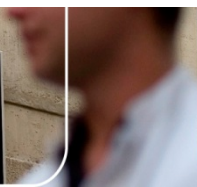
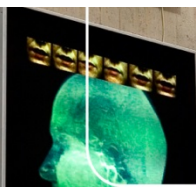
Oesophaguscardiaresectie: op de gastro-oesophageale overgang een fragment met Barrett slijmvlies, waarbij ter plaatse van de stalen markering (mogelijk gebied van eerdere hooggradige dysplasie. Resectievlakken zonder afwijkingen. In totaal veertien lymfklieren zonder maligniteit (0/14), waaronder de lymfklieren ter plaatse van het diafragma



Coding by physicians / nurses

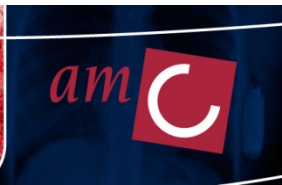
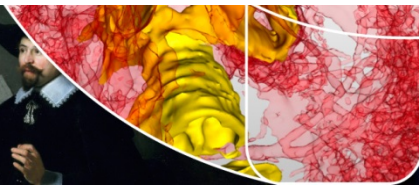
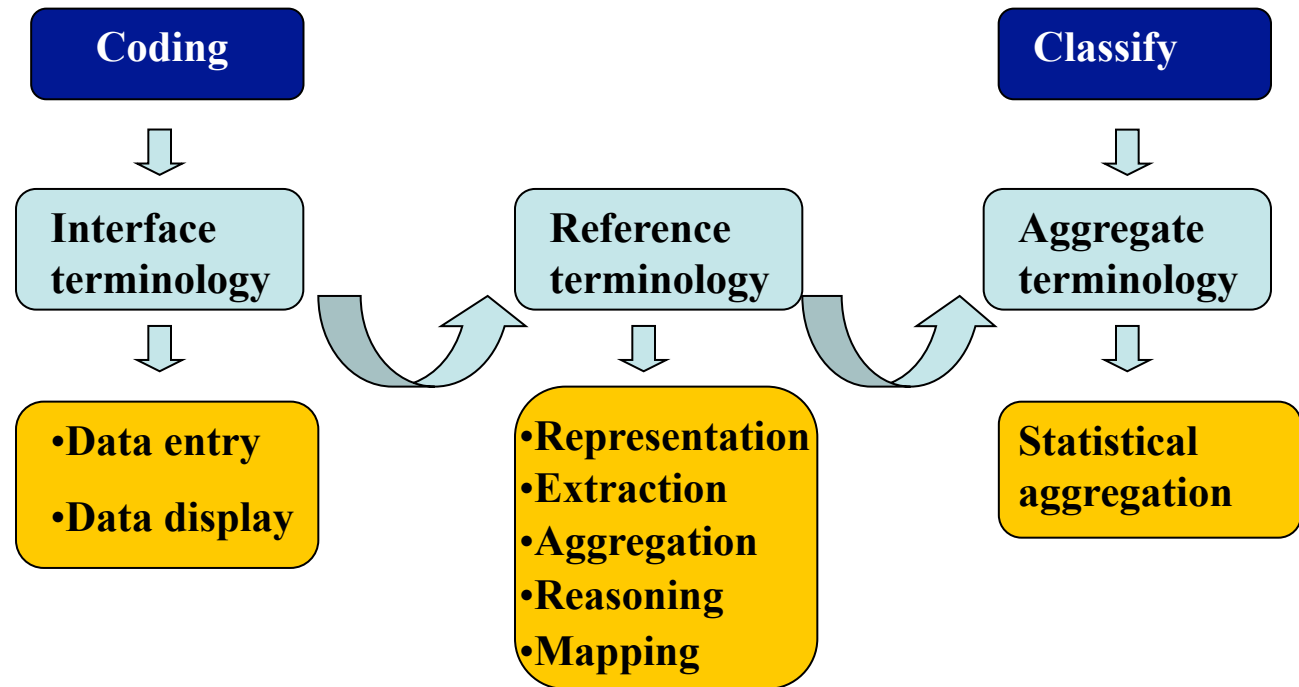


- Difficult to find
- Takes too much time
- Frustration



Solutions and challenges

- Interface terminologies e.g. HealthLanguage, IMO, DHD diagnoses thesaurus etc.



