Sunday, August 28, 2016

ICPE Symposium
Dublin, Ireland
Transitioning to ICD-10:
International Lessons Learned and Strategies for Moving Forward

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The power of **knowledge.**
The value of **understanding.**

DISCLOSURE

RTI International, of which RTI Health Solutions is a business unit, is an independent nonprofit research organization that conducts work for government, public, and private organizations, including pharmaceutical companies.

ICD-9 AND ICD-10 CODING SYSTEMS AND THEIR IMPACT WHEN CONDUCTING MULTICOUNTRY DATABASE STUDIES

OUTLINE

- Different ICD-10 coding systems used in Europe and the United States (World Health Organization [WHO], ICD-10-CM, WHO European adaptations)

- Disease-specific examples where the different ICD-10 systems diverge

- Different coding mapping tools from the ICD-9 to the different ICD-10 systems

- Our research experience working in multidatabase studies in the US/Europe and how we deal with the different coding systems

- Conclusions

CM = Clinical Modification; ICD = International Classification of Diseases.

Differences Between ICD-10 and ICD-10-CM

ICD-10

- Developed by the WHO (1990)
- Less granularity (up to 16,000 codes)
- Used mainly in other countries, and there are several European adaptations
- ICD-10-AM in Australia (1998) and ICD-10-CA in Canada (2000)

ICD-10-CM

- Developed by the US National Center for Health Statistics
- More granularity (70,000 codes, 155,000 with PCS):
  - Addition of 6th and 7th digit classification
  - Classification specific to laterality
- Used mainly in the US

AM = Australian Modification; CA = Canada; PCS = Procedure Coding System.

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Oesophageal Varices vs. Esophageal

ICD-10	VS.	ICD-10-CM

- I85.0 with bleeding
- I85.9 without bleeding

- I85.0 E. varices
  - 0 w/o bleeding
  - 1 with bleeding
- I85.1 secondary O. varices
  - 0 w/o bleeding
  - 1 with bleeding

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ICD-10 Adaptations Worldwide

	ICD-10	ICD-10-CM	ICD-10-AM	ICD-10-CA	ICD-10-GM (Formerly ICD-10 SGB-V)	ICD-10-TM
Country	WHO	United States	Australia	Canada	Germany	Thailand
Year first released	1989	1999, not used for morbidity coding yet	1998	2001	2000 (as ICD-10 SGB-V)	2000
No. revisions	Every year since 2000	2 revisions: 2007, 2009	Every 2 years; 6 revisions so far (last in 2008)	Every 3 years; 3 revisions so far	Every year since version 2004	2 (last in 2006)
Date of last revision	2008	2009	2007	2009	2010	2006
Countries that are using it	Most countries for mortality statistics	United States not yet implemented	Australia, New Zealand Ireland, Romania, Saudi Arabia	Canada	Germany	Thailand
Total no. codes	12,420	68,105 (refers to total no. valid codable codes)	16,308	16,041	13,315	36,586
No. chapters	21	21	22	23	22	21 in first edition; 22 in second edition
No. categories (3-digit codes)	2,036	270	2,059	2,067	268	1 category more than ICD-10 second edition
No. subcategories (4-digit codes)	12,159; 6 optional (T08, T10, T12)	5,471	10,341	8,890	7,982	12,082
No. sub-classifications (5-digit codes)	280 optional	5,701	6,404	4,589	5,065	24,249
Intervention classification	Yes (ICPM) but never updated	Yes (ICD-10-PCS) not yet implemented but planned as a replacement to ICD-9-CM volume 3	Yes (ACHI)	Yes (CCI)	Yes (OPS)	Yes Vol. 3-4 of ICD-10-TM procedure codes

