SNOMED CT for monitoring HIV-stage; Implementation in OpenMRS in Kenya

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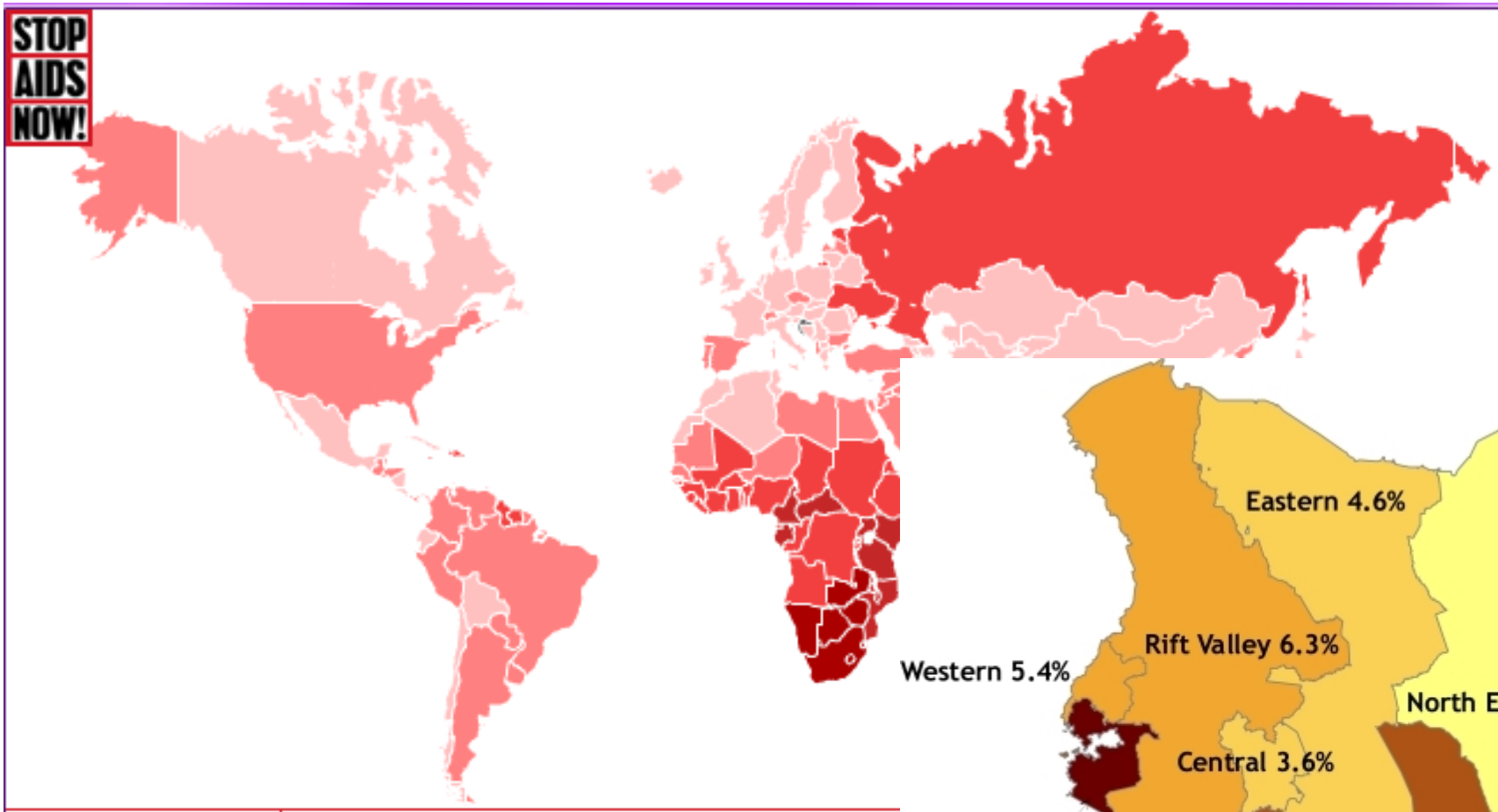
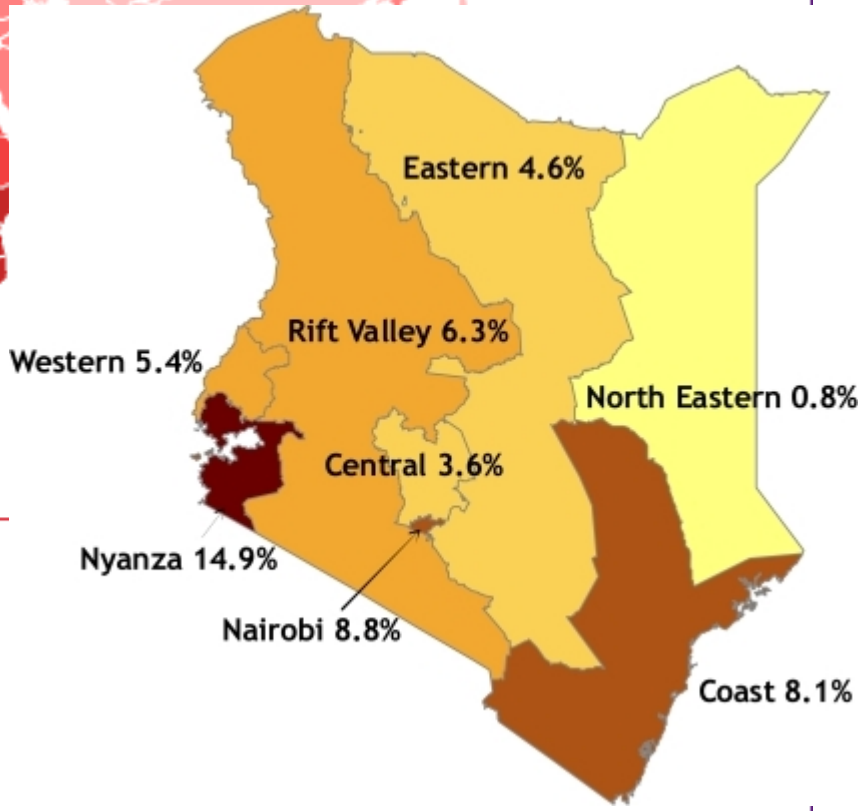
NDERE HEALTH
CENTRE