Solutions and challenges

- Interface terminologies e.g. HealthLanguage, IMO, DHD diagnoses thesaurus etc
- Graphical user interface
 - Browsing the browsers (Rogers et al., 2008)

The image displays three overlapping windows from a SNOMED CT browser interface. The leftmost window, titled "SNOMED CT 2008b Core and UK Extension...", shows a search for "pain lower back" with a tree view of results including "PROCEDURE (1)" and "CLINICAL FINDING (6)". The middle window, "CliniClue 2006: SNOMED CT(UK 0810)", shows a search for "pain lower back" with a description of "procedure" and a result for "lower back pain assessment". The rightmost window, "Apelon Mycroft - SNOMED CT [UK Edition]", shows a search for "pain lower back" with a search bar and a "Search" button, but no results are displayed.



What is a good GUI?

Search for “aortaklep” (aortic valve)

Configuration A

Resultaten: 14 van 14

1.	aortaklepstenose
2.	aortaklepatresie
3.	aortaklepprolaps
4.	bicuspidale aortaklep
5.	afwijking van aortaklep
6.	aortaklepinsufficiëntie
7.	aandoening van aortaklep
8.	congenitale aortaklepstenose
9.	congenitale aortaklepinsufficiëntie
10.	aortaklepstenose en -insufficiëntie

Configuration B

Resultaten: 16 van 16

5164	aandoening van aortaklep
5090	aandoeningen van mitralis- én aortakleppen
39058	afwijking van aortaklep
39059	aortaklepatresie
5162	aortaklepinsufficiëntie
39060	aortaklepprolaps
5161	aortaklepstenose
5163	aortaklepstenose en -insufficiëntie
5163	aortastenose / aortaklepstenose én aortainsufficiëntie / aortaklepinsufficiëntie
10592	bicuspidale aortaklep



GUI guidelines

- NHS
 - Rooney M. Consultation Document. Suggestions for Implementing SNOMED CT into the User Interface of an Electronic Healthcare System. London: NHS; 2011.
- Canada Health Infoway
 - Healthcare human factors group. Design Guidelines Development on Clinical Coding of Data for Canada Health Infoway. Toronto 2012.
- IHTSDO
 - SNOMED CT Search and Data Entry Guide. In: IHTSDO, ed2014.