ACHI = Australian Classification of Health Interventions; CCI = Chronic Condition Indicator; GM = German Modification; ICPM = International Classification of Procedures in Medicine; OPS = German Procedural Classification; SGB-V = Social Law Book, Number Five; TM = Thai Modification.
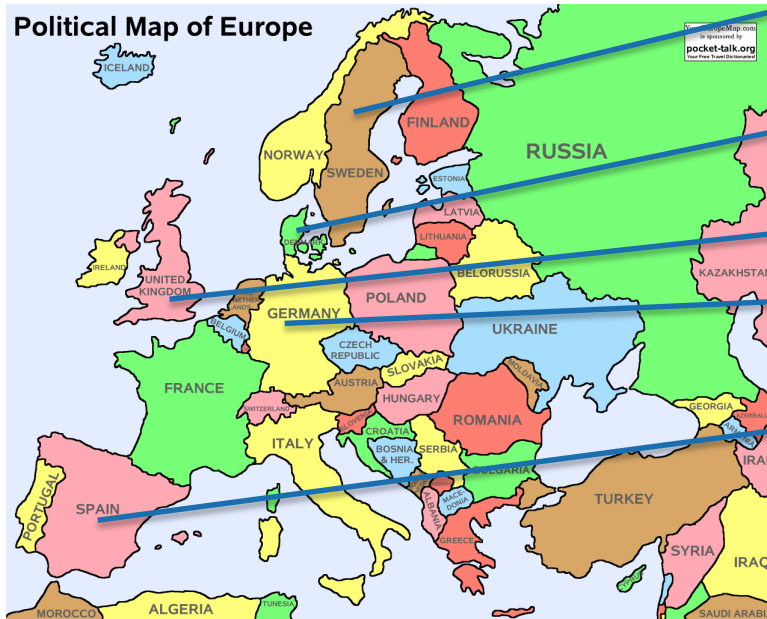
Source: Jette N, Quan H, Hemmelgarn B, Drosler S, Maass C, Moskal L, et al. The development, evolution, and modifications of ICD-10: challenges to the international comparability of morbidity data. Med Care. 2010;48(12):1105-10.

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Some of the Granularity of ICD-10-CM is Controversial

Code	Descriptor
W55.21	Bitten by a cow
W61.33	Pecked by a chicken
V00.01	Pedestrian on foot injured in collision with roller-skater
Y92.146	Swimming pool of prison as the place of occurrence of the external cause
Z63.1	Problems in relationship with in-laws
Y92.241	Hurt at the library
Y92.253	Hurt at the opera
Y93.D1	Accident while knitting or crocheting
W56.22	Struck by Orca, initial encounter
W56.32	Struck by marine mammals
W56.11	Bitten by sea lion
V91.07	Burn due to water-skis on fire
V91.35	Hit or struck by falling object due to accident by canoe or kayak
V94.810	Civilian watercraft involved in water transport accident with military watercraft
W61.12	Struck by macaw
W61.01	Bitten by parrot
V97.33	Sucked into jet engine
X52	Prolonged stay in weightless environment
V96.00	Unspecific balloon accident injuring occupant
V95.40	Unspecific spacecraft accident injuring occupant

Some ICD-10 Coding Adaptations in Europe

ICD-10-SE (WHO based)

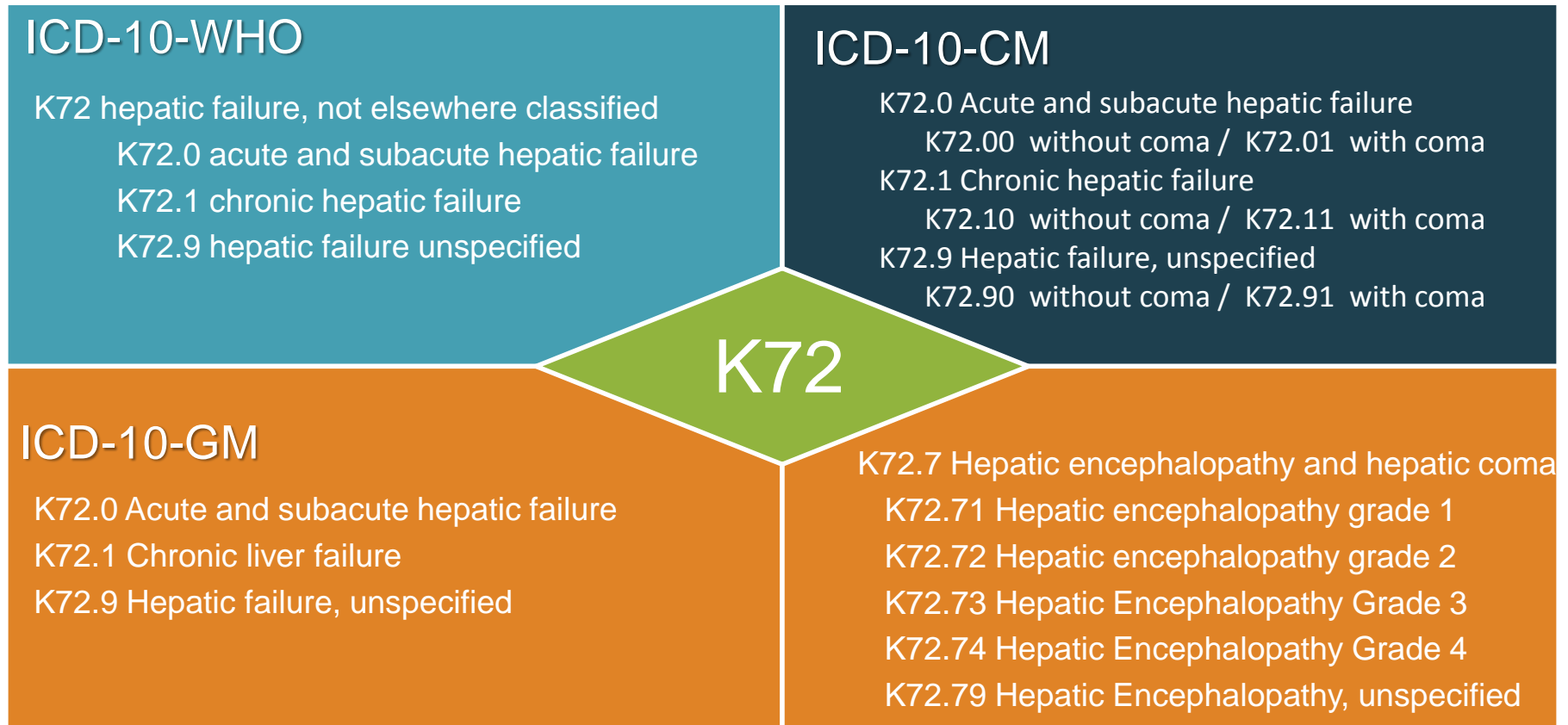ICD-10-SKS (WHO adaptation)

