World Health Organization

ICD-11 tooling and implementation

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ICD-10 coding starts with

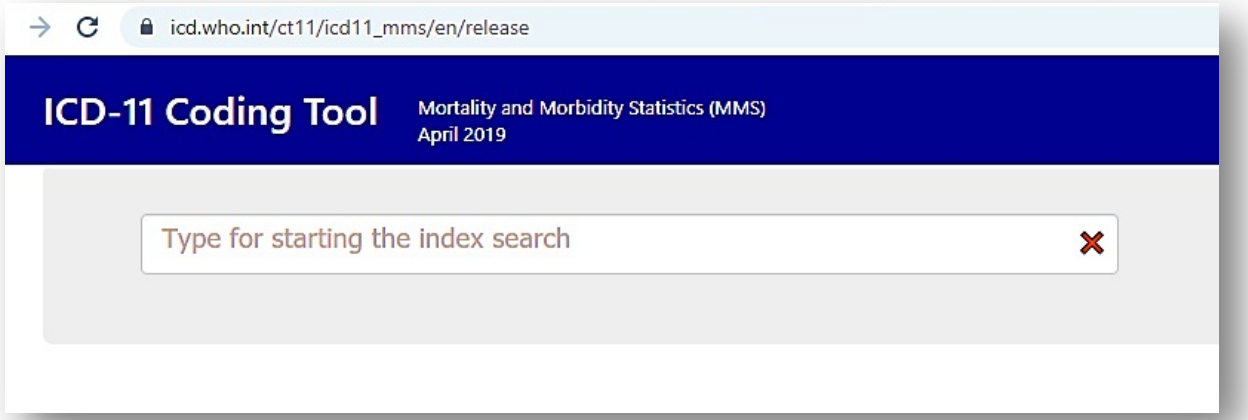
Alphabetical index

to find the lead (main) term

then

you move on to the Tabular List to find the code

ICD-11 coding starts with



Electronic coding tool

to enter the diagnosis or condition

then

select the matching term, or one closest to what you are looking for, among the displayed options

Capturing detail of diagnostic information with ICD-10/9

OUTPUT VOCABLUARY
N18.5 Chronic kidney disease, stage 5 (ICD-10)

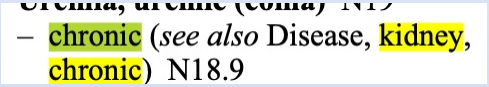
⇧

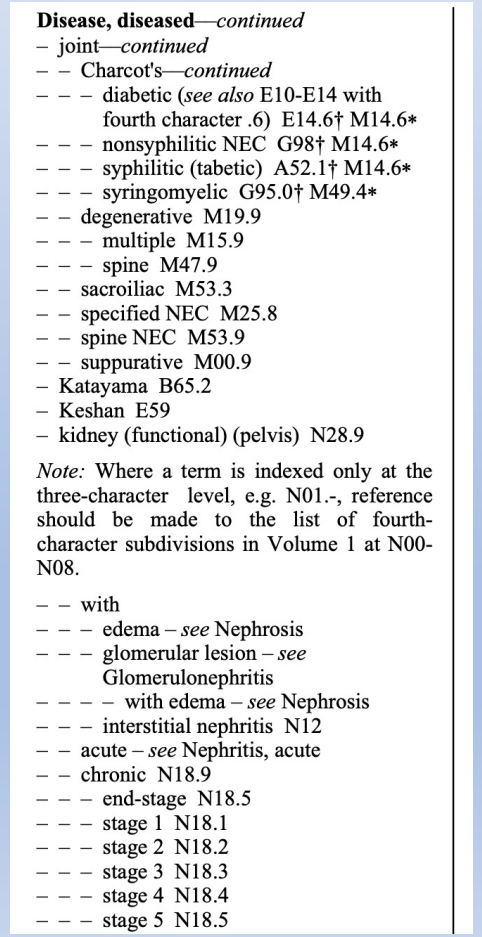
Manual coding/ trained expert coders/ complex rule base/ commercial coding software / interface terminology

⇧

NATURAL LANGUAGE
“Patient with end stage renal failure”

Kew Garden level A79.1
Kidney – *see condition*
Kienböck's disease or osteochondro


Uremia, uremic (coma) N19
– chronic (*see also* Disease, kidney, chronic) N18.9


Disease, diseased—*continued*
– joint—*continued*
– – Charcot's—*continued*
– – – diabetic (*see also* E10-E14 with fourth character .6) E14.6† M14.6*
– – – nonsyphilitic NEC G98† M14.6*
– – – syphilitic (tabetic) A52.1† M14.6*
– – – syringomyelic G95.0† M49.4*
– – degenerative M19.9
– – – multiple M15.9
– – – spine M47.9
– – sacroiliac M53.3
– – specified NEC M25.8
– – spine NEC M53.9
– – suppurative M00.9
– Katayama B65.2
– Keshan E59
– kidney (functional) (pelvis) N28.9

Note: Where a term is indexed only at the three-character level, e.g. N01.-, reference should be made to the list of fourth-character subdivisions in Volume 1 at N00-N08.

– – with
– – – edema – *see* Nephrosis
– – – glomerular lesion – *see* Glomerulonephritis
– – – – with edema – *see* Nephrosis
– – – interstitial nephritis N12
– – acute – *see* Nephritis, acute
– – chronic N18.9
– – – end-stage N18.5
– – – stage 1 N18.1
– – – stage 2 N18.2
– – – stage 3 N18.3
– – – stage 4 N18.4
– – – stage 5 N18.5

Capturing health information with the ICD-11 coding tool

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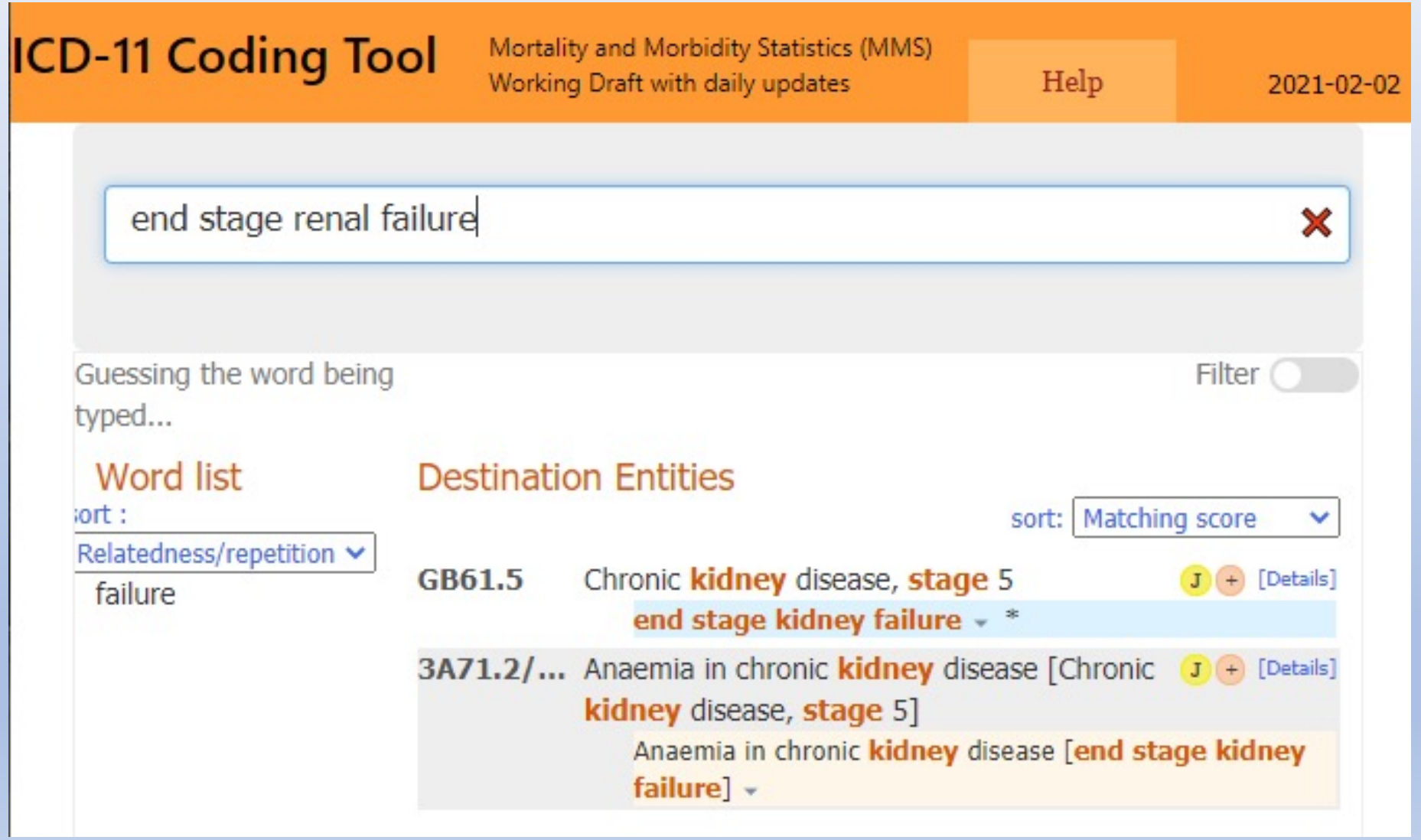

Search term renders stem code with extension or other stem code

Example 2: automated indexing of postC dimension for causing condition

ICD-11 Coding Tool Mortality and Morbidity Statistics (MMS) 2020-09

T2dm with diabetic foot

Guessing the word being typed... Filter

Word list sort : Relatedness/repetition

foot

Destination Entities sort: Matching score

BD54/5A11 **Diabetic foot** ulcer [Type **2 diabetes** mellitus] [Details]

