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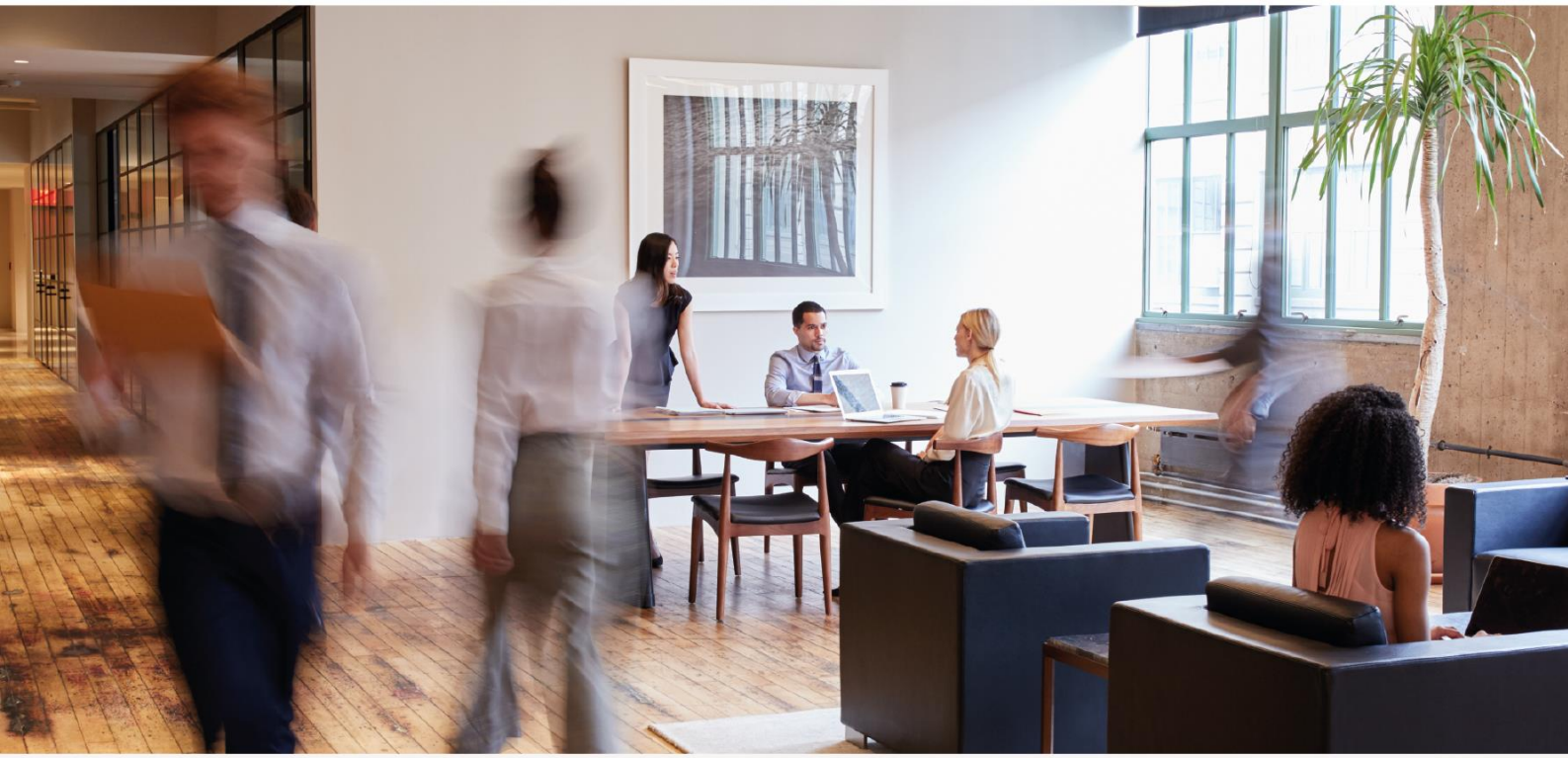

Recommendations on a Real-World Data Strategy for Belgium

Multi-stakeholder initiative on reuse of routine care health data

Report

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June 2022

Colophon

Title:	Recommendations on a Real-World Data Strategy for Belgium
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Commissioned by	Inovigate has performed this research and analysis under complete intellectual independence. The project has been made possible by Janssen.
Publication date:	June 2022
How to refer to this document?	Maes I., Kok E., Dewulf G., Recommendations on a Real-World Data Strategy for Belgium, a multi-stakeholder initiative on reuse of routine care health data, 2022

Preface

Contributing to the preservation of a high-quality and accountable healthcare system is part of the mission and vision of the Belgian Association of Hospital Managers (BAHM-BVZD-ABDH). The BAHM brings together the general managers, CEOs, managing directors, and members of executive committees of the Belgian hospitals.

