

Reformatted crosswalk-tables between annual ICD-10 versions for cross version data analysis

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1 Motivation

- **Increasing digitalization** in medicine
 - Use of expressive coding systems and semantic standards
- Ca. 14'400 **ICD-10** codes for the encoding of diagnoses
 - Various modifications
 - Example: German Modification (GM)
- **Annual updates** of ICD-10 complicate
 - Compatibility
 - Statistical analyses
- **Goal:**
 - Solution for an automated handling with different versions
 - Analysis of compatibility issues

Example: **K20.1 (Radiation esophagitis)**

- Introduced in 2023
- Before 2023:
 - K20 (Esophagitis)
 - T66 (Unspecified effects of radiation)

2 Methods – Data basis (ICD-10 German Modification)

- Crosswalk tables of BfArM¹, version: 2022 – 2023

K20	;	K20.0	;	X	;	A
K20	;	K20.1	;	X	;	X
T66	;	K20.1	;	X	;	X
T66	;	T66	;	X	;	A
↑		↑		↑		↑
Code older version		Code newer version		Transition old → new		Transition new → old
A – Automatic transition						
X – Non-automatic transition						

K20	–	Esophagitis
K20.0	–	Eosinophilic esophagitis
K20.1	–	Radiation esophagitis
T66	–	Unspecified effects of radiation

- Analysed 21 ICD-10 GM versions: 2004 to 2024

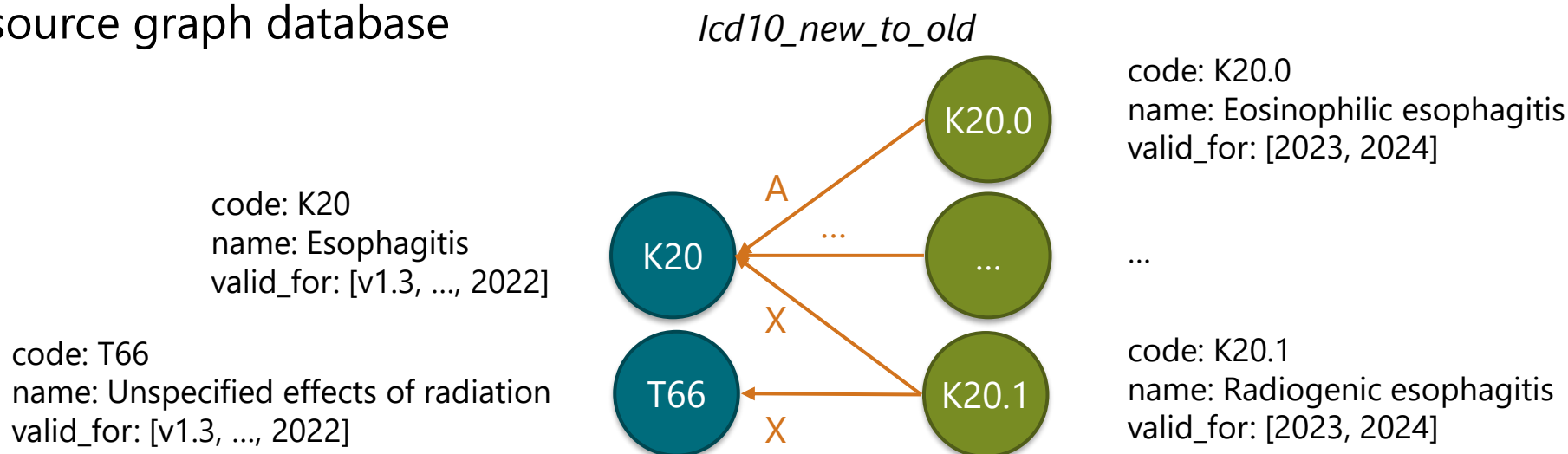
¹ BfArM = German Federal Institute for Drugs and Medical Devices

2 Methods

- **Two solutions** for an automated handling with different versions
 - Neo4J database
 - FHIR ConceptMaps

2 Methods – Neo4J database

- Open-source graph database



- CYPHER – a query language

```
MATCH (codeNewer:lcd10_n_t_o)-[rNtoO:rel]->(codeOlder: lcd10_n_t_o)
WHERE codeNewer.code = "K20.1"
RETURN codeNewer, rNtoO, codeOlder
```

Result:

K20.1 – [X] → K20

K20.1 – [X] → T66

2 Methods – FHIR ConceptMap

- Represent direction dependent relationships between codes: **new** → **old**
- Terminology service *\$translate*
- Example: K20.1 (Radiation esophagitis)

```
{ "resourceType": "Parameters",
  "parameter": [
    ...
    { "name": "match",
      "part": [
        { "name": "equivalence", "valueCode": "wider" },
        { "name": "concept",
          "valueCoding": { "system": "http://fhir.de/CodeSystem/dimdi/icd-10-gm",
                        "code": "K20",
                        "display": "Esophagitis" }
        }
      ]
    },
    { "name": "match",
      "part": [
        { "name": "equivalence", "valueCode": "wider" },
        { "name": "concept",
          "valueCoding": { "system": "http://fhir.de/CodeSystem/dimdi/icd-10-gm",
                        "code": "T66",
                        "display": "Unspecified effects of radiation" }
        }
      ]
    },
    ...
  ]
}
```