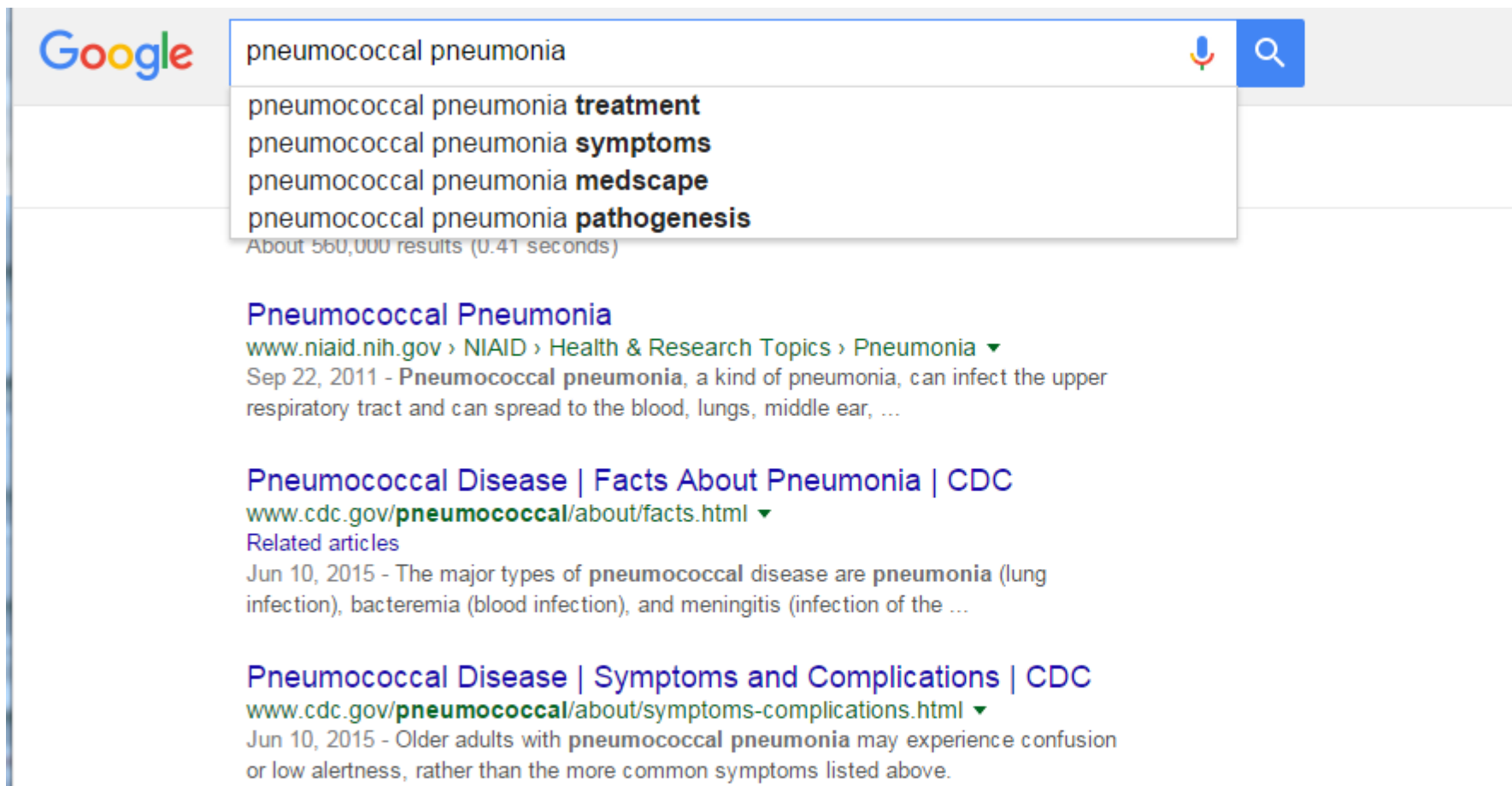


GUI guidelines

- Include recommendations on for example:
 - Search



Search– progressive matching



Google pneumococcal pneumonia

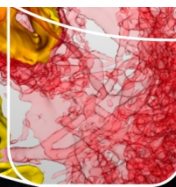
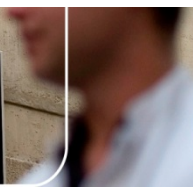
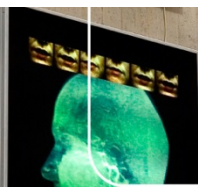
pneumococcal pneumonia **treatment**
pneumococcal pneumonia **symptoms**
pneumococcal pneumonia **medscape**
pneumococcal pneumonia **pathogenesis**

About 560,000 results (0.41 seconds)

Pneumococcal Pneumonia
www.niaid.nih.gov › NIAID › Health & Research Topics › Pneumonia ▼
Sep 22, 2011 - Pneumococcal pneumonia, a kind of pneumonia, can infect the upper respiratory tract and can spread to the blood, lungs, middle ear, ...