Healthcare is rapidly transitioning into a new world of patient choice and experience, focusing on integrated care and outcomes. Indeed, care models are shifting from medical interventions driven by episodic interaction with the patient to delivering continual care. Throughout hospital stays, but also beyond, a vast amount of data on health, and health care is generated. Meanwhile, technology is enabling the capture and analysis of routine care data—also called real-world data—and patient-generated/reported data. The routinely collected health data environment continues to mature rapidly. **Advances in medical research and the development of novel insights increasingly depend on the availability and secure reuse and analysis of routine care data**. Each encounter of a patient with the healthcare system leaves a trail of data. In an ideal world, every such encounter also represents an opportunity to learn. However, for now, there are multiple challenges concerning the secure reuse of routine care data. First and foremost is, of course, the challenge to respect patient privacy. Other challenges may concern topics such as interoperability, governance structure, and analytical methods.

On March 16, 2021, BVZD/ABDH organized a seminar titled "**Secure reuse of routine care data – Benefits & challenges**". Several aspects of secure and successful reuse of routine care data were presented. Also, several cases that benefit patients, the healthcare system and/or the life-sciences research ecosystem, were presented by Ziekenhuis Oost-Limburg (ZOL), Onze Lieve Vrouwziekenhuis (OLV) Aalst, Centre Hospitalier Universitaire (CHU) Liège, Algemeen Ziekenhuis (AZ) Delta, and many others. As a follow-up to the symposium, a roundtable on "**Secondary use for real-world data and development of a data governance framework" took place on October 26, 2021** to further discuss challenges and opportunities, as well as potential solutions.

The availability and secure reuse of routine care data is high on our agenda for increasing efficiency, quality of care, personalized care, and improved care coordination, etc. We must prepare for a more data-driven medicine. Data is an asset that should be re-used. The concept behind "**data is the new oil**" is that, just like oil, raw data is not valuable on itself, but rather, value is created when data is available and suited for its purpose based on accessory completeness, consistency, validity, uniqueness, and timeliness. Hospitals have a pivotal role to play in this process.

As an outcome of the roundtable, several **actions have been defined to reuse routine care and health data** that contribute to improving hospital care. We agreed on actions that must be taken by hospitals, such as starting with projects and pilot programs to explore data re-use, but also to define a data strategy for Belgium and the set-up of an independent health data institute. The BAHM wants to thank the participants of the roundtable and all parties that have supported the creation of this report. The seminar and the roundtable, of which this report summarizes the key conclusions, have contributed to a broader and continued debate with all stakeholders. Hospitals play an important role in health data generation and should lead in reusing the data to benefit themselves, the healthcare system, and patient care more particularly. The BAHM will further align with the Belgian government to define a safe and secure data environment that makes Belgium a top region for health data, to benefit Belgian society and the Belgian economy.

Pascal Verdonck, Vice-President, BVZD-ABDH

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Executive Summary

The growing use of electronic health records (EHRs) in the Belgian healthcare system fuels the **fast growth of clinical data** available in electronic format. This growth offers tremendous potential for the use of routine care data beyond its primary intent (i.e., patient care and healthcare operations). **Secondary use** (or reuse) of clinical data is defined as "non-direct care use of personal health information including but not limited to analysis, research, benchmarking, quality, and safety measurement".

Given societal pressure to **rapidly develop innovative treatments** for unmet needs, real-world data will complement clinical trials by providing evidence on the long-term performance of new therapies in large and diverse populations. **Real-world data** (RWD) can also help hospitals improve their own quality of care and enable research insights into disease mechanisms, leading to new diagnostics, treatments, and all-around better health. To achieve this, a data culture must be established in which outcomes are compared and benchmarking between hospitals is performed. Hospitals should work together and take action to collaborate at all levels.