STOP AIDS NOW!





Kaart Aids in de wereld

Bron: www.unaids.org

Aids in de Wereld

Mensen met hiv/aids --
33.400.000

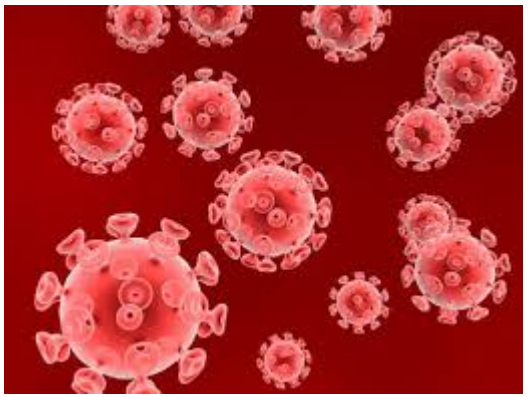
Aidsdoden in 2008
2.000.000

Aidswezen in 2008
15.000.000

Volwassenen met hiv/aids
0.8%

HIV versus AIDS

- HIV+ = infected with HIV virus
- AIDS = infected with HIV-virus and clinical symptoms (AIDS Defining Illness=ADIs)
- CD4 = laboratory test on CD4 cells. The higher the better the immune system works



Treatment HIV/AIDS

- Antibiotics to prevent infections, monitoring, lab investigation.
- WHO recommends anti-retroviral therapy (ART):
  - CD4 < 350 cells/µl with stage I or II
  - CD4 < 500 cells/µl with stage III
  - WHO stage IV independent of CD4 cell count

