National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Federated automated surveillance

Lessons learned from exploration of EHR data harmonization and standardization

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Background

Reuse of routine care data (EHR) to automate the surveillance process

Replacing manual steps in

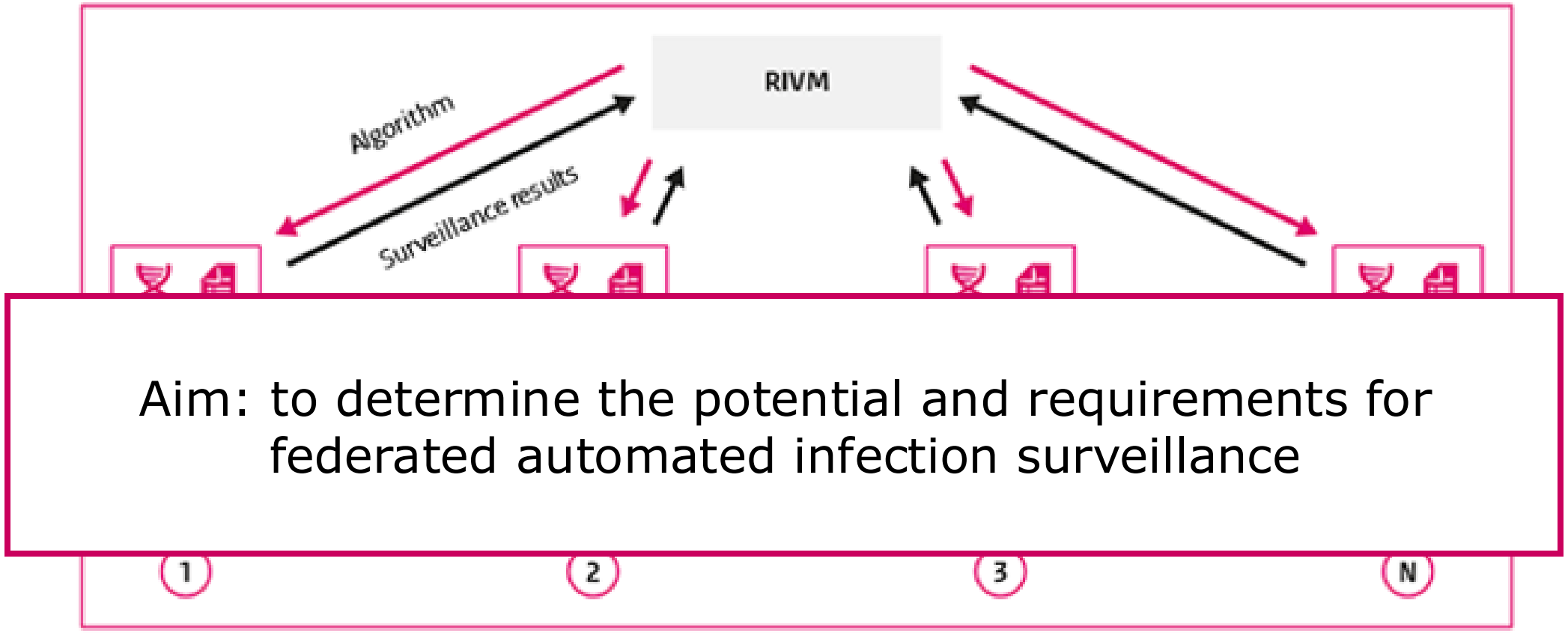
- Selection of surveillance population
- Collection of information of patient characteristics and risk factors
- Classification of patient's infection y/n

Needs large scale implementation of automation of surveillance

- Decentral implementation, but limited capacity and knowledge in hospitals required
- Advanced analyses methods support algorithm development, but complicate standardized implementation
- Sharing of applications and scripts
- Authorized and agile access to data sources and combination of data sources

Van Rooden et al, ARIC 2024, doi.org/10.1186/s13756-024-01464-8

Potential solution: Federated automated surveillance



Aim: to determine the potential and requirements for federated automated infection surveillance

Federated automated surveillance
Algorithms: central → hospitals
Aggregated surveillance results: hospitals → central

→ Source data stay local
→ Harmonization of source data requisite!