Several European countries have already invested tens of millions of euros into real-world data initiatives. The Belgian government, on the other hand, has yet to commit funds to initiatives in this area. Furthermore, Belgium has not even begun to develop legislation for the reuse of health data. Countries like Finland and the Netherlands have not only written their regulations, but have also begun implementing them. Although **Belgium is currently behind** in real-world data progress, we have all the ingredients to put Belgium back on the map for data and digital health. *"To keep Belgium as number one for clinical trials and healthcare, we need to develop a strategy to make Belgium number one for real-world data. It's one of the best investments the government can make."*

It is our goal to **position Belgium as a pioneering country for the use and reuse of routine care data**, and to develop a data framework to support this. However, the availability and secure reuse of routine care data poses many challenges, such as privacy and ethical concerns, data integration and interoperability, terminologies, unstructured data reuse, etc. To solve these challenges and facilitate discussion to find suitable solutions for Belgium, **common ground solutions**, gathered from the literature, case studies, and interviews with Belgian healthcare stakeholder representatives, were collected. These solutions were discussed at a roundtable with the Belgian Association of Hospital Managers to obtain a broad view on what is required to access and use RWD. This resulted in recommendations for hospitals and authorities.

Basic principles for routine care data reuse were generated.

Principle 1: To be pragmatic in defining which data to collect, **one common patient consent model for the whole of Belgium** should be developed. Data collection should go beyond the hospital and should also include InterMutualistic Agency (IMA) data, containing information from sick funds, RIZIV data, and patient reported outcomes measures (PROMs).

Principle 2: A **minimal standard of exchangeability should be imposed via electronic medical records (EMR) accreditation**, like general practitioners' software. This can be achieved via hospital funding linked to the obligation of data reuse. Common data models like Observational Medical Outcomes Partnership (OMOP) enable the capture of information in a harmonized and unified way.

Principle 3: The **quality and completeness** of data is important. Therefore, funding and compensation for data quality efforts should be made possible.

Principle 4: **Combined private/public funding** is considered a good approach to support the interests and capabilities of both.

Principle 5: A **governance model on the hospital network level** must be established.

Principle 6: On a Belgian level, a **multi-stakeholder representation in the governance body** that determines data access is required. This governance body should include all stakeholders, including pharma.

Based on these principles, we formulated recommendations and actions for safe and secure reuse of routine care data.

Recommendation 1: Belgian Independent Health Data Institute

An integrated data policy in Belgium requires the creation of an overarching health data institute to improve health data policy in the future. This institute, with clear responsibilities, would consolidate all the key roles, players, and expertise in health data. The institute would develop and oversee the implementation of a health data vision and policy. To this end the institute must (1) define the data infrastructure, (2) ensure alignment on data collection and its structural analysis, and (3) be organized according to the most modern principles of transparency. The institute should also (4) manage health data and data science expertise. Finally, (5) all expertise should be pooled and made available to all stakeholders. The institute should be based on a dynamic model that evolves as needs change. The government should facilitate the set-up but should not control it. The governance board of the institute should consist of representatives of all Belgian health data stakeholders.

Recommendation 2: **Top-down and bottom-up** actions and initiatives, including roles for hospitals and government

A top-down role for the government: The country needs to have a good governance model, establish a legal framework, and build an excellent data infrastructure with incentives and funding in place for qualitative data collection and curation. The government should impose standards, including interoperability standards, for hospital EMRs. On top of that, good governance consisting of one national health data charter is needed. One national patient consent form would support convenient data use and reuse. The government should provide a legal and ethical framework with an incentive model that supports data collection for reuse

The bottom-up approach and what hospitals must do: From the bottom up, the hospitals must develop a better strategy to organize their data internally and make it accessible. Data need to be collected in a standardized way. Investment in a good EMR will solve many challenges related to data reuse, as data will be collected in a structured way.

1. The Belgian health data landscape

Although Belgium is currently behind in real-world data use and reuse, we have all the ingredients to put Belgium back on the map for data and digital health. We had a head start in the field. Belgium was one of the first European countries with electronic health records and the first to roll out an electronic ID card to the whole population. Belgium also created its e-health platform (law passed August 21, 2008) to secure the exchange of health data for many types of applications, such as health care purposes, simplification of administrative procedures and contribution to health policy. The exchange of health data is organized through a hub-metahub system (figure 1).
The intention of the hub-metahub system is to provide a healthcare provider with the ability to retrieve and access all electronic health and well-being documents available for a particular patient, regardless of where these documents are stored. The aim is to support the exchange of data in the context of patient healthcare, without centralizing data, but via local or regional networks organized and managed by representatives of healthcare providers and care institutions.