Clinical staging

- Clinical staging is used where CD4 tests are not readily available

Clinical stage 1

1. Asymptomatic
2. Persistent generalized lymphadenopathy (PGL)

Clinical stage 2

1. Moderate unexplained weight loss (<10% of presumed or measured body weight)
2. Minor mucocutaneous manifestations (seborrheic dermatitis, popular pruritic eruptions, fungal nail infections, recurrent oral ulcerations, angular cheilitis)
3. Herpes zoster
4. Recurrent upper respiratory tract infections (sinusitis, tonsillitis, bronchitis, otitis media, pharyngitis)

Clinical stage 3

1. Unexplained severe weight loss (over 10% of presumed or measured body weight)
2. Unexplained chronic diarrhoea for longer than one month
3. Unexplained persistent fever (intermittent or constant for longer than one month)
4. Persistent oral candidiasis
5. Oral hairy leukoplakia
6. Pulmonary tuberculosis
7. Severe bacterial infections (e.g. pneumonia, empyema, pyomyositis, bone or joint infection, meningitis, bacteraemia)
8. Acute necrotizing ulcerative stomatitis, gingivitis or periodontitis
9. Unexplained anaemia (below 8 g/dl), neutropenia (below 0.5 x 109/l) and/or chronic thrombocytopenia (below 50 x 109 /l)

Clinical stage 4

Conditions where a presumptive diagnosis can be made using clinical signs or simple investigations:

1. HIV wasting syndrome
2. Pneumocystis jiroveci pneumonia (PCP)
3. Recurrent severe bacterial pneumonia (≥ 2 episodes within 1 year)
4. Cryptococcal meningitis
5. Toxoplasmosis of the brain
6. Chronic orolabial, genital or ano-rectal herpes simplex infection for >1 month
7. Kaposi sarcoma (KS)
8. HIV encephalopathy
9. Extra pulmonary tuberculosis (EPTB)

Conditions where confirmatory diagnostic testing is necessary:

1. Cryptosporidiosis, with diarrhoea >1 month
2. Isosporiasis
3. Cryptococcosis (extra pulmonary)
4. Disseminated non-tuberculous mycobacterial infection
5. Cytomegalovirus (CMV) retinitis or infection of the organs (other than liver, spleen, or lymph nodes)
6. Progressive multifocal leucoencephalopathy (PML)
7. Any disseminated mycosis (e.g. histoplasmosis, coccidiomycosis)
8. Candidiasis of the oesophagus or airways
9. Non-typhoid salmonella (NTS) septicaemia
10. Lymphoma cerebral or B cell Non Hodgkin's Lymphoma
11. Invasive cervical cancer
10. Visceral leishmaniasis
11. Symptomatic HIV-associated nephropathy or HIV-associated cardiomyopathy

Challenges in Kenya with HIV care

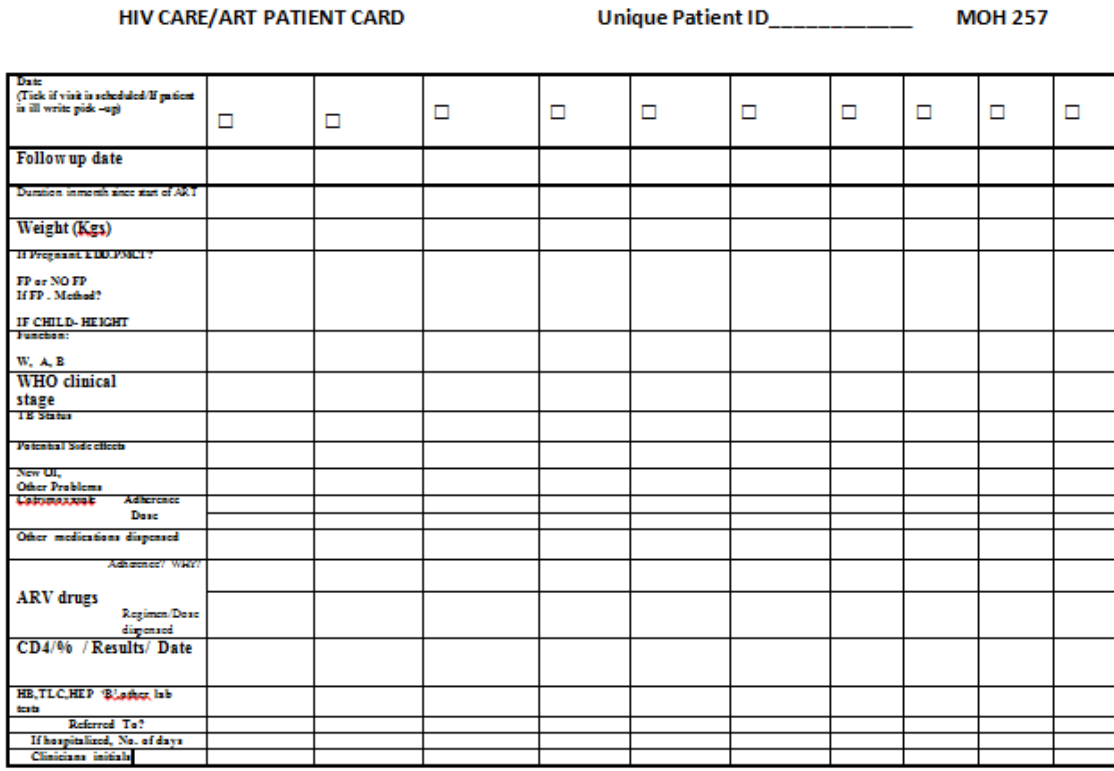
- Limited laboratory resources-> limited CD4 measurements -> dependent on clinical staging