Diabetic foot [**T2DM** - [Type **2 diabetes** mellitus]]

FA38.1 **Diabetic** Charcot arthropathy [Type **2 diabetes** mellitus] [Details]

Diabetic Charcot **foot** [**T2DM** - [Type **2 diabetes** mellitus]]

Smart search features in ICD-11

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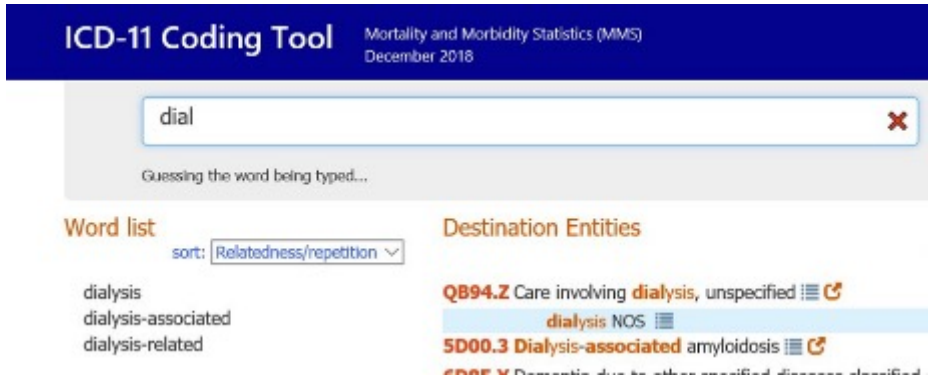
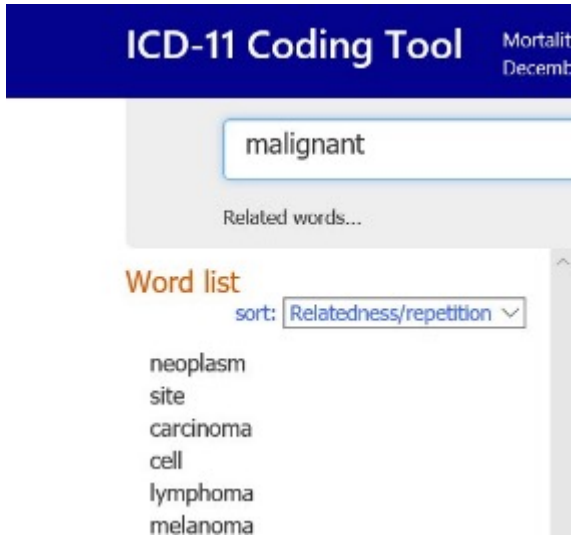
- **Similar words (**tuberculosis – tuberculous)
- Aware of **Spelling variants** (edema, oedema)
- Understand synonyms (renal - kidney) (cancer – malignant neoplasm)
- Diacritic **normalization** (behcet, behçet)
- Handling **compound words** (Searching **myelitis** will get you "**Neuromyelitis**" "**polymyelitis**" as well).

Smart search features in ICD-11 (cont.)

Supports **word completion** during search

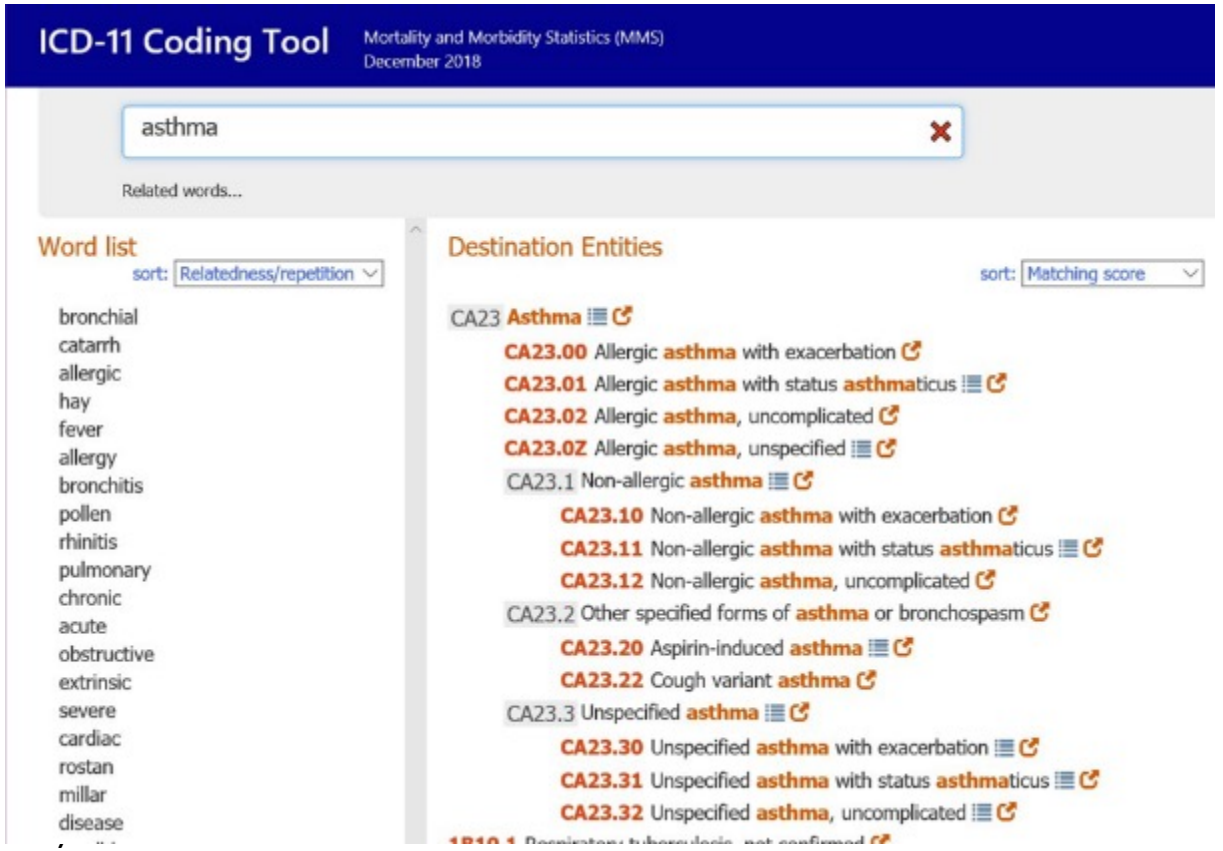




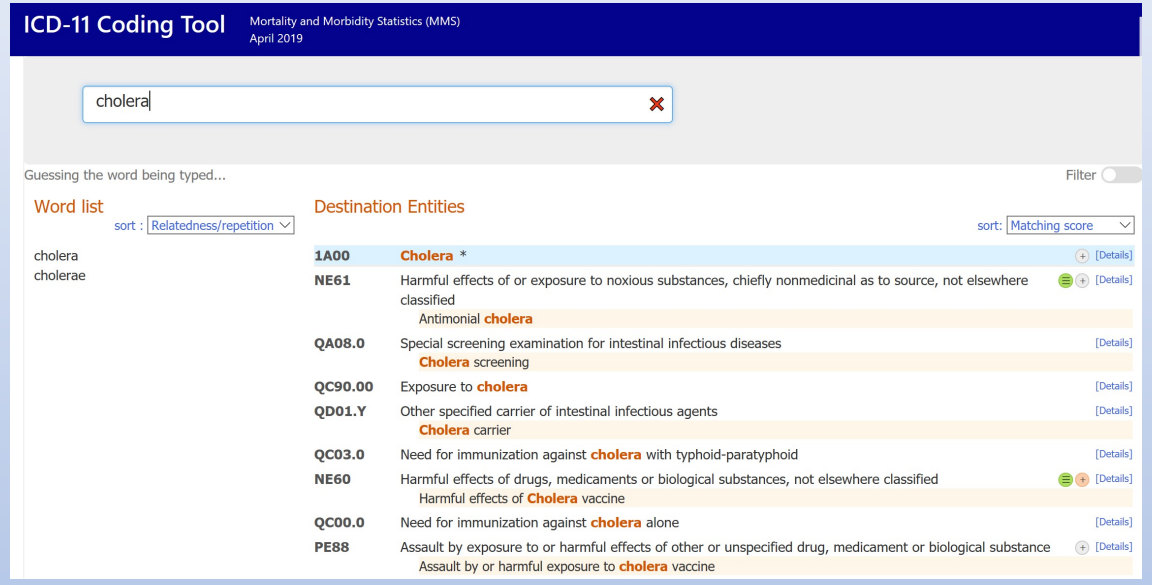
Relevance based **word suggestion**

- You may click instead of typing the next word
- Sorting by alphabetical order is also provided