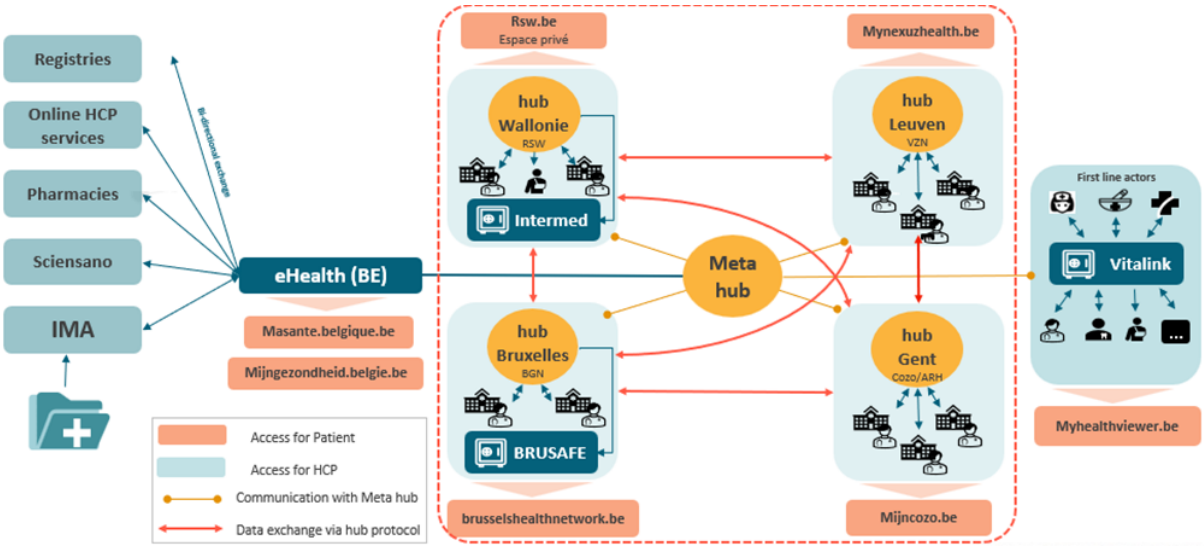

Figure 1:Schematic view of actual systems and databases in place in Belgium

The hubs and the metahub contain only a reference directory that indicates whether documents about a patient are available at the site of a healthcare provider or healthcare institution. In addition, the information can only be consulted as a document. As a result, this platform makes it difficult to use patient information as a source of real-world data. In any case, the hub-metahub system is intended for primary care and not for clinical trials.
Various initiatives have been set forth recently by multiple stakeholders, such as the Belgian Health Data Authority, the Agoria Health Data Charter, the ICURO paper on "Big data in de gezondheidszorg", the RWE4Decision, and many others.

1.1 Belgian Health Data Authority

In the Federal Government Agreement of 2020, the following was decided:

"Our citizens have the right to be informed about the quality delivered by healthcare providers and healthcare institutions and to judge for themselves which hospital, healthcare institution or healthcare team to choose.

The government will take the initiative to substantially increase transparency regarding the quality of the care provided, both intramuros and extramuros, through public disclosure. Patient experiences and satisfaction will be measured, surveyed and reported.

Therefore, we are developing a healthcare data authority responsible for the development and implementation of a policy strategy. This unique point of contact for healthcare data centralizes databases in a GDPR-compliant way, e.g. through querying and supports, among other things, scientific research and policy preparatory work for a better quality and more efficient healthcare."

The Belgian Health Data Authority will support the existing initiatives of the five main federal organizations working with health and healthcare data (Federal Agency for Medicines and Health Products (FAGG–AFMPS), FPS Public Health, Food Chain Safety and Environment (FODVVVL–FPSSPSCAE), Belgian Health Care Knowledge Centre (KCE), National Institute for Health and Disability Insurance (RIZIV–INAMI) and Sciensano). It aims at building capabilities for the collection of data, data analysis, data quality, data processes, data catalogues (with metadata), and master data management. Several tasks have been defined in which the Belgian Health Data Authority can make a substantial contribution to the efficient and correct use and reuse of health and healthcare data:

- Metadata management: findability, accessibility, interoperability, and reusability (FAIR) information about the available data;
- Guidance and regulation in the exchange of data for reuse;
- National and international services: guidance of organizations, internal, and external to the government, with a need for data on health and healthcare;
- Transparency.