Other challenges in Kenya HIV care

- Medical knowledge of clinicians/nurse practicioners is low (staging, ART initiation)
- High workload

Other challenges in Kenia HIV care

- Medical knowledge of clinicians/nurse practicioners is low
- High workload
- Paper-based chart
  - unreadable
  - lost
  - patients move
  - incomplete



HIV CARE/ART PATIENT CARD Unique Patient ID_____ MOH 257

Date (Tick if visit is scheduled/If patient is ill write pick -up)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Follow up date										
Duration in month since start of ART										
Weight (Kgs)										
If Pregnant: EDD/MCT? FP or NO FP If FP . Method? IF CHILD- HEIGHT										
Function: W, A, B										
WHO clinical stage										
TB Status										
Potential Side effects										
New OI, Other Problems										
~~Cotrimoxazole~~ Adherence Dose										
Other medications dispensed										
Adherence? WHY? ARV drugs Regimen/Dose dispensed										
CD4/% /Results/ Date										
HB,TLC,HEP ~~B~~,other lab tests										
Referred To?										
If hospitalized, No. of days										
Clinicians initials										

Other challenges in Kenia HIV care

- Medical knowledge of clinicians/nurse practicioners is low
- High workload
- Paper-based chart
  - unreadable
  - lost
  - patients relocate
  - incomplete

Clinical staging requires high quality of ADI reporting but….

Studies show that ADIs in clinical settings are under-reported by up to 67%

WHO motivates introduction of EMR

- OpenMRS open source EMR based on open standards
- Implemented in JOOTRH, Kisumu, Kenya
  - 7000 active HIV patients
  - 4800 receiving ART
- Expectation
  - ADI registration
    - Fine granularity
    - Standardized
  - Decision support system
    - Staging
    - Start ART

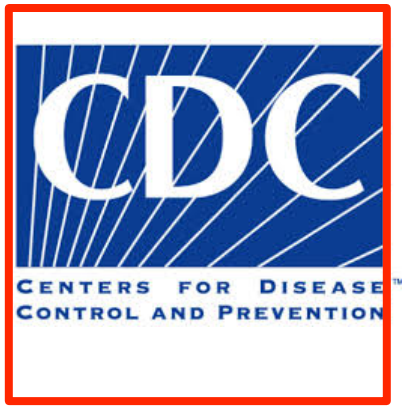
Goal of this project

- Derive a comprehensive RefSet of ADIs based on SNOMED CT and evaluate SNOMED CT's content coverage for ADIs in a provincial referral hospital in Kenya
- Implement the RefSet as an interface terminology in OpenMRS at JOOTRH

Methods

Bakhshi-Raiez F; Ahmadian L; Cornet R; de Jonge E; de Keizer N. Construction of an Interface Terminology on SNOMED CT: Generic Approach and its Application in Intensive Care. Meth Inform Med 2010; 49(4): 349-359.