ICD-10 (WHO 5th edition)

ICD-10-GM (WHO adaptation)

ICD-10-ES (CM adaptation)

RESEARCH EXAMPLE

Hospitalized Acute Liver Injury (ALI) and Antidepressants[a]

ICD-9 code 572.2 (hepatic coma) has been used in algorithms to identify ALI (PPV 13%-48%)

ICD-10-WHO

K72 hepatic failure, not elsewhere classified

K72.0 acute and subacute hepatic failure

K72.1 chronic hepatic failure

K72.9 hepatic failure unspecified

ICD-10-CM

K72.0 Acute and subacute hepatic failure
K72.00 without coma / K72.01 with coma
K72.1 Chronic hepatic failure
K72.10 without coma / K72.11 with coma
K72.9 Hepatic failure, unspecified
K72.90 without coma / K72.91 with coma

K72

ICD-10-GM

K72.0 Acute and subacute hepatic failure

K72.1 Chronic liver failure

K72.9 Hepatic failure, unspecified

K72.7 Hepatic encephalopathy and hepatic coma

K72.71 Hepatic encephalopathy grade 1

K72.72 Hepatic encephalopathy grade 2

K72.73 Hepatic Encephalopathy Grade 3

K72.74 Hepatic Encephalopathy Grade 4

K72.79 Hepatic Encephalopathy, unspecified

[a]Post-Authorisation Safety Study of Agomelatine and the Risk of Hospitalisation for Acute Liver Injury (EUPAS10446)

MAPPING TOOLS

- https://www.cms.gov/Medicare/Coding/ICD10/2016-ICD-10-CM-and-GEMs.html
- http://www.icd10codesearch.com/
- http://www.icd10data.com/Convert
- Observational Medical Outcomes Partnership (OMOP) has some tools available on request
- Codes Repository: https://clinicalcodes.rss.mhs.man.ac.uk/
- Not aware of mapping tools for WHO ICD systems

https://www.cms.gov/Medicare/Coding/ICD10/2016-ICD-10-CM-and-GEMs.html

http://www.icd10codesearch.com/nly

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http://www.icd10data.com/Convert

ICD10Data.com

Search

ICD-10-CM Codes   ICD-10-CM Indexes   Conversion   Coding Rules   ICD-10-PCS Codes   Disclaimer   About

Convert ICD-9-CM Codes to ICD-10-CM/PCS, or Convert ICD-10-CM/PCS Codes to ICD-9-CM

Type any single ICD-9-CM or ICD-10-CM/PCS code into the search box below to convert it, for example:

- **250.00** (ICD-9-CM Diagnosis)
- **E11.9** (ICD-10-CM Diagnosis)
- **00.01** (ICD-9-CM Procedure)
- **6A750Z4** (ICD-10-PCS Procedure)

572.2   [Convert Code]

Convert ICD-9-CM 572.2 to ICD-10-CM

ICD-9-CM 572.2 converts approximately to:

- 2016 ICD-10-CM K72.90 Hepatic failure, unspecified without coma

  or:

- 2016 ICD-10-CM K72.91 Hepatic failure, unspecified with coma

Note: approximate conversions between ICD-9-CM codes and ICD-10-CM codes may require clinical interpretation in order to determine the most appropriate conversion code(s) for your specific coding situation.