The Belgian Health Data Authority could bring more value to the broader stakeholder community by enlarging the scope of health data beyond the five federal organizations by also including data from the IMA/AIM (containing data from sick funds) and data from eHealth, similar to initiatives in other countries (see also page 18, which provides an overview of these initiatives).

1.2 Definition of RWD and RWE

RWD stands for real-world data. This is the data collected about patients and their treatment in a real-life setting, opposed to data gathered in an experimental setting such as randomized clinical trials (RCTs). The data can come from different sources (figure 2).

There is debate about the exact definition of RWD. For instance, RAND Europe defines RWD as an umbrella term referring to *"any data not collected in 'conventional randomized controlled trials'. It may include data from existing secondary sources (e.g., databases of national health services) and the collection of new routine care data, both retrospectively and prospectively collected."*

Real-world data is used to generate clinical evidence. This evidence generated by RWD is called RWE or **real-world evidence**. RWE can provide answers to problems such as the effect of medication on patients with comorbidities excluded from an RCT or allows the analysis of long-term effects of drugs.

Obviously, there are **many types of real-world data** coming from different sources. In fact, there is a great difference between data collected under strictly controlled conditions on the one hand and data reflecting what happens in daily practice on the other hand. There is a continuum between data collected in strictly controlled conditions and data reflecting what happens in daily practice/routine care. On the far-left side of the continuum, patients are heavily selected to avoid confounding effects, and data are collected while following strict protocol instructions and mandatory actions. On the far-right side of the continuum, data are collected based on observing daily life practice in patients, for instance, collected in routine care or based on registries or existing databases. In between, we find, for instance, pragmatic trials whereby there is still control due to patient selection and protocol instructions, but where attempts are made to better mimic real practice.

It is clear that RWD can be collected at different time points throughout a person's life, can come in different formats (e.g., registries) and may have different types of content (e.g., resource use or patient-reported outcomes). Outlined below is a non-exhaustive list.

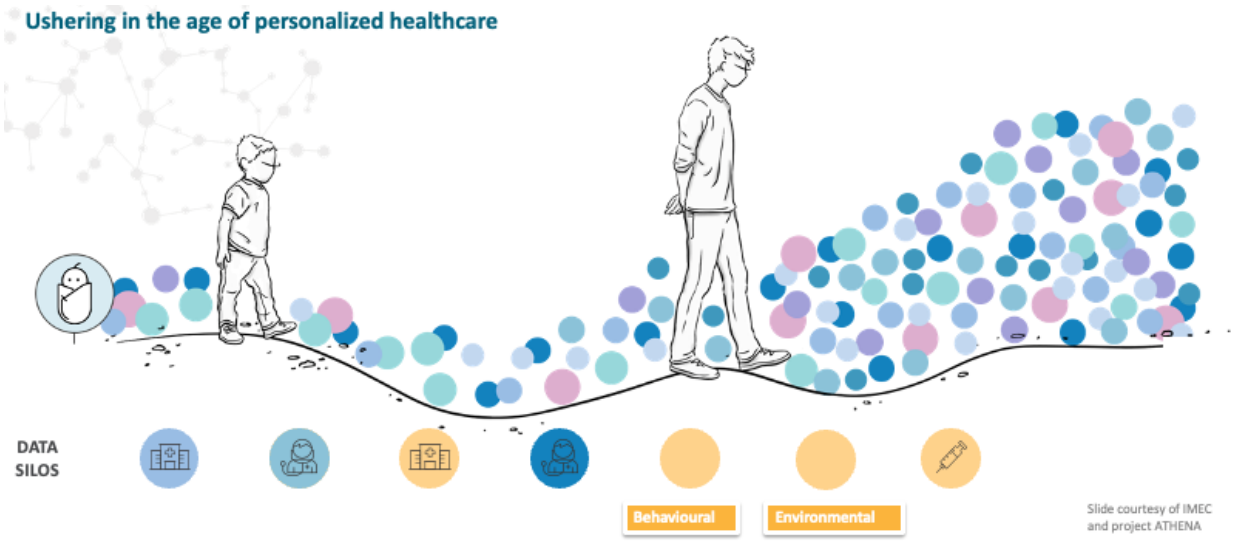

Figure 2: Data silos

Data obtained from electronic health or patient records (EPRs). When connected to a central database, the use of EPRs allows thorough insight into real-life practice, since they combine diagnostic information and medical practice data in a longitudinal manner. Hence, patients can be tracked over time. It can help to better understand the current practice and standard of care, and to assess the performance of new medicines and medical devices in real life.