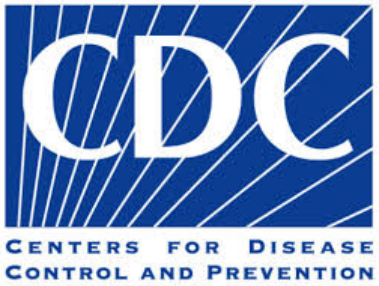
Methods



SNOMED CT
The global language of healthcare

- 2008
- CDC & Accenture opportunistic infections
- SNOMED CT subset of diagnosis and organism concepts
- Stored in OWL format

Methods



- Query January 2014 release in SQL database
  - Concept described by Terms “assoc#” AND (“HIV” or “AIDS” or “acquired immunodeficiency syndrome”)
  - Concepts linked by relationship “associated with” to the concept “AIDS (62479008)”

Methods

CENTERS FOR DISEASE CONTROL AND PREVENTION

SNOMED CT
The global language of healthcare

Zoekterm(en) associa aids

SNOMED Clinical Terms version: 20140731 [R] (July 2014 Release) Help Licentie

Resultaten (5 van 5)

P	Pneumonia associated with AIDS	Pneumonia associated with acquired immunodeficiency syndrome (disorder)
P	Pneumocystosis associated with AIDS	Pneumocystosis associated with acquired immunodeficiency syndrome (disorder)
P	Viral pneumonia associated with AIDS	Viral pneumonia associated with acquired immunodeficiency syndrome (disorder)
P	Bacterial pneumonia associated with AIDS	Bacterial pneumonia associated with acquired immunodeficiency syndrome (disorder)

Pneumonia

Respiratory disorder associated with AIDS

Pneumonia associated with acquired immunodeficiency syndrome (disorder)
Pneumonia associated with AIDS
Pneumonia associated with acquired immunodeficiency syndrome

X

Id	421671002
Definition status	Defined
Associated with	AIDS
Associated morphology	Consolidation
Associated morphology	Inflammation
Finding site	Lung structure

Bacterial pneumonia associated with AIDS 1

Candidiasis of lung associated with AIDS

Viral pneumonia associated with AIDS

Methods

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

SNOMED CT
The global language of healthcare

- All patients that visited JOOTRH in Febr/March 2014
  - 583 initial patient visits
  - 762 follow-up visits
- Two clinical officers extracted ADIs
- Free-text paper-based records & OpenMRS
- Terms mapped to SNOMED CT concepts