Pneumococcal Disease | Facts About Pneumonia | CDC
www.cdc.gov/pneumococcal/about/facts.html ▼
Related articles
Jun 10, 2015 - The major types of pneumococcal disease are pneumonia (lung infection), bacteremia (blood infection), and meningitis (infection of the ...

Pneumococcal Disease | Symptoms and Complications | CDC
www.cdc.gov/pneumococcal/about/symptoms-complications.html ▼
Jun 10, 2015 - Older adults with pneumococcal pneumonia may experience confusion or low alertness, rather than the more common symptoms listed above.



GUI guidelines

- Include recommendations on for example:
 - Search
 - Structured forms



Long list

Country State / Province

Israel

- Please Select --

United States

United Kingdom

India

Canada

Afghanistan

Aland Islands

Albania

Algeria

Andorra

Angola

Anguilla

Antigua And Barbuda

Argentina

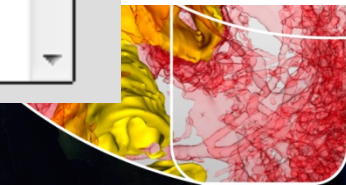
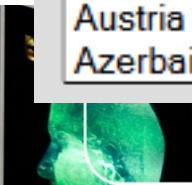
Armenia

Aruba

Australia

Austria

Azerbaijan



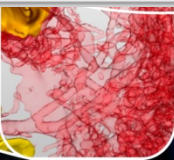
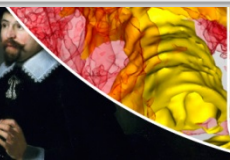
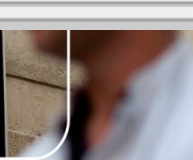
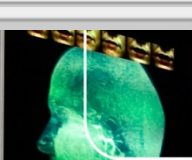
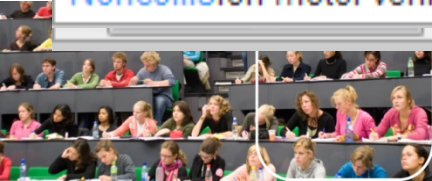
Small vs wide list

noncollis|



OK

- Noncollision motor vehicle traffic accident involving fall from car in street while boarding or alighting
- Noncollision motor vehicle traffic accident involving fall from car in street whilst boarding or alighting
- Noncollision motor vehicle traffic accident involving fall down stairs of motor bus while boarding or alighting
- Noncollision motor vehicle traffic accident involving fall down stairs of motor bus whilst boarding or alighting
- Noncollision motor vehicle traffic accident involving fall from car in street while boarding or alighting (event)
- Noncollision motor vehicle traffic accident involving fall from motor vehicle while in motion, pedestrian injured
- Noncollision motor vehicle traffic accident involving jump from motor vehicle while in motion, pedestrian injured
- Noncollision motor vehicle traffic accident involving fall from motor vehicle whilst in motion, pedestrian injured
- Noncollision motor vehicle traffic accident involving jump from motor vehicle whilst in motion, pedestrian injured
- Noncollision motor vehicle traffic accident involving being trapped by door of motor bus while boarding or alighting
- Noncollision motor vehicle traffic accident involving fall from motor vehicle while in motion, motor cyclist injured
- Noncollision motor vehicle traffic accident involving fall from motor vehicle while in motion, pedal cyclist injured
- Noncollision motor vehicle traffic accident involving jump from motor vehicle while in motion, motor cyclist injured
- Noncollision motor vehicle traffic accident involving jump from motor vehicle while in motion, pedal cyclist injured
- Noncollision motor vehicle traffic accident involving being trapped by door of motor bus whilst boarding or alighting



GUI guidelines

- Include recommendations on for example:
 - Search
 - Structured forms
 - Free-text parsing
 - Post-coordination
 - Meaningful and intuitive display
 -

*Expert opinion, not
evidence based*



Infrastructure to obtain evidence

- Web application to compare different data entry, search and display modes
- Extracted from the guidelines



