# Casemix costing Sensibility to coders personal skill and coding systems for diagnosis and procedures

***Jean-Marie Rodrigues*****
INSERM U1142, LIMICS Paris France
***Koki Idehara***
K. PRRISM Consulting Tokyo Japan
***Sunelle Cloete-Lubbe***
Mediclinic Cape Town South Africa
***San mari Matthee***
Mediclinic Cape Town South Africa
***James R Campbell***
University of Nebraska Medical Center
Omaha USA

LIMICS UMRS 1142

# Plan

- Terminology artefacts
- PCSI Summer School exercice
- Clinical note
- Coders skill
- Results
- Conclusion

# Interface terminologies

- Tend to be as short as possible, and ambiguous out of context.
- User group dependent (medical specialties, regional dialects and geographic names (e.g. "GWB": "general well-being", or "George Washington Bridge").
- Change across time, "AIDS" "Acquired Immunodeficiency Syndrome", or "Acquired Iatrogenic Death Syndrome"
- Continuous maintenance
- If made explicit not used by clinicians

# Reference terminologies

- stable and well-defined representational units

But

- Infested by context as “suspected”

- polluted by information entities or objects without ontology representation

- Not fully available (synonyms) outside English and Spanish Argentina

# Aggregation terminologies

- Mono hierarchical :Exhaustive, Mutually Exclusive with meaningless classes as « other » or « non specified »

- Mixed of Clinical vocabulary expressing non Ontology knowledge, taxonomy and coding rules

- Needing specifically trained staff

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# PCSI Summer School Exercice

- Since 2015 we use anonym clinical notes and ask the students to summarize the information of the clinical notes in principal diagnosis, secondary diagnosis and procedures. With ICD 10 or ICD 11, ICHI and SNOMED CT.
- The First difference is related to the choice of the principal diagnosis versus the secondary diagnosis and as well what is a current patient diagnosis versus the patient past history or patient family diagnosis history.
- The second difference is the number of codes selected
- We compare the results for the same clinical note.

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# Clinical note 1

- HPI [NAME] is a very pleasant 80-year-old female here today for followup of hypertension, hyperlipidemia, hypothyroidism, and osteoporosis.
- With regards to her hypertension, she is currently on lisinopril 10 mg a day. She is tolerating this, has no cough, has no orthostatic symptoms. She also denies any chest pain, shortness of breath, or change in her exertional capacity.
- For her cholesterol, she is on simvastatin 20 mg a day and also tolerating this. She remains very active, eats a very healthy diet of fresh vegetables, fruit and fish.
- With regards to her hypothyroidism, she is on levothyroxine 50 mcg a day and is clinically euthyroid.
- She does take vitamin D and calcium and is no longer on alendronate which he had been for greater than five years. Currently on a drug holiday, but we are going to recheck her lipids or her density within the next couple of months.

# Clinical note 2

- The following portions of the patient's history were reviewed and updated as appropriate: allergies, current medications, immunization history, past medical history, past social history, past surgical history and problem list.
- 
- Patient Active Problem List
- Diagnoses
- â€¢ Essential hypertension
- â€¢ Hypercholesterolemia
- â€¢ Optic atrophy
- â€¢ Nephrolithiasis
- â€¢ Drusen of optic disc
- â€¢ Hypothyroidism
- â€¢ Myopia
- â€¢ Presbyopia
- â€¢ Diverticulosis
- â€¢ Senile nuclear cataract
- â€¢ Vitreous degeneration
- â€¢ Osteoporosis
- 
- Current Medications
- Medication Sig Dispense Refill
- â€¢ aspirin 81 MG EC tablet Take 81 mg by mouth 1 (one) time a day.
- â€¢ calcium carbonate-vitamin D3 600mg (1,000mg) -1,000 unit Tab Take 1 tablet by mouth 1 (one) time a day.
- â€¢ cholecalciferol, vitamin D3, (VITAMIN D3) 1,000 unit Chew Take by mouth.
- â€¢ levothyroxine (SYNTHROID, LEVOTHROID) 50 mcg tablet TAKE ONE TABLET BY MOUTH EVERY DAY  90 tablet  3
- â€¢ lisinopril (PRINIVIL,ZESTRIL) 10 mg tablet TAKE ONE TABLET BY MOUTH EVERY DAY  90 tablet  3
- â€¢ simvastatin (ZOCOR) 20 mg tablet TAKE ONE TABLET BY MOUTH EVERY DAY  90 tablet  3
- 
- No Facility-Administered Medications for the 7/1/14 encounter (Office Visit) with [DOCTOR].
- 