Source: 2016 ICD-10-CM CMS General Equivalence Mappings.

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With Our Experience…

Regarding mapping from ICD-9 to ICD-10

- Most tools map from ICD-9-CM to ICD-10-CM
- Do not trust the results: Look at how the disease is coded in both systems, use clinical judgement, and consult with research partners to make sure the ICD-10 code is available in their systems

Regarding ICD-10 codes and variable creation

- Consider the level of granularity of the different coding systems
- Consider coding practices in each country
- Work with research partners to adapt the commom statistical analysis plan (SAP) to each data source. Consider using both ICD-10 and ICD-10-CM in the common SAP. Verify code translation from SAP to the adaptations

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Conclusions for Researchers

- ICD-10 coding systems are not uniform across countries. Very different level of granularity. When mapping from ICD-9, consider whether the validated codes were in CM or WHO versions.

- In the multicountry database study context, consider carefully from the beginning the different ICD coding systems in use locally.

- Consider whether codes are used for reimbursement.

- Include in the SAP adaptations by research partners code lists that map codes listed in the common SAP.

- Do not trust mapping tools; verify the code suggested by the translation tool.

- Work sooner than later on the codes lists for variable creation.

THANK YOU!

QUESTIONS?

BACKUP SLIDES

ICD 10 and Pharmacoepidemiology Research: Other Issues

- Alternatives to ICD-10 coding systems:
  - Systematized Nomenclature of Medicine—Clinical Terms (SNOMED- CT)
  - Being used by OMOP
  - Access to researchers might become an issue
  - Developed for e-records
- Reimbursement coding
- Increasing difficulties to access free-text and other granular clinical data (complete lists of medications for patients). Increasing problems to access medical records. All of those factors complicate validation of diagnosis codes being used in pharmacoepidemiology research.

https://clinicalcodes.rss.mhs.man.ac.uk/

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ClinicalCodes.org

An online clinical codes repository to improve validity and reproducibility of medical database research

The ClinicalCodes repository aims to hold code lists for all published electronic medical record studies, irrespective of code type (e.g. Read, ICD9-10, SNOMED) and database (CPRD, QResearch, THIN etc.). Once deposited, code lists will be freely available, with no login needed to download codes.

Clinical codes

Large Primary Care Databases (PCD's) are increasingly being used to address a wide range of research questions in healthcare. Much research has been done into establishing the internal validity of such studies, but PCD studies also rely on clinical codes to provide standardised means for medical professionals to record clinical information. The validity of PCD studies depends upon the validity of the clinical codes used to define the population of interest, their disease conditions, exposures, treatments and outcomes.

However, there is currently no obligation on researchers to publish clinical code lists by journals or research councils and no centralised repository to hold archived clinical code lists. ClinicalCodes.org was set up to address this problem.

Why an online clinical codes repository?

- Clinical codes can be held to scrutiny and peer-review in the same way as any other research methods

- Replication of previously published studies (e.g. in different databases) is facilitated

- Access to historical code-lists allows researchers and clinicians to make incremental improvements to disease (and other) definitions, building on and avoiding unnecessary replication of previous work

- Clinical code lists can become a resource for future research in their own right (e.g. tracking disease definitions through time)

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The University of Manchester
ClinicalCodes is a project at the
University of Manchester Institute of
Population Health

NHS
**National Institute for
Health Research**

The ClinicalCodes project is funded by
the National Institute for Health
Research (NIHR) School for Primary Care
Research (SPCR)

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Atrial Fibrillation and Flutter[a]

In ICD-10 WHO (2010) only I48 (3 digits) available
In ICD-10-CM and WHO (2016):

I48 Atrial fibrillation and flutter

- I48.0 Paroxysmal atrial fibrillation
- I48.1 Persistent atrial fibrillation
- I48.2 Chronic atrial fibrillation
- I48.3 Typical atrial flutter
- I48.4 Atypical atrial flutter
- I48.9 Unspecified atrial fibrillation and atrial flutter
  - **I48.91 Unspecified atrial fibrillation**
  - I48.92 Unspecified atrial flutter

In ICD-10-SKS: I48.9A and I48.9B – A and B specify whether chronic or paroxistic, but there is no 5th digit

[a]Evaluation of potential off-label use of dabigatran etexilate in Europe (EUPAS7591)