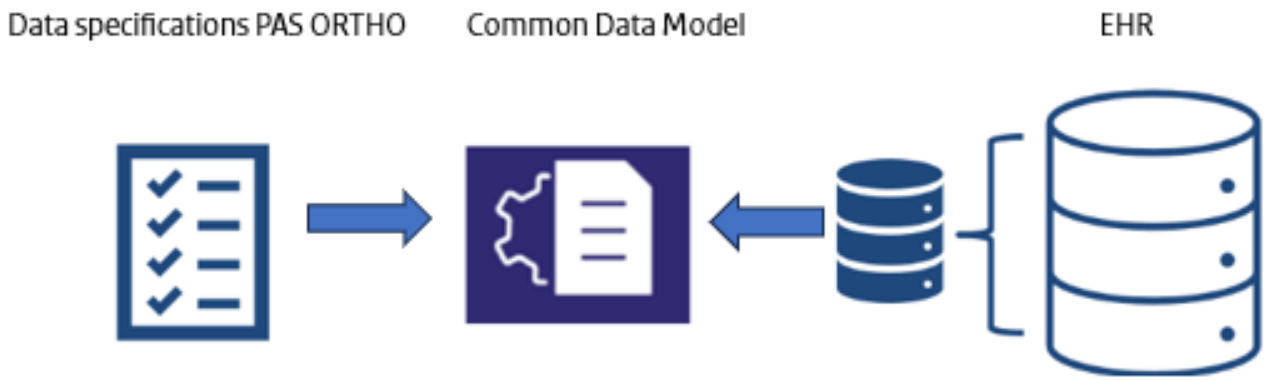


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Subgoals:

Definition of a common data model and data quality evaluation for automated infection surveillance (SSI)

Delphi study: Definition of standard terminology



Do all stakeholders agree on definition of (inter)national standard terminologies ?
Do all stakeholders have the same understanding of data elements?

- Use case SSI surveillance after orthopedic surgery (patient characteristics, surgical procedures, microbiology)
- Align with important (inter)national initiatives (preparatory work, composition of working group)
- Working group 12: medical informatics, infection prevention, medical microbiology, orthopedics, IT specialists

Source symbol CDM: https://archive.rd-alliance.org/sites/default/files/attachment/GORC-International-Model-RDA-WG-Considerations-for-Developing-Policy-with-Global-Impact.pdf

CDM Delphi: Results and lessons learned

Results

- Consensus on semantic mapping 85,1% of items
- (medical) microbiology data > ESGAID studygroup ESCMID and OHDSI working group

Lessons learned

Data registered for care, different culture practices. Fit for purpose?

- Importance of involvement domain experts
- Still complex to define source data - EHR metadata
- Interpreting EHR metadata (context)