# Clinical note 3

- Allergies Allergen Reactions
- â€¢ Sulfamethoxazole Urticaria
- 
- Review of Systems
- ROS otherwise negative on 14-system review other than what is mentioned in the HPI.
- 
- Objective: BP 137/81 | Pulse 61 | Temp(Src) 36.5 Â°C | Resp 16 | Ht 1.613 m (5' 3.5") | Wt 54.4 kg (119 lb 14.9 oz) | BMI 20.91 kg/m2 Physical Exam
- Constitutional: She is oriented to person, place, and time. She appears well-developed and well-nourished.
- HENT: Head: Normocephalic and atraumatic.
- Right Ear: External ear normal. Left Ear: External ear normal.
- Nose: Nose normal.
- Mouth/Throat: Oropharynx is clear and moist.
- Eyes: Conjunctivae normal and EOM are normal. Pupils are equal, round, and reactive to light. Neck: Normal range of motion. Neck supple.
- No thyromegaly present.
- Cardiovascular: Normal rate, regular rhythm and intact distal pulses. Exam reveals no gallop and no friction rub. No murmur heard.
- Pulmonary/Chest: Effort normal and breath sounds normal.
- Abdominal: Soft. Bowel sounds are normal. She exhibits no distension and no mass. There is no tenderness.
- Musculoskeletal: Normal range of motion. She exhibits no edema and no tenderness.
- Lymphadenopathy: She has no cervical adenopathy.
- Neurological: She is alert and oriented to person, place, and time. She has normal reflexes. No cranial nerve deficit.
- Skin: Skin is warm and dry. No rash noted.
- Psychiatric: She has a normal mood and affect.

# Clinical note 4

- Hospital Outpatient Visit on 06/30/2014 Component Date Value Range Status
- â€¢ Sodium, Blood 06/30/2014 142 136 - 145 mmol/L Final
- â€¢ Potassium, Blood 06/30/2014 4.3 3.6 - 5.1 mmol/L Final
- â€¢ Chloride, Blood 06/30/2014 108 101 - 111 mmol/L Final
- â€¢ CO2 06/30/2014 28 22 - 32 mmol/L Final
- â€¢ Anion Gap 06/30/2014 6 4 - 15 mmol/L Final
- â€¢ Glucose, Blood 06/30/2014 98 70 - 125 mg/dL Final
- â€¢ BUN 06/30/2014 9 6 - 20 mg/dL Final
- â€¢ Creatinine 06/30/2014 0.84 0.44 - 1.03 mg/dL Final
- â€¢ BUN/Creatinine Ratio 06/30/2014 10.7 10.0 - 20.0 mgUN/mgCR Final
- â€¢ Osmolality, Calculated 06/30/2014 292 275 - 295 mOsm/kg Final
- â€¢ Calcium 06/30/2014 9.3 8.9 - 10.3 mg/dL Final
- â€¢ GFR Non African American 06/30/2014 >60 >59 Final Units: mL/min/1.73 m2
- â€¢ GFR African American 06/30/2014 >60 >59 Final Units: mL/min/1.73 m2
- â€¢ TSH Ultrasensitive 06/30/2014 2.290 0.400 - 5.000 mcIU/mL Final
- â€¢ Cholesterol 06/30/2014 159 <200 mg/dL Final Desirable
- â€¢ Triglycerides 06/30/2014 54 <150 mg/dL Final Desirable
- â€¢ HDL Cholesterol 06/30/2014 69 >39 mg/dL Final Optimal
- â€¢ LDL Cholesterol 06/30/2014 79 0 - 129 mg/dL Final Optimal
- â€¢ VLDL Cholesterol 06/30/2014 11 Final Reference Range Not Established
- â€¢ Chol/HDL Ratio 06/30/2014 2.3 Final Comment: Units: mgCHOL/mgHDL Reference Range Not Established
- â€¢ Vit D2 25 Hydroxy 06/30/2014 <10 Final
- â€¢ Vit D3 25 Hydroxy 06/30/2014 36 Final
- â€¢ Ttl Vit D 25 Hydroxy 06/30/2014 36 30 - 80 ng/mL Final
-