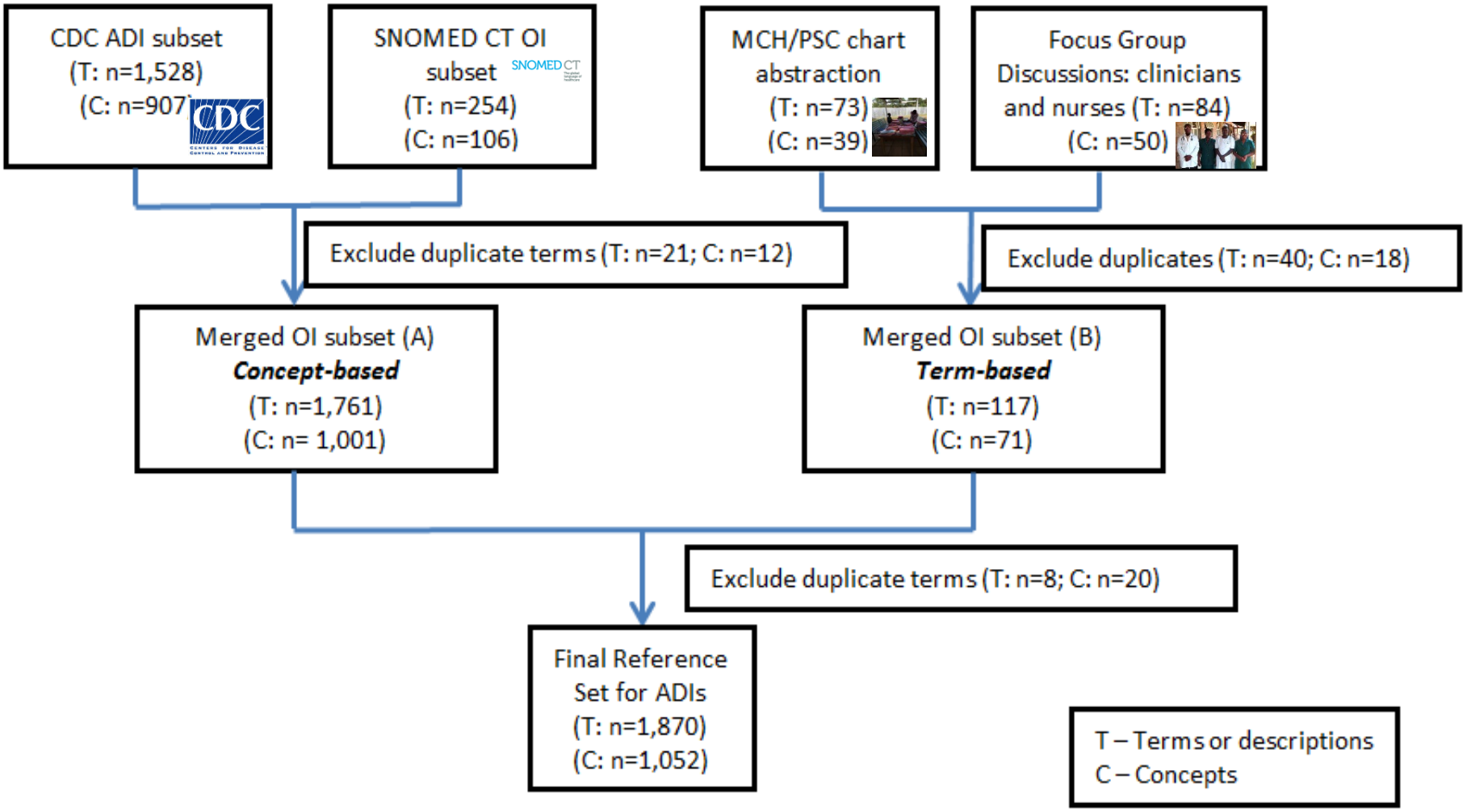
Methods

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

SNOMED CT
The global language of healthcare

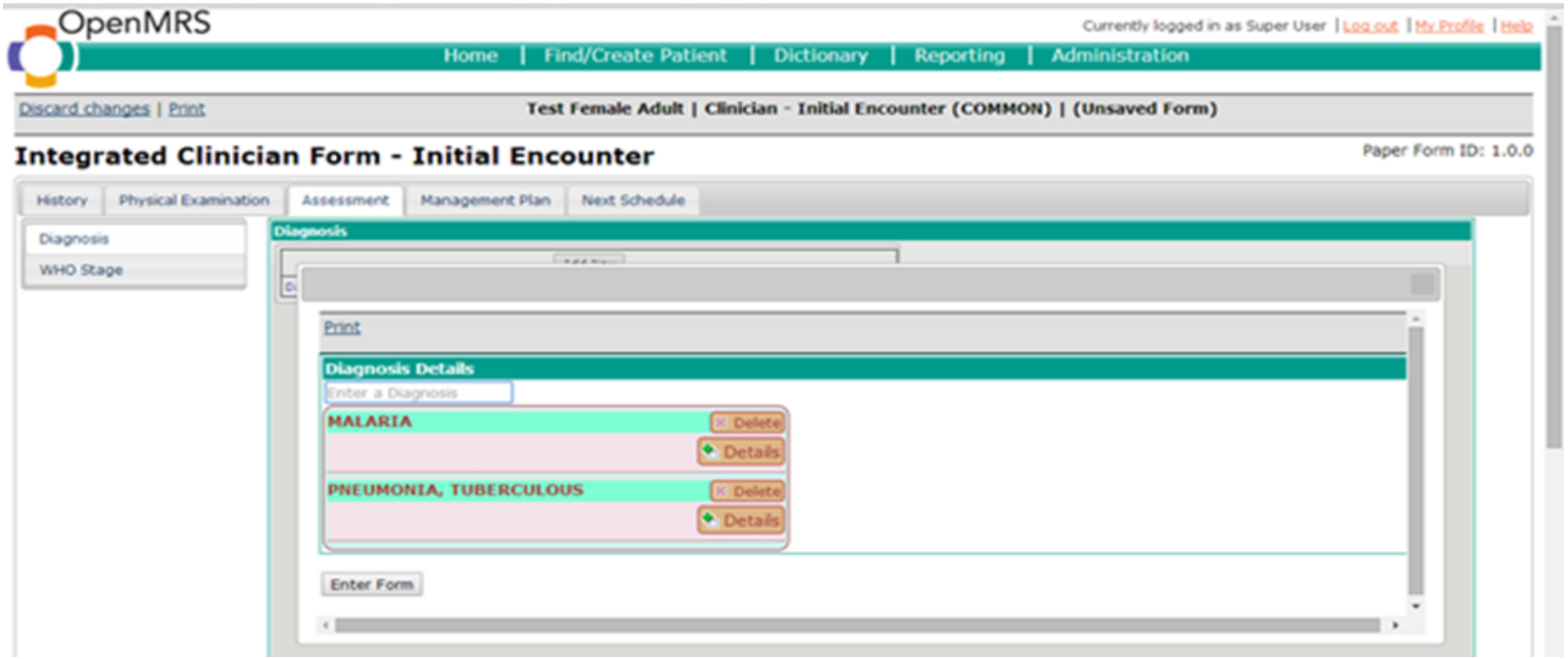
- Focus groups for clinicians and nurses at JOOTRH
- Asked to list ADIs in local terms (inspired by results of other sources)
- Determine content coverage of SNOMED CT

Results


CDC ADI subset
(T: n=1,528)
(C: n=907)
SNOMED CT OI subset
(T: n=254)
(C: n=106)
MCH/PSC chart abstraction
(T: n=73)
(C: n=39)
Focus Group Discussions: clinicians and nurses (T: n=84)
(C: n=50)
Exclude duplicate terms (T: n=21; C: n=12)
Exclude duplicates (T: n=40; C: n=18)
Merged OI subset (A)
Concept-based
(T: n=1,761)
(C: n= 1,001)
Merged OI subset (B)
Term-based
(T: n=117)
(C: n=71)
Exclude duplicate terms (T: n=8; C: n=20)
Final Reference Set for ADIs
(T: n=1,870)
(C: n=1,052)
T – Terms or descriptions
C – Concepts

Results

- Content coverage ADI in SNOMED CT 100%
- Implementation in OpenMRS
  - ADI Refset implemented as interface terminology