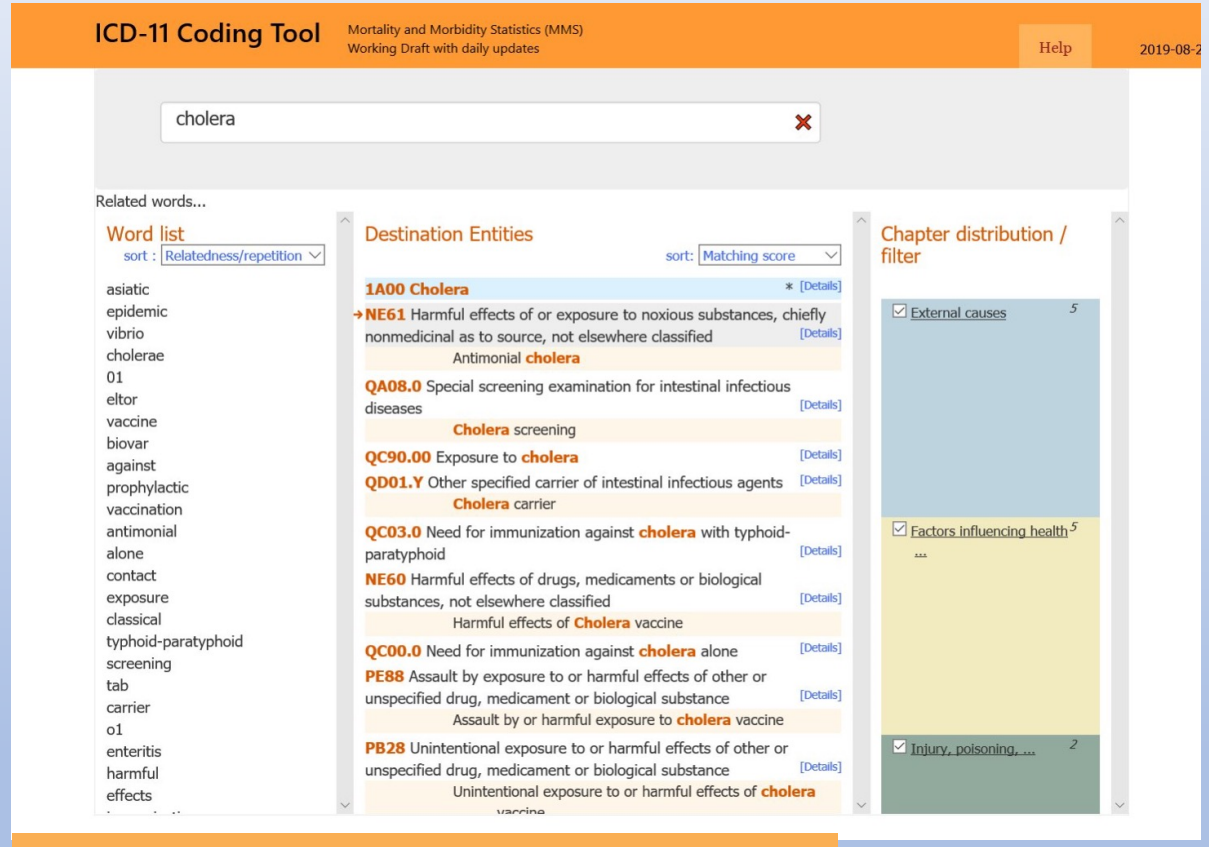
Search results **dynamically** available as user types
Organized by **matching score** and classification hierarchy



ICD-11 Coding Tool versions

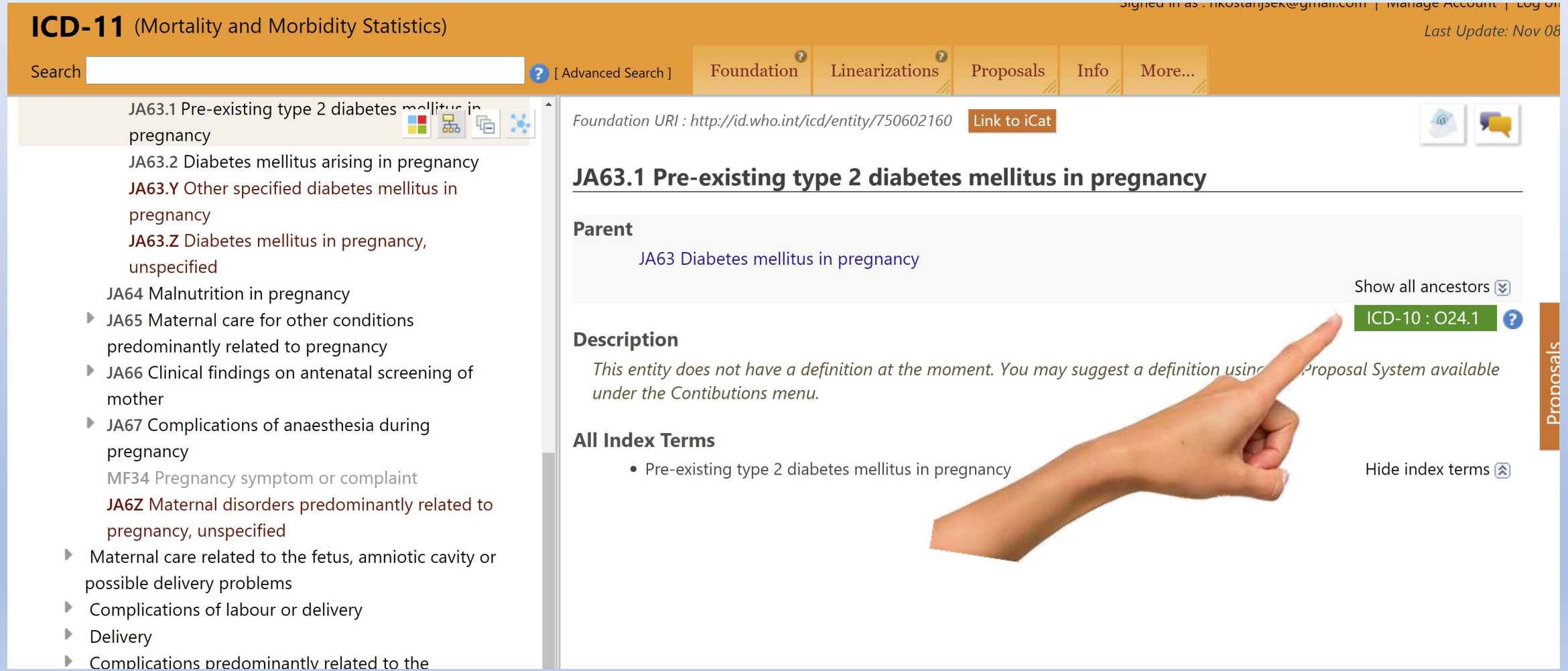


Blue: official release version



Orange: maintenance version

Cross-reference to ICD-10



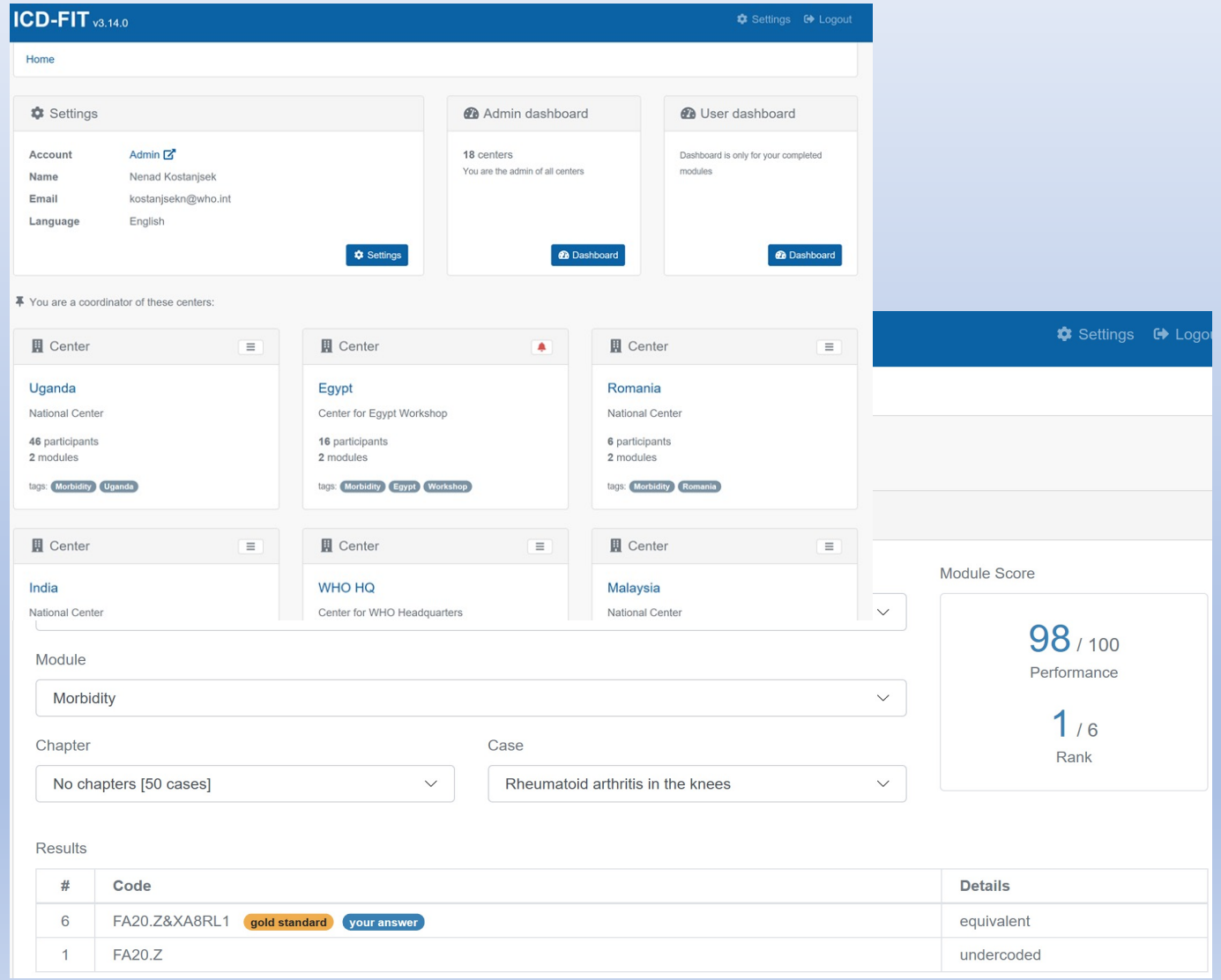
ICD-11 Translation Tool

Makes **ICD-11 translation easier, faster and better** through

- **translation memory (**use of existing ICD-10 translations)
- **multiple translators** can **work simultaneously**
- **automatic update of structural changes** in translation
- **Notification** and **track change function for content changes**
- **commenting on the translations**