# Clinical note 5

- Hospital Outpatient Visit on 06/30/2014 Component Date Value Range Status
- â€¢ Sodium, Blood 06/30/2014 142 136 - 145 mmol/L Final
- â€¢ Potassium, Blood 06/30/2014 4.3 3.6 - 5.1 mmol/L Final
- â€¢ Chloride, Blood 06/30/2014 108 101 - 111 mmol/L Final
- â€¢ CO2 06/30/2014 28 22 - 32 mmol/L Final
- â€¢ Anion Gap 06/30/2014 6 4 - 15 mmol/L Final
- â€¢ Glucose, Blood 06/30/2014 98 70 - 125 mg/dL Final
- â€¢ BUN 06/30/2014 9 6 - 20 mg/dL Final
- â€¢ Creatinine 06/30/2014 0.84 0.44 - 1.03 mg/dL Final
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- â€¢ Vit D3 25 Hydroxy 06/30/2014 36 Final
- â€¢ Ttl Vit D 25 Hydroxy 06/30/2014 36 30 - 80 ng/mL Final
-

# Clinical note 6

- 
- Assessment & Plan:
- 1. Hypertension, good control on lisinopril 10 mg a day. Her electrolytes and kidney function are all within normal limits.
- 2. Hyperlipidemia, currently on simvastatin 20 mg a day with excellent control.
- 3. Hypothyroidism. She is clinically euthyroid and has a normal TSH on 50 mcg a day of levothyroxine. She will continue this.
- 4. Osteoporosis, has been on alendronate for greater than five years and stopped this last year. We will check a bone density to see if she is stable or has declined and go from there. She is getting enough calcium and vitamin D per requirements of 1500 mg of calcium and 800 international units of vitamin D. 5. Screening for breast cancer, did discuss this with her regarding her age. She is very healthy, so will do it every other year for now until she has until she has any change in her medical condition.

# Clinical note 7

- I will see her back in one year or sooner on a p.r.n. basis.

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# Coders skill

- 2 highly qualified coders
- 1 non graduate coder
- 1 terminologist physician
- Qualified team University of Nebraska as Gold standard

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# overview

| students | P Dx ICD | P Dx SCT | S Dx ICD | S Dx SCT | PR ICHI | PR SCT |
|---|---|---|---|---|---|---|
| SCL | 1 | 1 (proc) | 13 | 12 | 0 | 1 |
| SM | 1 | 1 (proc) | 14 | 13 | 0 | 1 |
| KI | 4 | 4 | 0 | 0 | 1 | 1 |
| JM | 4 | 3 (proc) | 15 | 14 | 3 (ICD11) | 4 |
| Team UN | 2 | 15 | 13 | 0 | | |

# University of Nebraska Team

| PD x | DX_LINE | PROBLEM_TERM | IMO_ICD9 | IMO_ICD10 | _LINE | SNCTID | SNCT_PREFTERM | |
|---|---|---|---|---|---|---|---|---|
| N | 4 | Osteoporosis | 733 | M81.0 | 1 | 64859006 | OSTEOPOROSIS | |
| Y | 1 | Essential hypertension | 401,9 | I10 | 1 | 59621000 | ESSENTIAL HYPERTENSION | |
| N | 5 | Screening for breast cancer | V76.10 | Z12.39 | 1 | 243878006 | BREAST NEOPLASM SCREENING STATUS | |
| N | 3 | Hypothyroidism | 244,9 | E03.9 | 1 | 40930008 | HYPOTHYROIDISM | |
| N | 2 | Hypercholesterolemia | 272 | E78.0 | 1 | 13644009 | HYPERCHOLESTEROLEMIA | |
| N | 8 | Sinusitis | 473,9 | J32.9 | 1 | 36971009 | SINUSITIS | |
| N | 5 | Sleep apnea | 780,57 | G47.30 | 1 | 73430006 | SLEEP APNEA | |
| N | 7 | Colon cancer screening | V76.51 | Z12.11 | 1 | 243876005 | SCREENING STATUS | |
| Y | 1 | Diabetes mellitus | 250 | E11.9 | 1 | 73211009 | DIABETES MELLITUS | |
| N | 3 | Hypertension | 401,9 | I10 | 1 | 38341003 | HYPERTENSIVE DISORDER | |
| N | 4 | Prostate cancer screening | V76.44 | Z12.5 | 1 | 243876005 | SCREENING STATUS | |
| N | 6 | Depression | 311 | F32.9 | 1 | 35489007 | DEPRESSIVE DISORDER | |
| N | 2 | Hyperlipidemia | 272,4 | E78.5 | 1 | 55822004 | HYPERLIPIDEMIA | |
| N | 2 | Hyperlipidemia | 272,4 | E78.5 | 2 | 166816003 | SERUM LIPIDS HIGH | |
| N | 9 | Hearing loss, bilateral | 389,9 | H91.93 | 1 | 95820000 | BILATERAL HEARING LOSS | |