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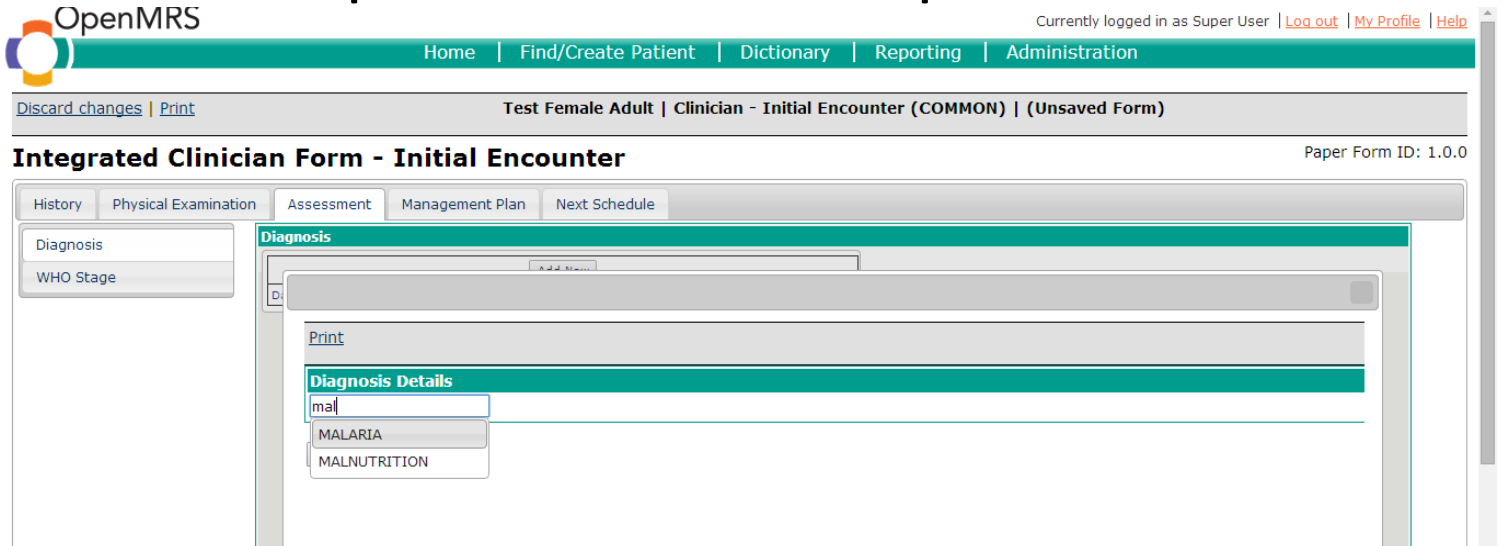
  - Distinction of ADIs, non-ADIs and signs/symptoms
  - Autocomplete feature to improve data accuracy



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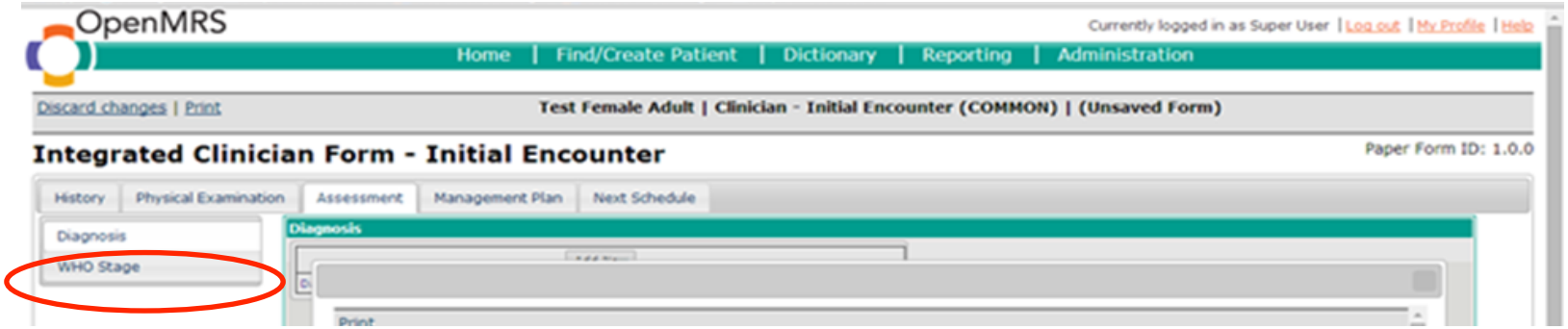

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  - Autocomplete feature to improve data accuracy
  - Automatic inference of WHO clinical stage
  - Free-text entry for new ADI concepts

Discussion and conclusion

- Interface terminology for ADI consisting of 1052 concepts and 1870 terms
- Expect full coverage
  - Different sources are combined
  - Only 2 months patient visits
  - Dynamic update based on additional free text
- Implemented in JOOTRH, Kisumu Kenya but shared within OpenMRS community

Further research

- Evaluate the effect of the standardised ADI registration on
  - Data quality (more and finer granular recording of ADIs)
  - Quality of care (better adherence to ART guideline)
  - Outcome of patient (lower morbidity and mortality)

Acknowledgement

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- *The findings and conclusions in this presentation are those of the author(s) and do not necessarily represent the official position of the U.S. Centers for Disease Control and Prevention/Government of Kenya*

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