Ongoing translation: 14 languages including official WHO languages

ICD-11 Coding training and self-evaluation tool (ICD-FIT)



Purpose

- ICD user can test their accuracy in coding with ICD-11
- WHO & Member States can check translation and data quality

Features

- immediate user feedback on their coding performance
- ranking with peers

Results & conclusion

- Good to very good ICD-11 coding results with basic training

UGANDA Morbidity 02 results			
Diagnostic Term	Grand Total of code assignments	# of correct code assignments	Percent correct
Gastric ulcer with acute haemorrhag	18	1	5.56%
NSTEMI	19	5	26.32%
Respiratory failure	19	7	36.84%
Cataract	19	17	89.47%
Pneumonia	21	19	90.48%
Typhoid Fever confirmed	18	17	94.44%
Conjunctivitis	18	17	94.44%
Neonatal Sepsis	18	17	94.44%
Febrile Convulsion	18	17	94.44%
Substances induced psychosis	19	18	94.74%
Sepsis (septic shock)	19	18	94.74%
RDS	19	18	94.74%
bilateral Conductive Hearing Loss	21	20	95.24%
Peptic ulcer disease	21	21	100.00%
Charcot-Marie-Tooth disease	20	20	100.00%
Friedreich ataxia	20	20	100.00%
Ovarian Cyst	20	20	100.00%
Uterine Fibroid	20	20	100.00%
Schizophrenia, unspecified	20	20	100.00%
Temporal lobe epilepsy	20	20	100.00%
Congenital malformation	19	19	100.00%
Periventricular leukomalacia	19	19	100.00%
Cerebro Vascular Accident (CVA)	19	19	100.00%
OSA syndrome	19	19	100.00%
Viral hepatitis	19	19	100.00%
TB meningitis	19	19	100.00%
Pre-eclampsia	19	19	100.00%
Chronic Osteomyelitis	19	19	100.00%
Dental caries	18	18	100.00%
Complete heart block	18	18	100.00%

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- **Module 2** (n=30):
  - **27 terms** -> coding accuracy **90% or higher**

Conclusion: **Good to very ICD-11 coding results with basic training**

ICD-11 rule engine for automated coding for selection of the Underlying Cause of Death

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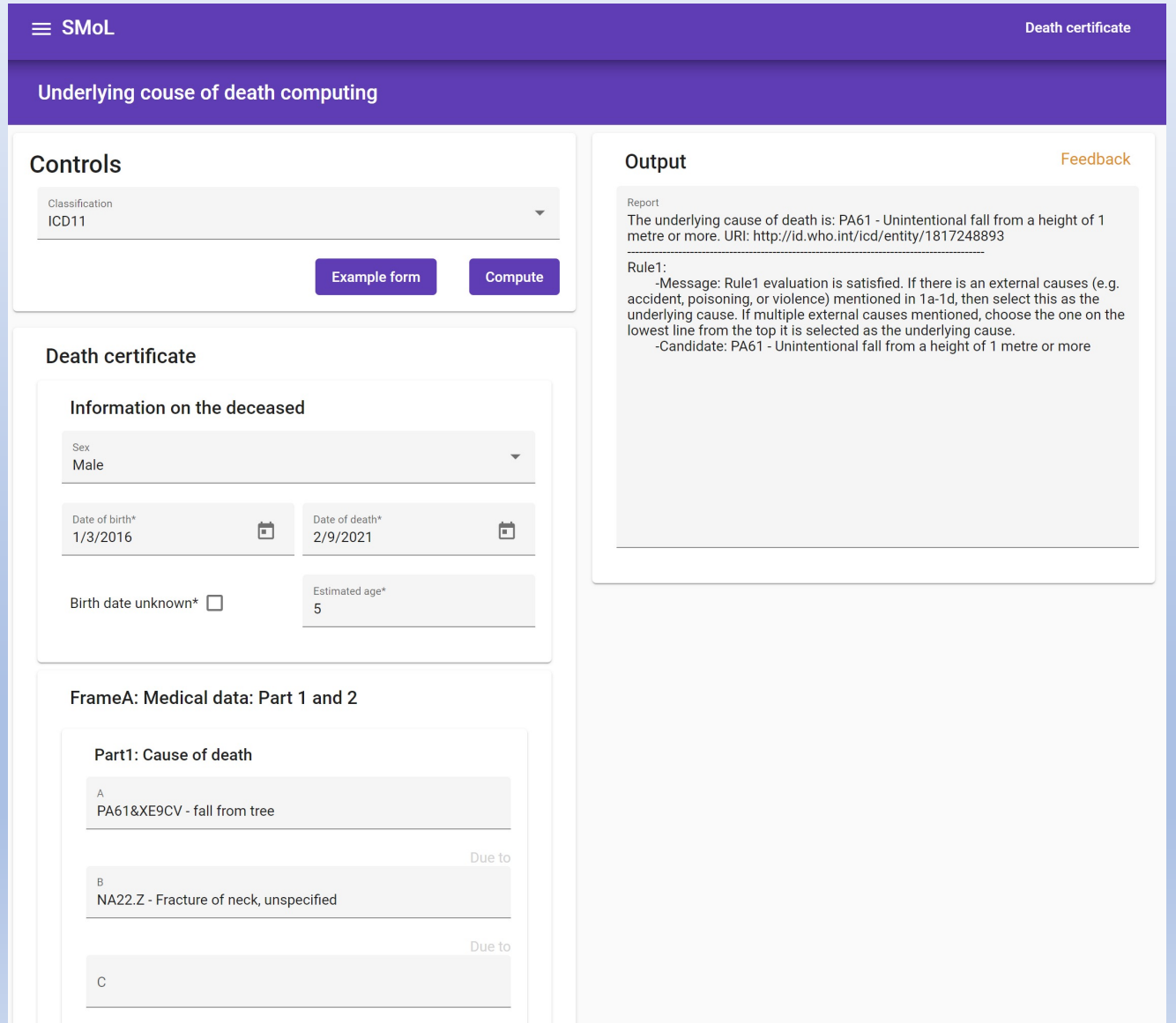

Basic features of Rule engine

- Rules coming from SMOL and from ICD-11 Reference Guide
- Abstract, high level rules based on **code sets** (based on ICD-11, SMOL, ICD-10)
- Rules
  - written in a JSON-based format (i.e. open, readable)
  - When working with ICD-11, causing condition linkages between entities can be exploited to use the correct code
  - New rules could be added rather easily
  - Possibility to have a collaborative authoring platform to edit/discuss existing or suggested new rules
- Technical approach in line with the current WHO-FIC framework (i.e. openness, rest-based API, locally installable platform)
- A demo (cloud-based) frontend has been developed for testing the API and validating results. Final version will be integratet in upcoming ICD-11 API release.

Analyzing ICD-11 coded Cause of Death Data with ANACoD3

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World Health Organization | Upload | Check data (Step 1) | Analysis | Reference material | About

Welcome to ANACoD 3!

The Analyzing Mortality and of Cause of Death 3 (ANACoD3) online tool helps you to perform a comprehensive and systematic analysis of mortality and cause of death data. The tool automatically tabulates data and presents basic mortality measures in tables and figures. It highlights potential inconsistencies and errors in the data and estimates the completeness of reporting. ANACoD3 generates indicators that reveal potential data-quality issues, as well as an array of comparable indicators including sex- and age-specific mortality rates, crude death rates, life expectancy at birth, causes of death distributed by global burden of disease categories, the top 20 causes of death, and the percentage of ill-defined causes of death.

This latest version allows for the analyses of cause-of-death data coded in ICD-10 as well as ICD-11 formats. ANACoD3 analyzes sub-national level data to inform of potential health equity issues or outbreak patterns; it also analyzes data over multiple time periods for trend analyses.

For additional information or support, please contact mortality@who.int.

Suggested citation for the tool: *Analysis of Mortality and Cause of Death, ANACoD V3, WHO, 2020.*

Upload data | Or | Use sample dataset

ICD-11 Application Programming Interface (APIs) for easy integration of ICD-11 in any Software https://icd.who.int/icdapi