Instellingen:

Volgorde:

- Alfabetisch
- Lexical distance
- Aantal karakters
- Aantal woorden
- Match positie
- ConceptID
- Standaardvolgorde

Synoniemen onderscheiden:

- Geen
- Met "v" en "s"

Synoniemen filteren:

- Geen
- Eén per concept: 1e
- Eén per concept: v, NL 1e

FSN includeren:

- Geen
- Wel

DBC includeren:

- Geen
- Wel

Code weergeven:

- Geen
- ConceptID

Resultaten nummeren:

- Niet nummeren
- Wel nummeren

Matches stijl:

- Geen
- Vetgedrukte matches
- Vetgedrukt behalve matches

Antel 17:47 80%
swith.nl

ITEM DiTo Prototype 23-10-2015
Source: SNOMED CT, IHTSDO
Version: 31-07-2015

Experiment Logout (Nicolet)

Case:

(1/4)
Cryptococcal meningitis

Diagnoses:

1. Cryptotia

delete

Add remark

Save case



Small pilot

- 18 patient diagnoses; 21 participants
- Dutch interface terminology on SNOMED CT
- Lexical distance vs. alphabetic order, switch after half of the cases
- Outcome measures:
 - task completion
 - correctness of recorded concepts
 - time needed to finish a registration

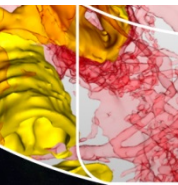
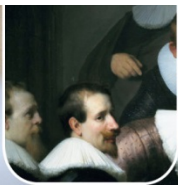
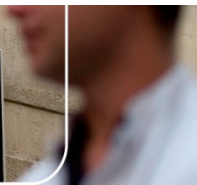
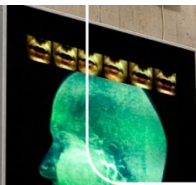
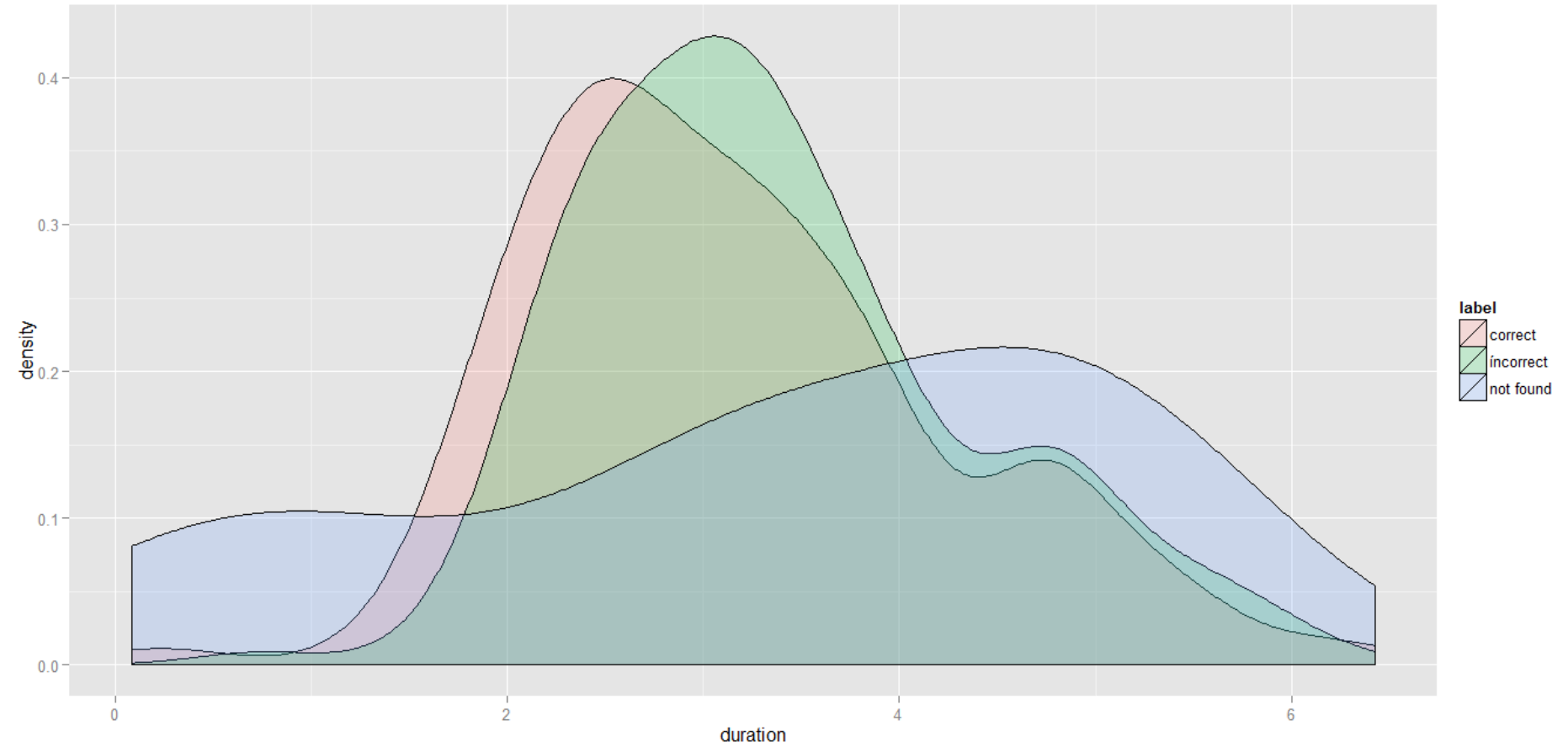