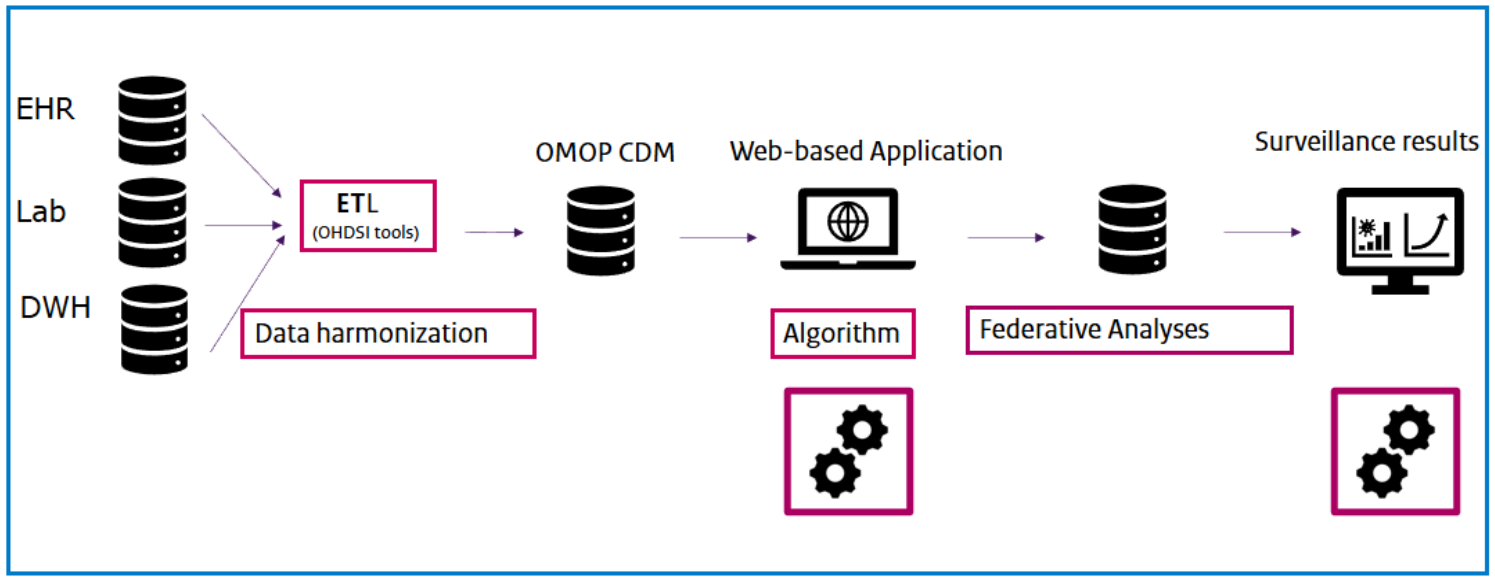
Further testing
->
Connectathon

Item nr	Item	Uitleg item	Onderverdeling (wat behoort er to	Optie	Standaard	Code standaard	Naam	Waardelijst	Ronde 1	Ronde 1	Ronde 1	Ronde 1	Ronde 1	Beoordeling	Alternatieve mappi	Overweginge	Voortgang	Opmerkingen w
Pas-Ortho data specificaties nummer	Naam Item	Extra informatie Item	Subverdeling Item wanneer het uit meerdere definities bestaat (of formule nodig voor item)	Verschillende opties voor mappin	Naam codestelsel SCT (SNOMED), LOINC	Cijfercode passend bij de mapping en link	Beschrijving van vertaling	Antwoordmogelijkheden bij de variabele	% zeer passend	% passend	% neutraal	% minder passend	% niet passend	INVULLEN door werkgroep	INVULLEN door werkgroep - OPTIONEEL	INVULLEN door werkgroep - OPTIONEEL		
		knieprothese (HMKNIE) uitgevoerd binnen surveillance																voor alle items gek
			HEUPPR: totale heupprothese	A	SCT	304120007	totale heupprothese (fysiek object) |		0	43	14	0	43					Lijkt me weinig get
				B	SCT	398010007	implantatie van heupprothese (verrichting)		0	29	14	29	0					te generiek
				C	SCT	52734007	implantatie van totale heupprothese (verrichting)		1	29	0	14	0					Ook specifiekere v
			TOTKNIE totale knieprothese	A	SCT	313062001	totale knieprothese (fysiek object)		0	43	14	0	43					Lijkt me weinig get
				B	SCT	609588000	implantatie van totale knieprothese (verrichting)		1	14	0	14	0					
			HMKNIE: hemi knieprothese															NB Optioneel aanv
			(mogelijke subcategorieën hemi-knie)	A	SCT	313064000	unicompartimentele knieprothese (fysiek object) |		0	43	14	0	43					Lijkt me weinig get
				B	SCT	466873001	unicondylaire knieprothese (fysiek object)		0	43	14	0	43					Lijkt me weinig get
					SCT	433085009	geïnfecteerde unicondylaire gewrichtsprothese van knie (aandoening)											Ik mis: 433085009
					SCT	61141000146109	implantatie van mediale unicondylaire knieprothese (verrichting)		0	14	14	29	29					;op zich passende
					SCT	61131000146101	implantatie van laterale unicondylaire knieprothese (verrichting)		0	14	14	29	29					Voor PAS ORTHO
				C	SCT	303722003	prothese van patellofemoraal gewricht (fysiek object)		0	29	29	14	14					Lijkt me weinig get

Consensus CDM to testing CDM: Connectathon

1 day event at the RIVM
Participating hospitals

Aim of Testing CDM
- **Compliance**: ETL process. Source data to OMOP.
- **Interoperability**: CDM data in web-based application
- **Validity Algorithm results**





Results

Successful demonstration of **ETL principle**: Data could be extracted, transformed to defined data model and uploaded in application

- **Insights in pipeline, dependencies, and requirements** (capacity, expertise)
- '**Uniformity of language**': Mutual understanding needs all roles involved
- **Compliance**: source data MDS, mapping table, generic ETL scripts, DQ control
- **Interoperability**: all OMOP tables loaded in tool, shifting data, understanding relational model
- **Validation** algorithm results: solve relational model > validation

Lessons learned

- Domain expertise in hospitals, but **collaborative start** essential (insight in entire process)
- Learn from **existing initiatives**, expand application OHDSI (OMOP) tools
- Optimization more **generic CDM** and more specific **logic in application**

Future steps

- **Connectathon 2.0 Enhancing OMOP maturity level,** data validation and data quality
- Exploration integration FAIR (rdf?)

- ***How can the flow of data be better supported, and challenges and opportunities for Public Health thanks to the EHDS?***

- Interoperability of data will be promoted, but the data will not be automatically interoperable.
- Expert domain knowledge and collaboration is pivotal > interpretation and selection of data sources is crucial.
- Importance of fitness for purpose, context of data, quality of data
- Bridge-builders to connect technical and domain experts

- Need for overall coordination (and alignment?) of all international initiatives and projects