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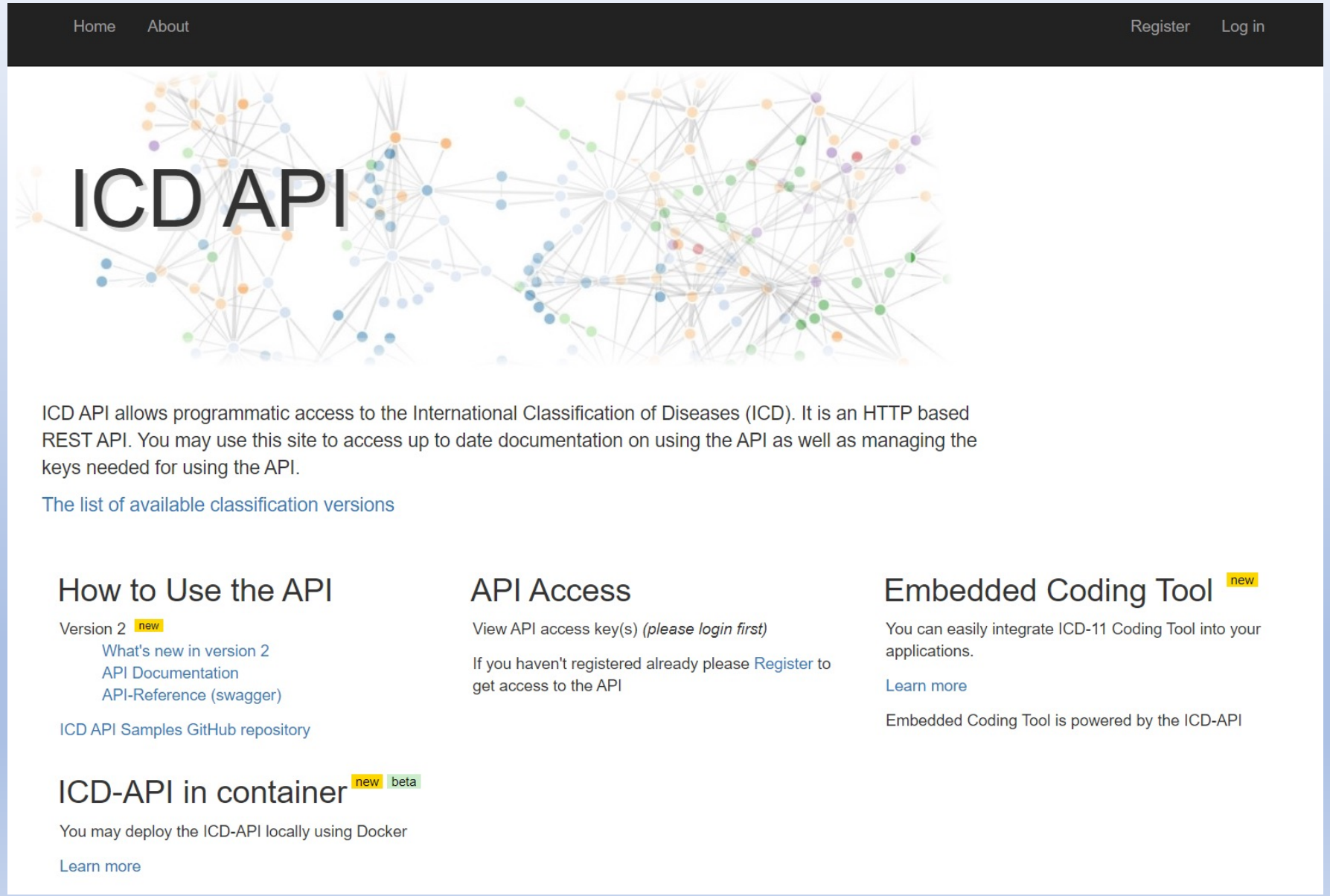


Local Deployments of ICD-11

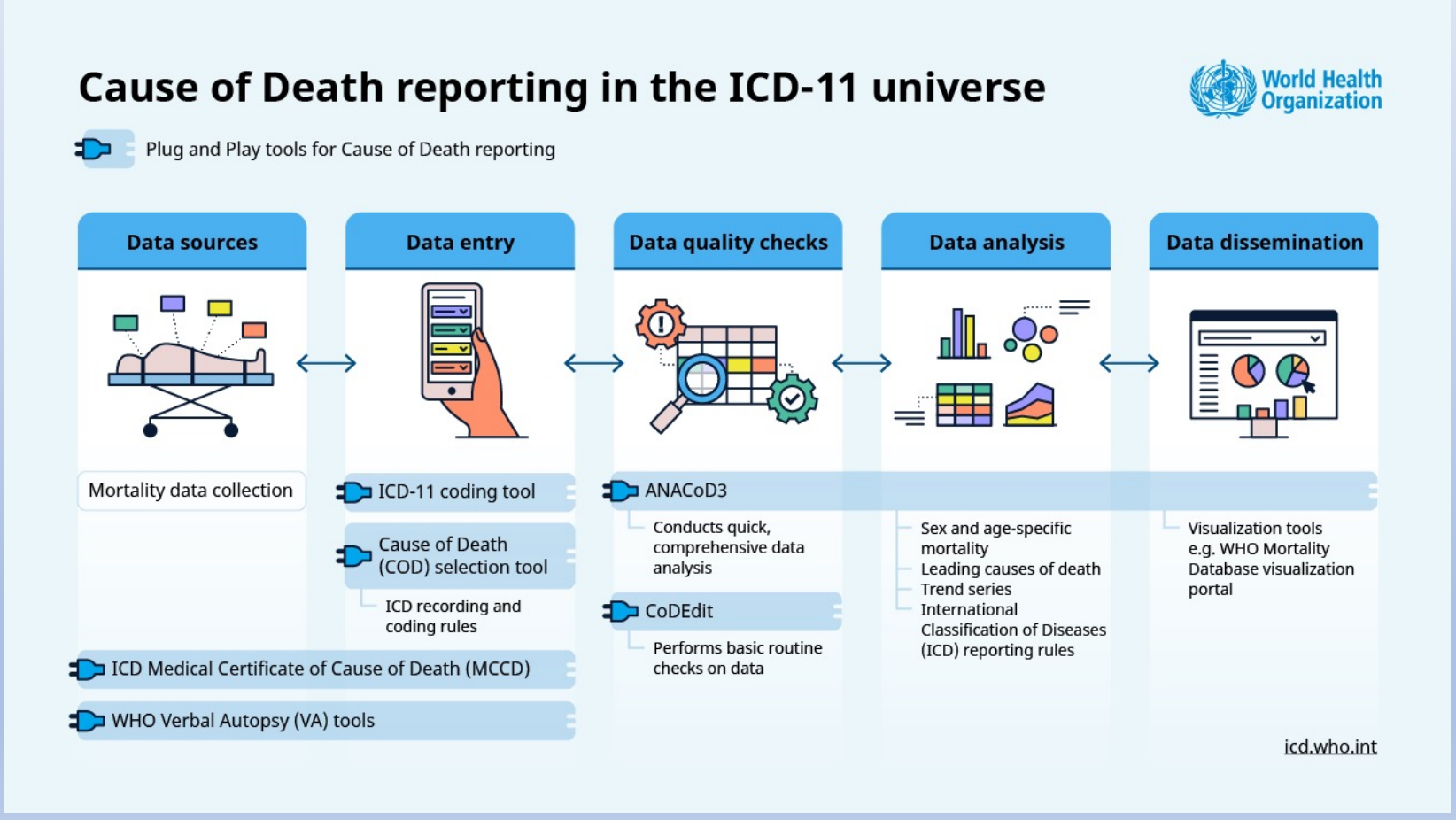
Docker based deployment

- Very light weight docker images
- Supports multilingual versions
- Linux / Windows / Cloud

Other local deployment options coming

- Windows service
- Linux systemd service

ICD-11 digital infrastructure
(e.g.ICD-11 CoD tools)



Why does it matter? ICD-11 tools are

- **freely available** (no licensing, no fees)
- **easy to use** & integrate into software for use in all settings**, without additional tooling**
- **multilingual**
- **Future-proofed** to enable semantic interoperability
- kept clinically **up-to-date** through an **open, public and transparent maintenance process**
- **controlled by member states for member states** (recall WHOs Director Generals request to all Member states for nomination of official ICD focal point)

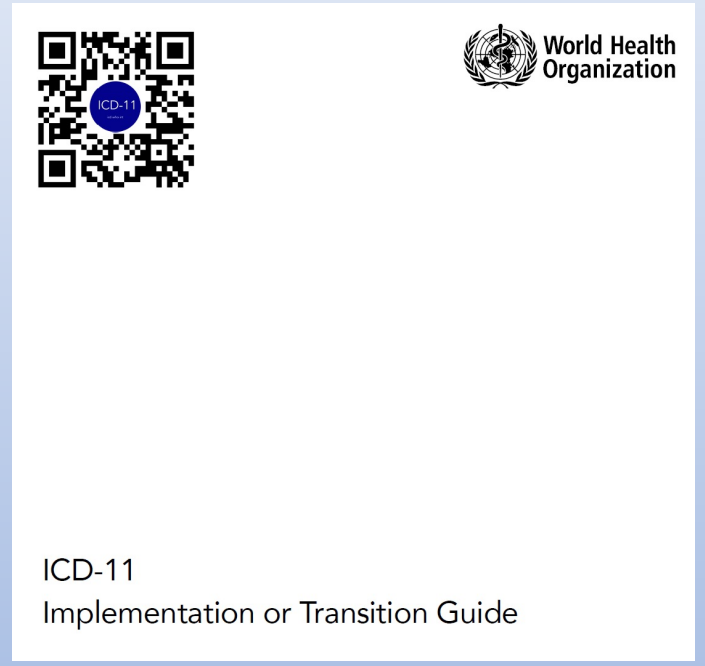
Key consideration for ICD-11 implementation

National plan to transit from ICD-10 to ICD-11

Planned activities	Expected results	Year 1				Yaer 2			
ONE: Establish working group at national level involving stakeholders and partners, get approval and support from the Cabinet		I yn	II yn	III yn	IV yn	I yn	II yn	III yn	IV yn
Finalize translation of the classification, user guide and other documents	Transalted ICD-11 book	■	■	■	■				
Organize virtual trainings to introduce ICD-11	Organized trainings for working group, all 21 provinces, national centers and hospitals	■							
Develop a national standard to introduce ICD-11 in Mongolia	Developed standard			■	■				
Check computer system thru manual coding and transcription, make adjustments if necessary	Uploaded ICD-11 platform			■	■	■			
Link ICD-11 with health insurance, national statistics office an civil registration systems x	Linked information systems			■	■	■			
Evaluate coding capacity	Conducted evaluation, evaluation on implementation					■	■		
Training of trainers on ICD-11	Trained trainers	■	■	■					
Develop training curriculum based on needs of the users (coders, health care workers, resaerchers etc)	Developed training curriculum and plan			■	■				
Training on how to use users guide for coders, health care workers, health insurance staff	Organized training				■	■	■	■	■
Training on use of computer tools for coders, health care workers, health insurance staff	Organized training					■	■	■	■
Training on morbidity and mortality data analysis and quality of the information	Organized training				■	■	■		
Evaluation of impact of trainings on coders, health care professionals, others	Conducted evaluation					■	■		