# variation

- Primary Diagnosis vs Secondary Diagnosis
  - WHO and casemix 1
  - SNOMED and EHR several 2 to 4
- Disease/Disorder or context :screening:monitoring
- Disease/ disorder or Procedure (ICD11 vs ICHI)
- Granularity of secondary diagnosis
  - Experience 0 to 14
  - Coding system ICD11 XM  or SNOMED CT codes for medications vs ICD10

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# Activity Base Funding fair?

- Comparison of Case mix cost can only be meaningful when coders skill and coding systems for diagnosis and procedures are the same
- Extract a meaningfull information from clinical notes is a hard work vs automatic cost computing
- From ICD10 X generation Casemix to a more advanced generation based on clinical notes (natural language) and reference terminologies (controlled vocabulary)?

# Materials :

- The ICD-11
- Chapter : « Circulatory System »

The World Health Organization browser

**ICD-11 Beta Draft** (Joint Linearization for Mortality and Morbidity Statistics)

*Foundation Id : http://id.who.int/icd/entity/1015872326*

## CA12 Hypertensive renal disease

**Parent**

Hypertensive diseases

**Definition**

Hypertensive renal disease is a medical condition referring to damage to the kidney due to chronic high blood pressure.

**Inclusions**

- Chronic kidney disease due to hypertension
- arteriosclerosis of kidney
- arteriosclerotic nephritis (chronic)(interstitial)
- hypertensive nephropathy
- nephrosclerosis
- Glomerular diseases due to hypertension
- Unspecified contracted kidney due to hypertension

**Exclusions**

- Secondary hypertension (CA14)

?

- SNOMED CT

IHTSDO SNOMED CT browser

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Taxonomy | Search | Favorites | Refset

Hypertensive renal disease

Expression from Stated Concept Definition (*)

=== 90708001 |Kidney disease (disorder)| :
47429007 |Associated with (attribute)| = 38341003
|Hypertensive disorder, systemic arterial (disorder)|

Parents

- Complication of systemic hypertensive disorder (disorder)
- Kidney disease (disorder)

Children (16)

- Arteriolar nephritis (disorder)
- Autosomal dominant progressive nephropathy with hypertension (disorder)
- Benign hypertensive renal disease (disorder)
- Chronic hypertensive uremia (disorder)
- Chronic kidney disease due to hypertension (disorder)
- End stage renal disease due to hypertension (disorder)
- Hypertension concurrent and due to end stage renal disease on dialysis (disorder
- Hypertension due to compression of renal parenchyma (disorder)
- Hypertensive heart AND renal disease (disorder)
- Hypertensive nephrosclerosis (disorder)
- Hypertensive renal disease in obstetric context (disorder)
- Hypertensive renal disease with renal failure (disorder)

# Semi automatic Mapping SNOMED CT to ICD-10

79619009 Mitral valve stenosis (disorder)

IF A 194734000 | AORTIC INSUFFICIENCY

**ICD-10 I08.0**

79619009 Mitral valve stenosis (disorder)

IF A 123802001 | REGURGITATION

**ICD-10 I05.2**

79619009 Mitral valve stenosis (disorder)

IF NO OTHERWISE TRUE ALWAYS

**ICD-10 I05.0**

# ICD11 Linearizations differences with SNOMED CT

- **Mono-hierarchy vs Multi parenthood**
- **Specific preferred term vs Full specified names and synonyms**
- **Inclusion/exclusion**
- **Residuals**

# Merci pour votre attention

rodriguesjeanmarie2@gmail.com

- **Thank you**
- **Vielen Dank für Ihre Aufmerksamkeit**
- **Merci**
- **Gracie**
- **Gracias**
- **Obrigado**
- **Efcharisto**
- **Kessenem**
- **Mange takk**
- **Tänan**
- **Kiitos**
- **Spasibo**
- **Arigato Gozaimasu**
- **Terima Kasih**
- Xiéxie

  – Et BONJOUR