Data obtained from claims databases. These data, typically from health insurers, provide insights into medical resource use and offer possibilities like those of EPR-based data. As is the case with EPRs, claims data are typical types of routinely collected data. However, these claims databases often lack diagnostic information and outcome.

Molecular profiling, genetic, and biomarker data. These are datasets holding rich information about genetic characteristics (for instance, of patients or of cancer cells) and other biomarkers. These "bundles of information" have a special use in the field of personalized medicine and can be very useful in the development phase of medicinal and medical products to better understand the relationship between genetic characteristics and treatment outcomes.

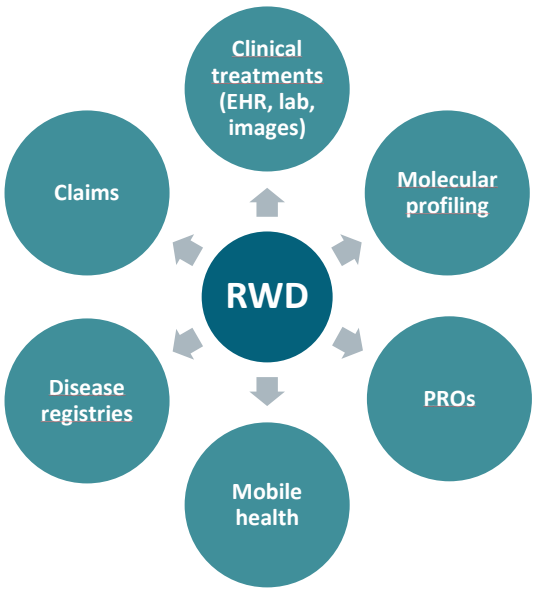

Figure 3: Sources of real-world data

Data from disease registries (existing or newly set up). In several countries, registries in different disease areas have been established that are maintained and updated with new information and patients. Registries can also be newly created for a given purpose. Typically, they play a role during the market access phase of new medicines to understand current practice, but even more during the market usage phase (post launch) to assess the performance in a real-life context.

Patient reported outcomes measures data (PROMs). Data were collected from patients via questionnaires.

Mobile health data. The use of mobile devices, wearables, and other biosensors to gather and store huge amounts of health-related data has been rapidly accelerating. This data holds the potential to allow us to better monitor patients.

2. RWD reuse benefits and challenges

2.1 RWD reuse benefits

RWD and RWE are playing an increasing role in health care decisions, such as in designing and conducting clinical trials and studies in the healthcare setting to answer questions previously thought infeasible. In addition, with the development of sophisticated, new analytical capabilities, we are better able to analyze these data and apply the results of our analyses to medical product development and approval. The healthcare community is using these data to **support coverage decisions** and to develop **guidelines and decision support tools for use in clinical practice**. Medical product developers are using RWD and RWE to support clinical trial designs (e.g., large simple trials, pragmatic clinical trials) and observational studies to generate innovative treatment approaches.

Since the digital revolution began, data has been generated at an extremely high pace. These data can have various sources. Patient health data are currently being generated and stored for two main reasons: optimization of the health status of patients through adequate medical follow-up and for medical billing and insurance purposes. So even though not primarily intended for it, this **health data could be reused and leveraged for big data analysis to gain new insights** into specific disease characteristics, patient trajectories, and potential biomarkers, especially for data in structured and semi-structured formats.

Insights from RWD also play an increasingly important role in **personalized medicine**, to streamline clinical decision making by distinguishing in advance those patients most likely to benefit from a given treatment from those who will suffer side effects and incur cost without gaining benefit. The complexity and heterogeneity of diseases (e.g., cancer) leads to variable patient responses, treatments, and interventions. Therefore, models that provide insights into patient's care pathways using prognostic and predictive biomarkers are increasingly important in both clinical practice and scientific research. As such, data-driven medicine improves outcomes at the individual patient level.
There is a growing consensus on the need to reuse health data. It is proven to enhance individuals' healthcare experiences, expand knowledge about diseases and treatments, strengthen understanding of health care systems' effectiveness, and efficiency and support public health (figure 4).