3 Results – Non-automatic transition

Average percentages

0.89 %
122 codes

old → new

0.48 %
66 codes

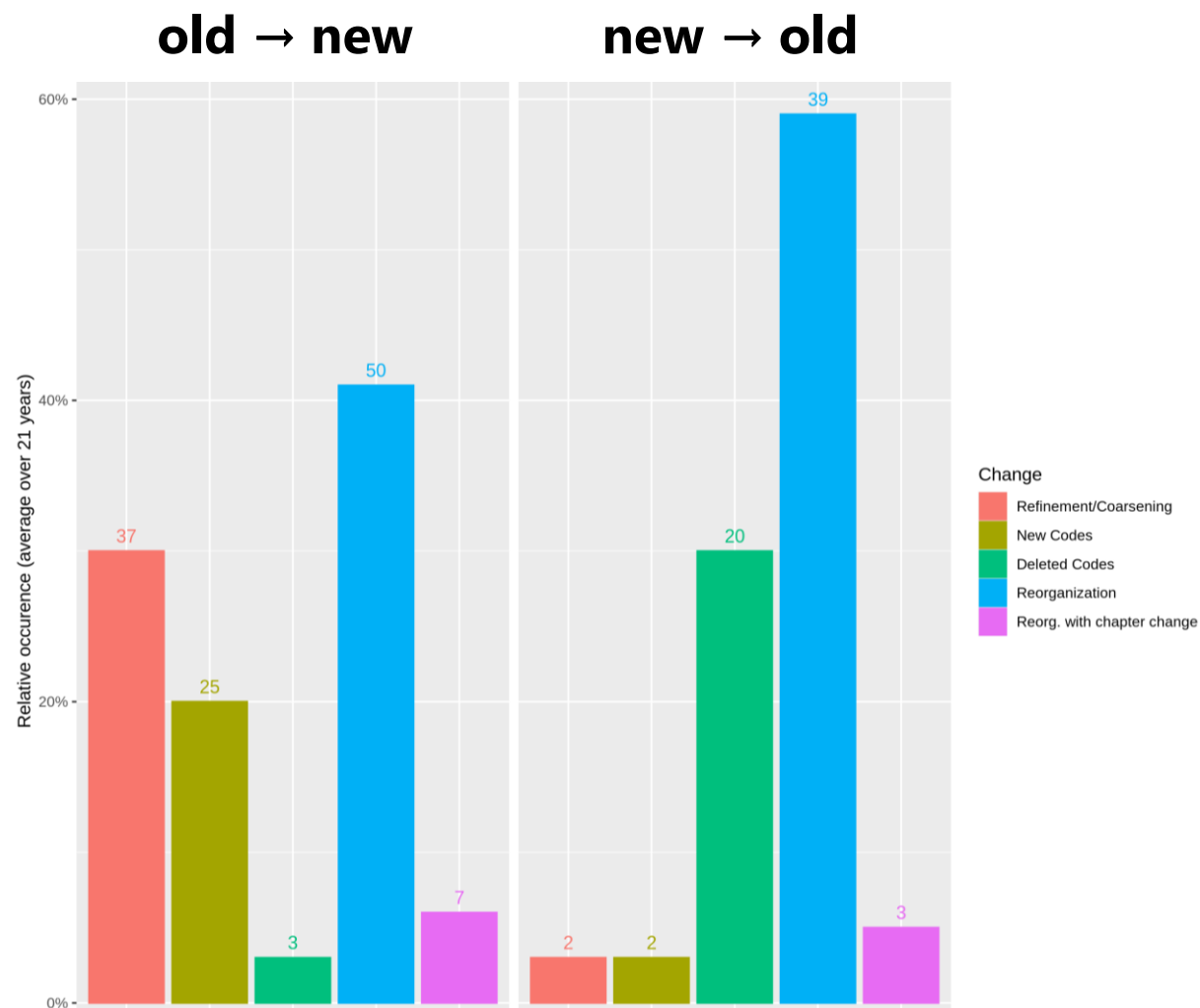
new → old

→ Our solutions enable 99% automatic mapping

3 Results – Causes for non-automatic transition

Cause	Example
Refinement / Coarsening	K20 (Esophagitis) ↔ K20.1 (Radiation esophagitis)
New codes	UNDEF (Undefined) ↔ U69.75 (Insulin resistance in diabetes mellitus, type 1, in persons aged 18 years and older)
Deleted codes	U12.4 (Unassigned key number U12.4) ↔ UNDEF (Undefined)
Reorganisation	<p>H54.1 (Blindness in one eye, visual impairment in the other eye) → H54.4 (Blindness and severe visual impairment, monocular)</p> <p>D18.08 (Hemangioma: Other localizations) → D18.08 (Hemangioma: Other localizations)</p> <p>Other localizations → D18.07 (Hemangioma: Bony spine)</p>
Reorganisation with chapter change	T66 (Unspecified effects of radiation) → K20.1 (Radiogenic esophagitis)

3 Results – Causes for non-automatic transition



4 Conclusion

- **Non-automatic transitions** shouldn't be neglected
 - Version control is increasingly important
 - Options: Neo4J database and FHIR ConceptMaps
- **Benefits:**
 - Enables automatic mapping in 99% of cases
 - Improved and intelligent retrieval of coding data
 - Interactive retrieval of information of a code
- **Current work:**
 - Web application for visualizing versioning

→ [Available on Github](#)





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