Pilot results

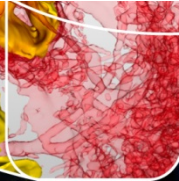
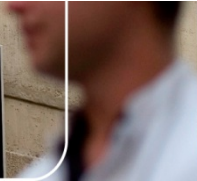
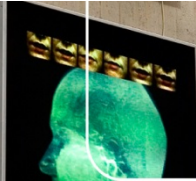
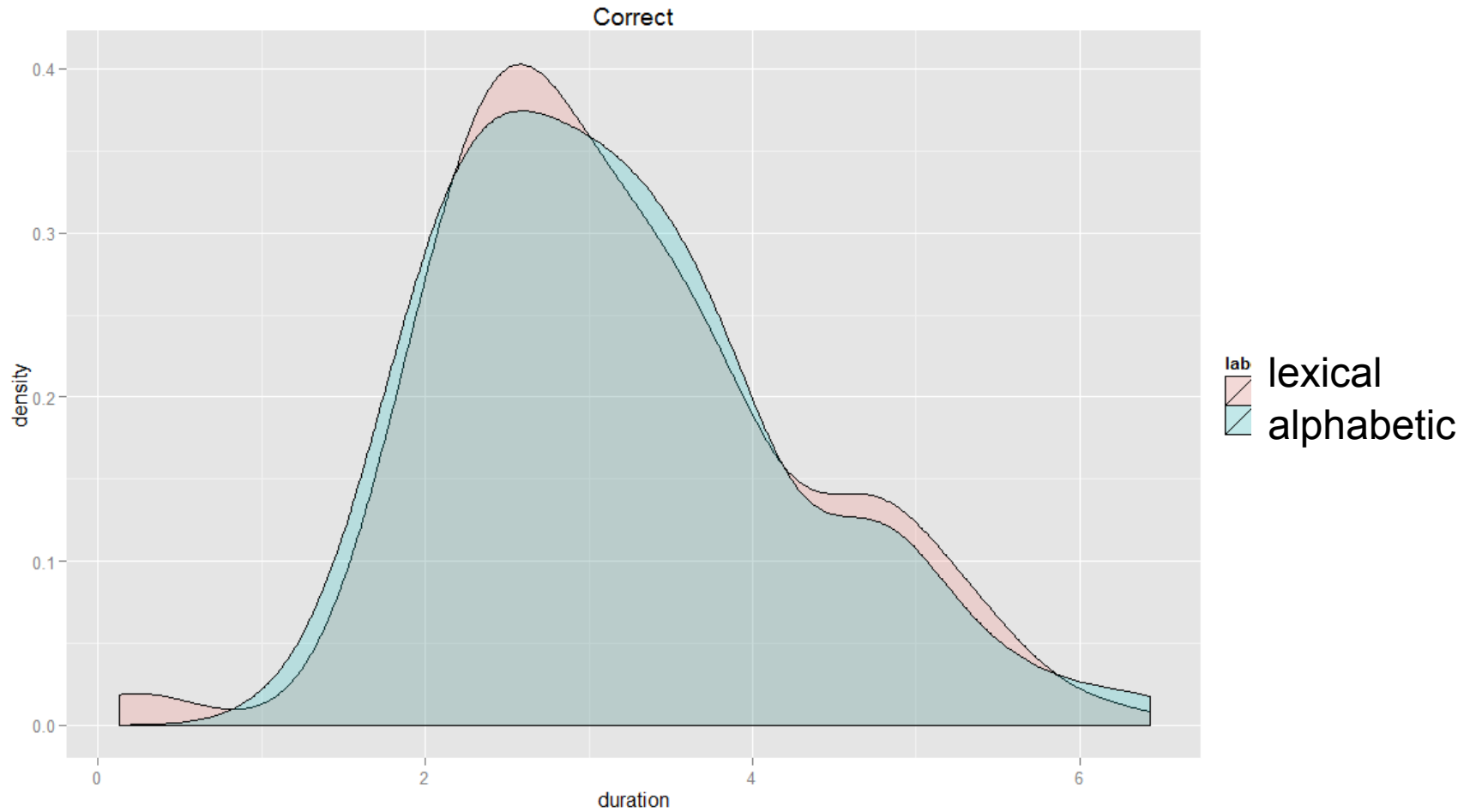
- Task completion : 93% (353/378)
- Only 56% (212/378) of the diagnoses were correctly coded
 - Lexical vs alphabetic: 54.9% vs 57.3%



Pilot results



Pilot results



Summary

- No difference between lexical distance and alphabetic ordering
- Future:
 - larger scale
 - more principles described in the GUI guidelines
- Powerful framework
 - comparative analyses on variety of GUI configurations
 - evidence that implementers can use to configure optimal graphical user interfaces



Results of the experiment

●●●●○ Movistar 16:19 92% swith.nl

Diagnoses:

crypto

Results: 57 of 57

1.	Cryptotia
2.	Cryptorchism
3.	Cryptodidymus
4.	Onychocryptosis
5.	Cryptococcosis
6.	Cryptocotylosis
7.	Cryptophthalmos
8.	Pseudocryptorchism
9.	Cryptogenic edema
10.	Cryptosporidiasis
11.	Ocular cryptococcosis
12.	Hepatic cryptococcosis
13.	Osseous cryptococcosis
14.	Cryptogenic cirrhosis

●●●●○ Movistar 16:17 93% swith.nl

Diagnoses:

crypto

Results: 87 of 87

86638007	Alveolitis due to Cryptostroma corticale
187094001	Cerebral cryptococcosis
700251005	CFA - Cryptogenic fibrosing alveolitis
421278000	Choroiditis due to Cryptococcus neoformans
240371008	Chronic intestinal cryptosporidiasis
129458007	COP - Cryptogenic organising pneumonitis
129458007	COP - Cryptogenic organizing pneumonitis
416877003	Cryptococcal chorioretinitis
417344003	Cryptococcal choroiditis
416296007	Cryptococcal endophthalmitis