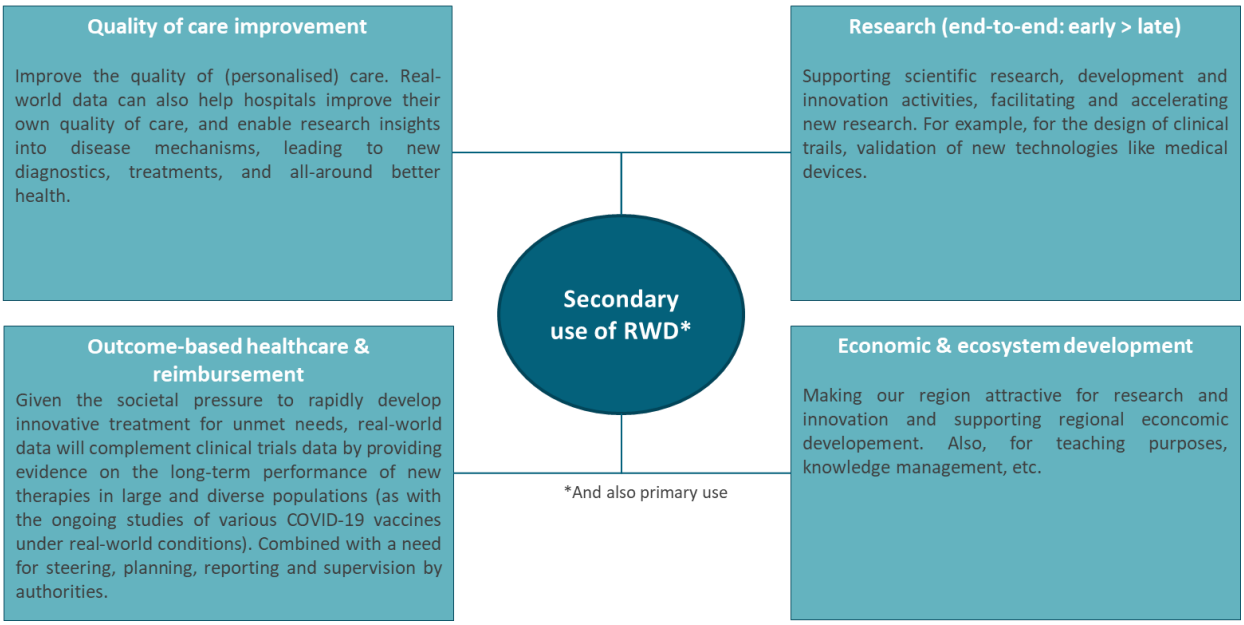

Figure 4: Secondary use of real-world data

2.2 Challenges associated with RWD reuse

Yet, there are still several challenges to be overcome relating to the use and reuse of health-related data, for health purposes, and for the benefit of the patient. Although securing, linking, and analyzing large amounts of data are complex matters, the difficulties are of a technical, ethical, legal, cultural, and mainly organizational nature. Allowing different sectors to work together to share data, agree on standards, and achieve a change in data culture are long-term tasks that must first and foremost be led by all stakeholders.

Technical challenges are related to the availability, interoperability, and quality of the data:

- Quality and integrity of the data. Quality issues can be related to missing data, wrong inputs, and issues with definitions. Data integrity refers to maintaining and assuring the accuracy and consistency of data;
- Lack of agreement between the involved parties regarding what data is needed, when, and for which purpose;
- Differences in the structure, setup, and content of different databases lead to challenges in linking and exchanging data (interoperability issues);
- Scientific rigor of data management and analysis;
- Access to, and availability of, the data. Excellent data sources may exist in each jurisdiction, but due to rules and restrictions regarding the reuse of data may be difficult, or even impossible, to access;
- Time required to collect, analyze, and report the data may be such that the evidence based on RWD comes in too late to serve its purpose;
- Cost of collecting the data. In some circumstances, access is possible, but at a high cost for the party that needs the data for a given purpose.

The ethical and legal challenges come down to the following:

- Issues with privacy and data security, including:
    - Cybersecurity;
    - De-identification and anonymization;
    - Prove of data protection by ISO-27001.
- Sensitivities regarding the reuse of data, including data ownership and data access rights;
- Lack of trust in the organizations interested in the data.

To support the use and reuse of data, there is a need to establish international standards that facilitate data interoperability and resolve privacy and ethical issues. International standards would increase general public's trust that their medical data is being carefully handled. Moreover, a good governance framework for collecting real-world data is missing today.

3. RWD reuse framework

3.1 Method for defining solutions for RWD reuse

The availability and secure reuse of routine care data poses many challenges, such as privacy and ethical concerns, data integration and interoperability, data models and terminologies, unstructured data reuse, structured data mining, clinical practice, and research integration. To solve these challenges and facilitate a discussion to find suitable solutions for Belgium, we have first performed extensive literature research and investigated what other countries have been doing. We also studied best practices, pilots, and examples.