- **Establish ICD-11 reference centre/taskforce & nominate ICD-11 focal point** as requested by DG letter to Member States in 2019.
- **Maintenance of existing system during the transition**
- **Project management and strategic planning**
  - Set vision & formulate strategy
  - Designate project management team
  - Ensure stakeholder representation
- **Develop and follow National Plan to transit from ICD-10 to ICD-11**
  - Use **WHO ICD-11 implementation and transition plan** as reference
  - Carry out a **Health Information System ecosystem analysis** and review
    - current practice of documenting, coding, analysing and using ICD coded mortality and morbidity data
    - specify important areas/data gaps/future data needs for which ICD coded data should be available
    - Health IT infrastructure (what IT hardware/software needs to be adapted, data entry form)
    - Human workforce (who is coding, analyzing and using ICD data)

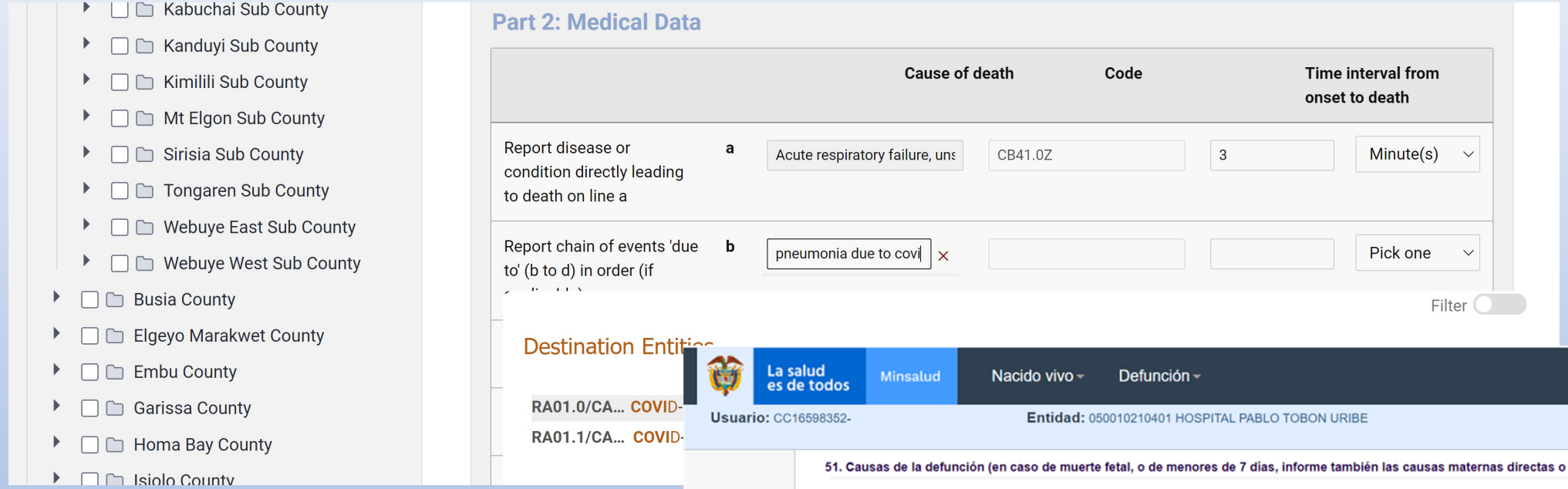
Key consideration for ICD-11 implementation (cont.)

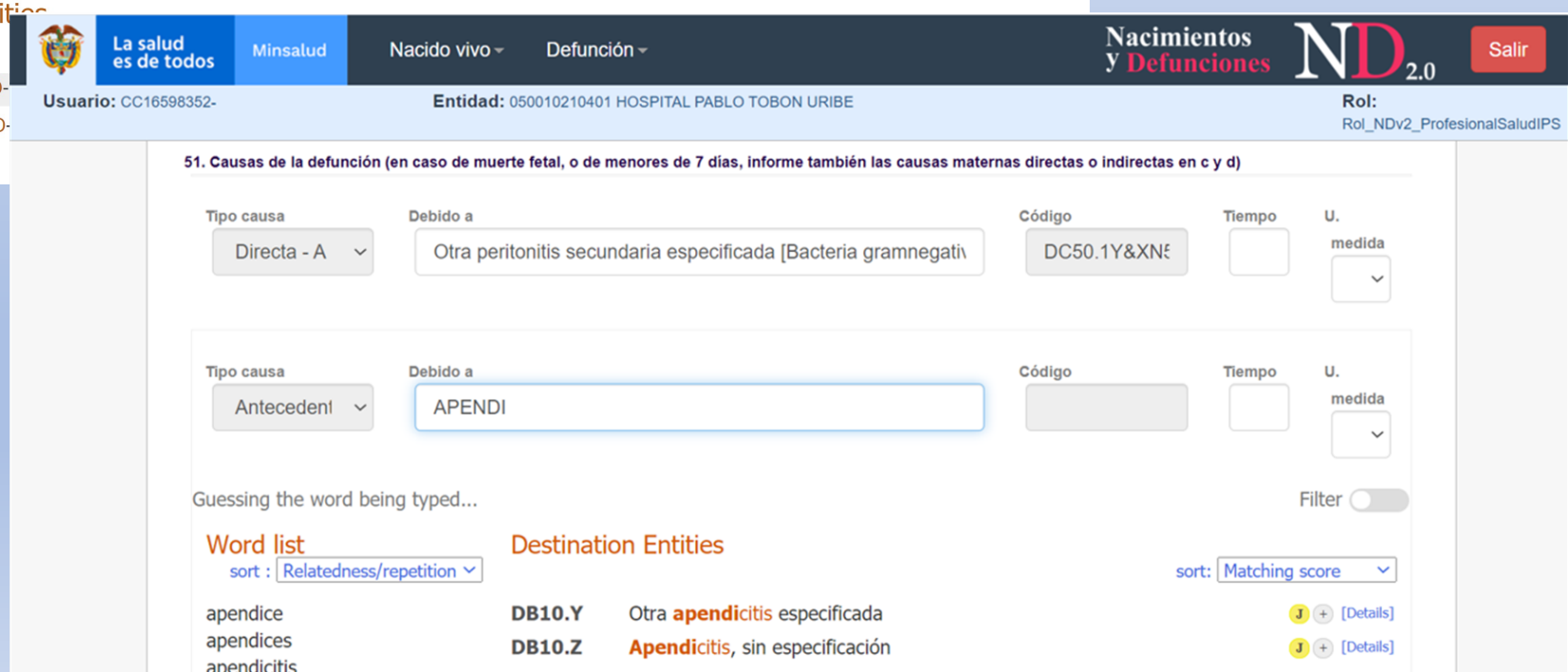


[ICD-11 Implementation and Transition Guide_Draft_v105.edited.pages (who.int)]

- Develop and follow National Plan to transit from ICD-10 to ICD-11 (cont.)
  - Specify the **value proposition** of ICD-11 (e.g. faster, easier, more accurate coding) **from the country perspective**
  - Specify **opportunities & challenges** for ICD-11 implementation
  - Specify and carry out a **step-wise transition process**
    - **Integration and piloting of ICD-11 APIs in software applications** (e.g. e-death certification, EMR, DHIS-2) & **training and capacity building of coding workforce**
    - **Scaling up of ICD-11 pilots & training** (i.e. country-wide capacity building and piloting of ICD-11 incl. analysis of coded data, Start country wide advocacy and dissemination, Start pilot in routine environment
    - **Prepare system-wide implementation** (i.e. ensure comparability and quality of data; large-scale piloting in routine environment, Use of ICD-11 with terminologies and electronic health records, Identify technical requirements and plan lead time for health information system changes, mortality and morbidity coding tools and casemix groupers
    - **Routine reporting with ICD-11** (i.e. national deployment)

ICD-11 implementation in Mortality





Example of ICD-11 Coded and certified Death in DHIS2:

Use of (google like search) with embedded ICD-11 coding tool instead of drop-down list.

ICD-11 MCCoD in DHIS-2

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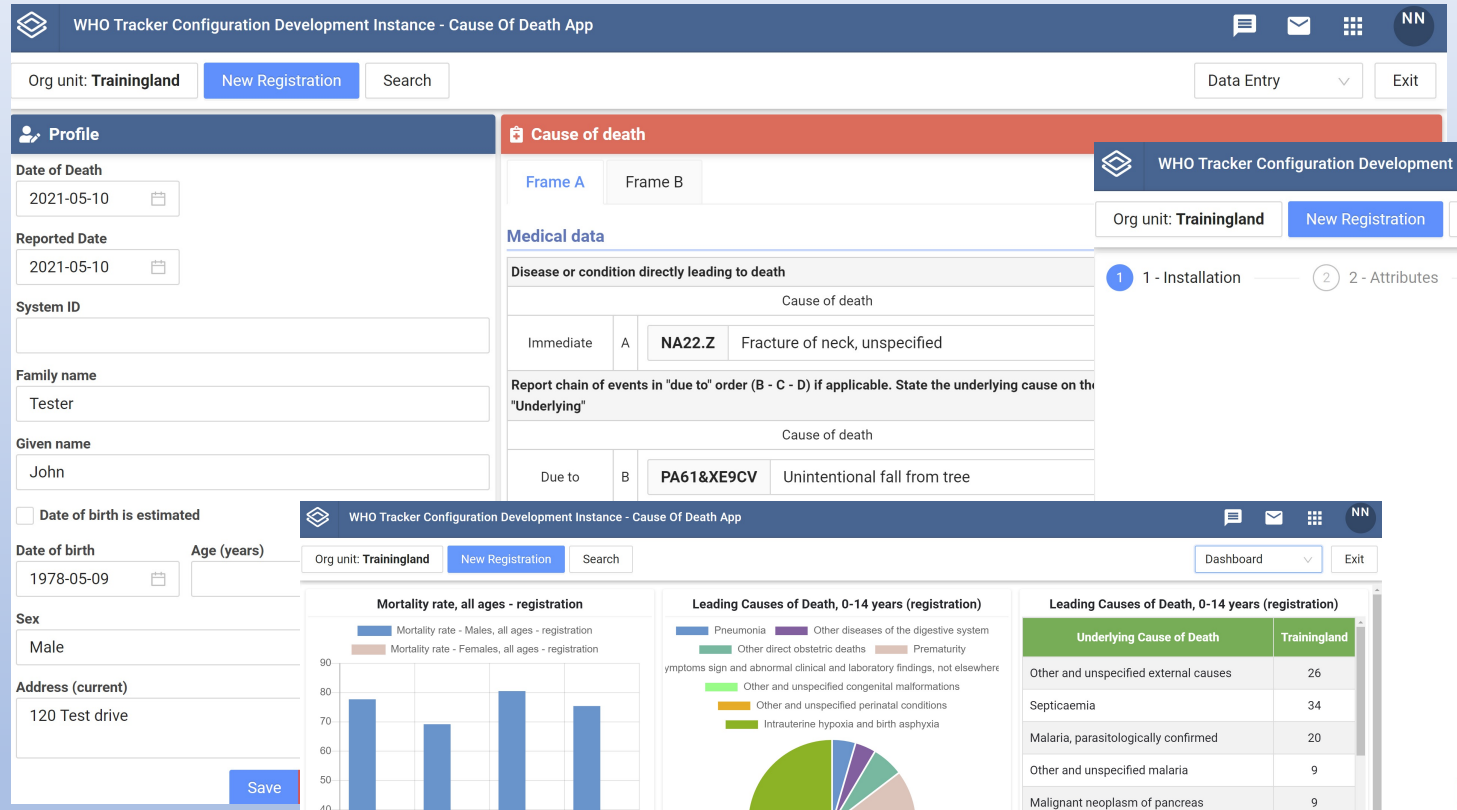
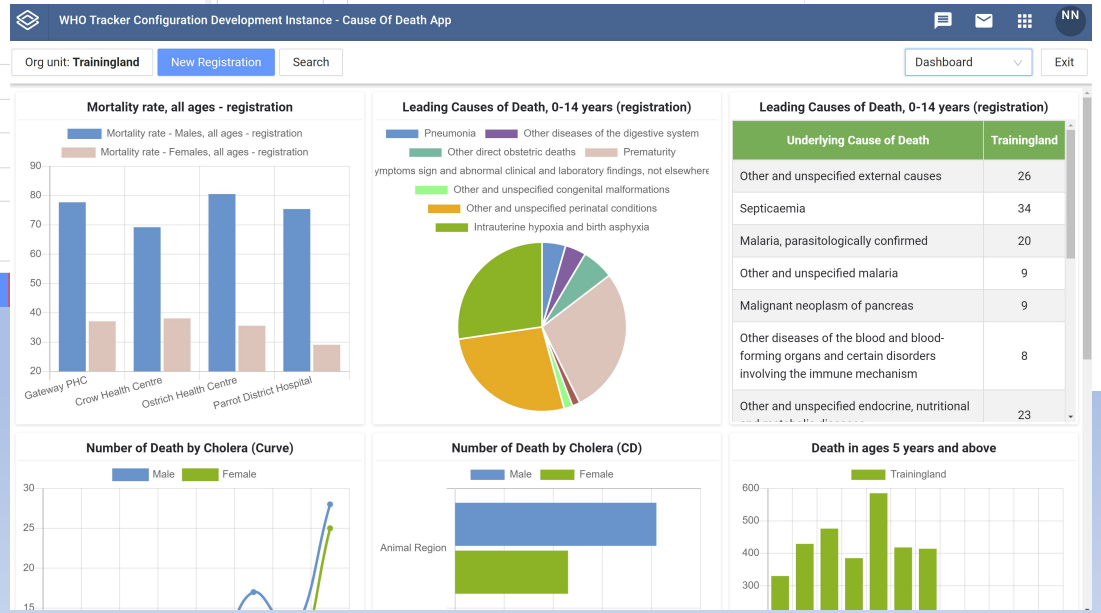
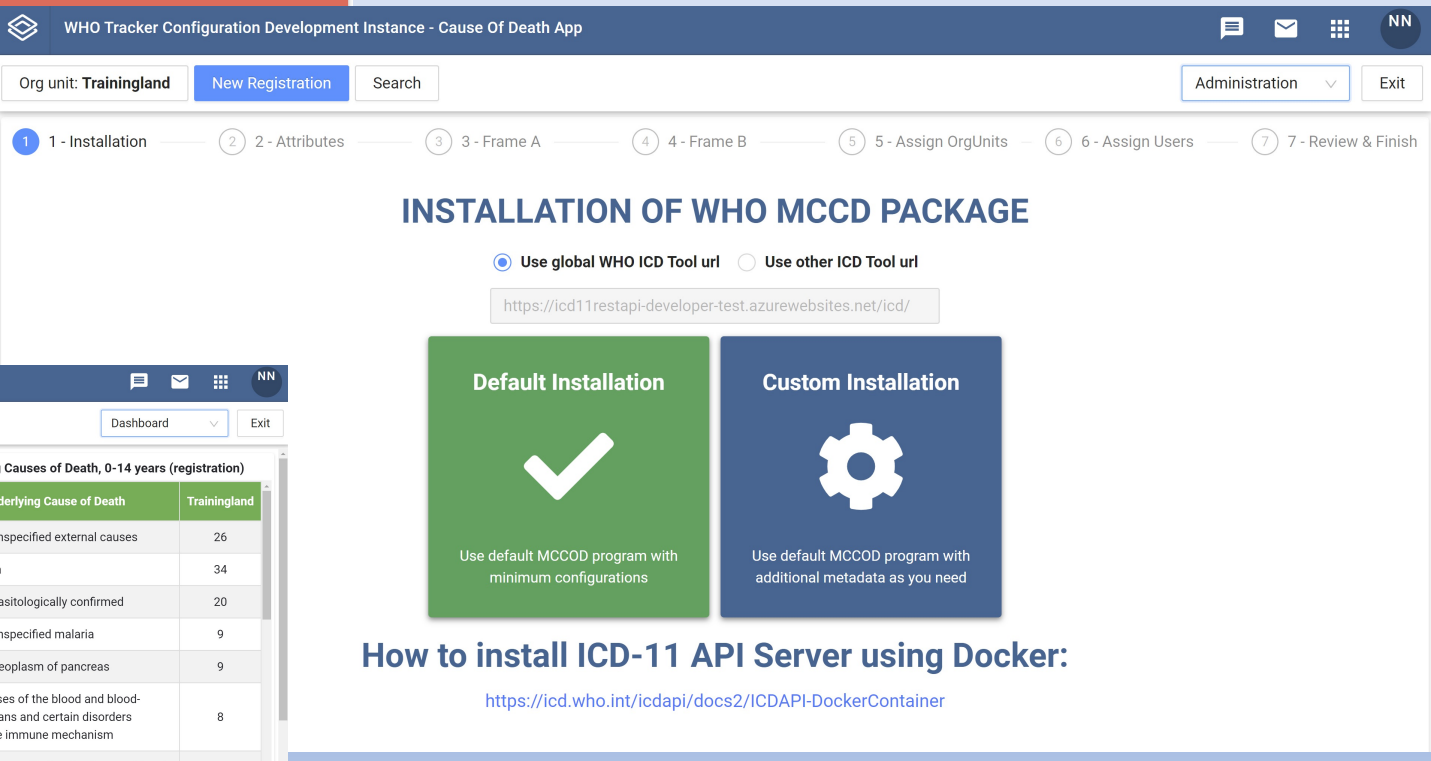
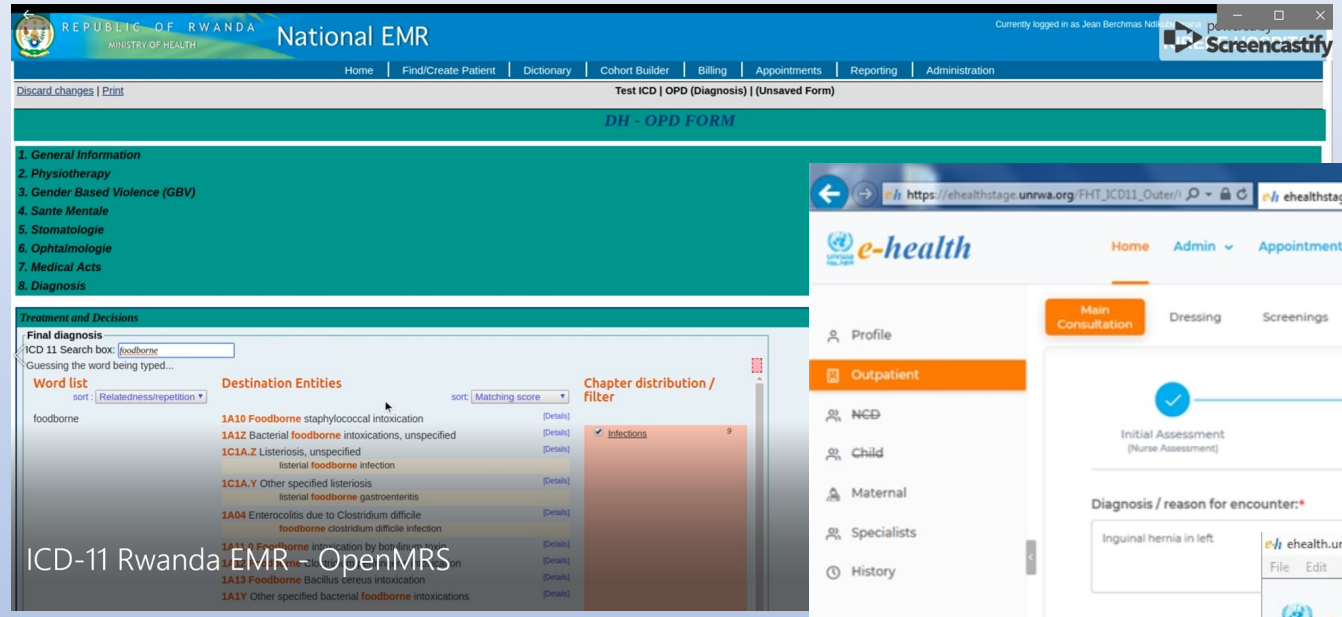
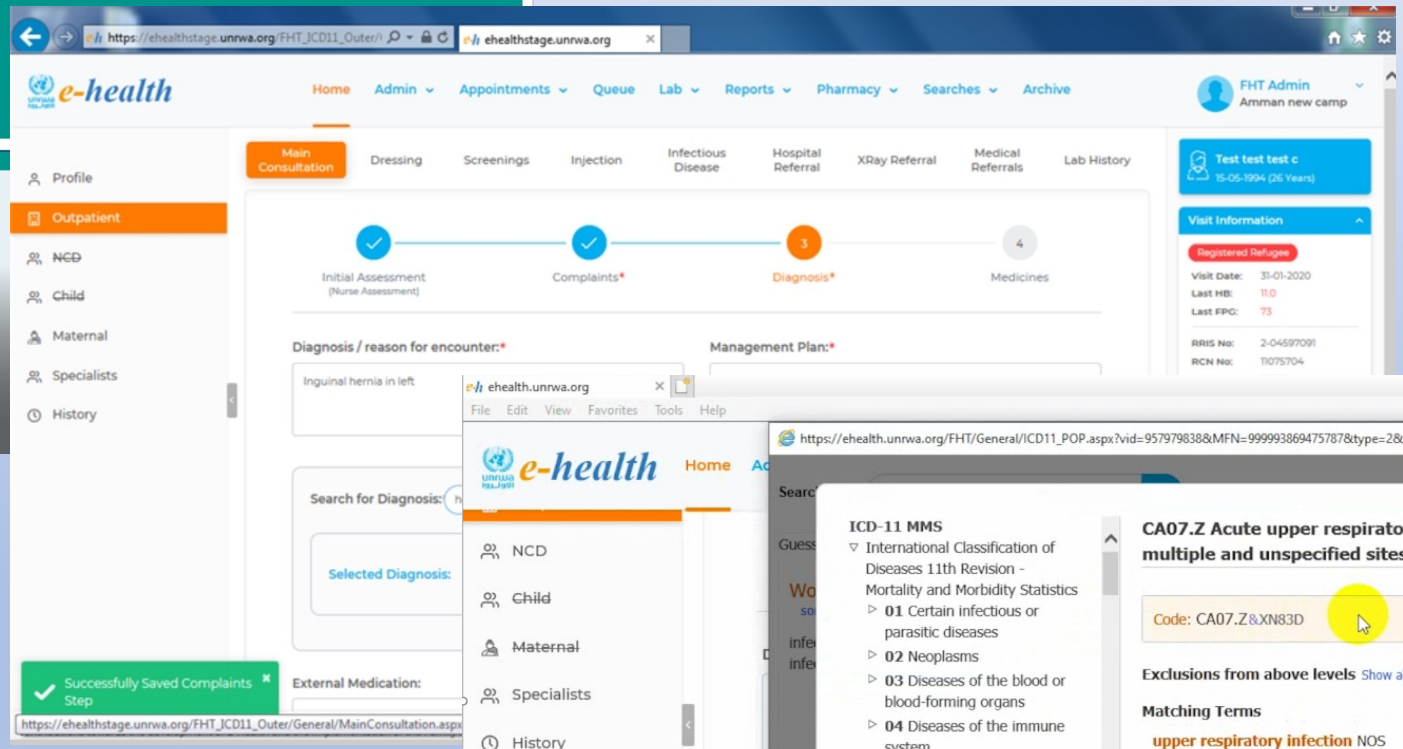


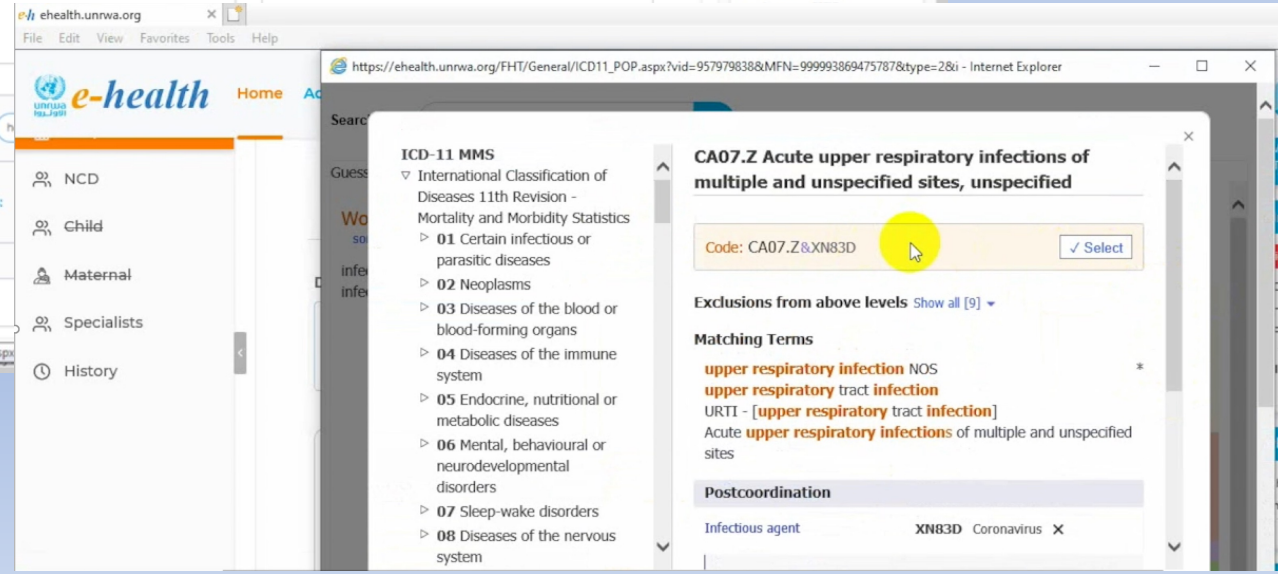




ICD-11 implementation in Morbidity







ICD-11 use as interoperability standard in COVID-19 Smart Vaccination Card

What is a Smart Vaccination Certificate?

- A **medical document** managed by **public health authorities** of member states
- A **digital vaccination certificate** based on the existing *home-based records* guidance and the *international certification of vaccination or prophylaxis*
- Can be **purely digital** (i.e., stored on a smartphone application) **or be a complementary digital "twin"** of traditional paper records
- The SVC only documents **vaccination events,** but is architected to evolve with the science, and needs of countries

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5.0.2 Terminology: Value Sets

WHO Vaccine List	The WHO Vaccine List from ICD 11 is used by: • the SVC Immunization
WHO List of Vaccinable Conditions	The WHO Vaccinable Conditions List from ICD 11 is used by: • the SVC Immunization
WHO Vaccine List (COVID-19)	WHO Vaccine List (COVID-19) from ICD 11

5.11.1.1 Logical Definition (CLD)

- Include these codes as defined in `http://hl7.org/fhir/sid/icd-11`

Code	Display
XM1NL1	COVID-19 vaccine, inactivated virus
XM5DF6	COVID-19 vaccine, live attenuated virus
XM9QW8	COVID-19 vaccine, non-replicating viral vector
XM0CX4	COVID-19 vaccine, replicating viral vector
XM5JC5	COVID-19 vaccine, virus protein subunit
XM1J92	COVID-19 vaccine, virus like particle (VLP)
XM6AT1	COVID-19 vaccine, DNA based
XM6AT1	COVID-19 vaccine, DNA based
XM1NL1	COVID-19 vaccine, inactivated virus
XM5DF6	COVID-19 vaccine, live attenuated virus
XM9QW8	COVID-19 vaccine, non-replicating viral vector
XM0CX4	COVID-19 vaccine, replicating viral vector
XM5JC5	COVID-19 vaccine, virus protein subunit
XM1J92	COVID-19 vaccine, virus like particle (VLP)
XM6AT1	COVID-19 vaccine, DNA based
XM6AT1	COVID-19 vaccine, DNA based

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5.10.1.1 Logical Definition (CLD)

- Include these codes as defined in `http://hl7.org/fhir/sid/icd-11`

Code	Display
RA01.0	COVID-19, virus identified
RA01.1	COVID-19, virus not identified

Next page

Lesson learned so far

- **Working across all three levels** (HQ+ROs+COs) **of WHO** is critical
- **Country ownership** at technical and political level is key
  - shared understanding regarding ICD-10 problems and ICD-11 solutions
- Some countries face **difficulties** in integrating ICD-11 in their digital health infrastructure because they are bound to proprietary ICD-10 based software (i.e. EMR, HIS)
- **ICD-11 implementation** and data streams need **to be supported** by **Digital Health Information Strategies, Initiatives and Institutions**
- **ICD-11 is clinician friend allows coding at the point of care** (e.g. (141) ICD-11 Pilot in Kuwait: The doctors' perspective (Farwaniya hospital, Kuwait) - YouTube
- **Non-legacy countries can leapfrog** coverage and quality of ICD coded mortality and morbidity data