Based on these insights, a solution framework has been developed to facilitate the gathering of multi-stakeholder perspectives and viewpoints on potential solutions to support the key data process steps and the enabling foundation. Solution options for each element of the framework have been listed. The **common ground solutions** for each of the key elements, for all stakeholders, were collected. Solutions to improve data collection to enable reuse of routine care data, as well as to improve data quality and support data analysis, have been identified. An appropriate data governance model to support data reuse that is convenient for patients, healthcare professionals (HCPs), and other stakeholders (like authorities and life-science research companies), but respects privacy and security to maintain trust. Finally, the incentives and funding for data collection and analysis have also been defined.

3.2 Literature study

To develop a framework with solutions for data reuse, a thorough literature review was conducted (see the reference list). Also, cases, best practices, and examples from abroad have been studied.

In a recent article, co-authored by Jo De Cock (CEO, NIHDI, Belgium), titled "Real-world evidence to support payer/HTA decisions about highly innovative technologies in the EU—actions for stakeholders"[1], stakeholders are called to **collaborate on pilot projects** to consider how RWE can be developed to support regulatory decision making. For this RWE4Decisions initiative, all stakeholders were brought together at the EU level to discuss the use of RWD. The aim of this RWE4Decisions initiative is to consider actions that each stakeholder could take to improve the use of RWD. For each stakeholder group, recommended actions to support the generation, analysis, and interpretation of RWD to inform decision-making were developed in consensus.

In addition, Zorgnet-Icuro published a report in 2020 following multi-stakeholder discussions in 2019 on the use and reuse use of health data for research[2]. The report discusses how clinical data can be **accessed for societally relevant research**, and this in an ethical and judicially sound manner with respect for patient privacy and managed by a transparent and equitable governance structure representing the key stakeholders.

3.3 Initiatives in other countries

In several countries, there are already initiatives relating to primary and secondary use of data. We have highlighted some interesting ones below as a potential source for initiatives for Belgium.

[1] Facey K. M., Rannanheimo P., Batchelor L., Borchardt M., De Cock J. (2020). Real-world evidence to support Payer/HTA decisions about highly innovative technologies in the EU—actions for stakeholders. *International Journal of Technology Assessment in Health Care* 1–10.

[2] Raeymaekers P., Balthazar T., Denier Y. (2020). Big data in de gezondheidszorg. Technische, juridische, ethische en privacy-gerelateerde randvoorwaarden voor (her)gebruik van gezondheidsgegevens voor onderzoek. *Brussel: Zorgnet-Icuro*

Medical Informatics Initiative (Germany)

The German Federal Ministry of Education and Research (BMBF) provides 180 million euros to strengthen medical research and improving patient care. All of Germany's university hospitals have joined forces with research institutions, businesses, health insurers, and patient advocacy groups to create a cross-organizational basis and framework for harnessing and exchanging of data from research and patient care to the direct benefit of patients.

Personalized Health Network (Switzerland)

The Swiss Personalized Health Network (SPHN) is an infrastructure that adopts a federative approach by building upon existing data sources across the country. The goal is a coordinated data infrastructure to make health-relevant data interoperable and accessible, for research in Switzerland. Recently, they announced that a query system went online with access to 70 million data from 450k patients.

Health Data Research (UK)

This is the British national institute for health data science. It unites the UK's health data to enable discoveries for improving people's lives. This non-profit alliance consists of leading healthcare and research organizations and works with industry, charities, patients, and the public. The initiative consists of developing and coordinating the adoption of tools and conventions that enable the use of data in an ethical way for research and innovation.

Health Data Hub (France)

A collective project based on bringing together ecosystem representatives and multidisciplinary experts. It assures easy and unified, transparent, and secure access to health data to improve the quality of care and patient support

Health-Research Infrastructure (the Netherlands)

Health-RI is the Dutch national initiative to facilitate and stimulate an integrated health data infrastructure accessible to researchers, citizens, care providers, and industry. It will enable optimal use of health data, samples, and images, a learning healthcare system, and accelerate personalized health.

These countries see the need for real-world data and want to put themselves on the map by supporting initiatives. All these initiatives received **funding from the government**.

The table below provides an overview of some of the countries in which the government has supported real-world data initiatives.

Table 1: Governmental support in RWD for other countries

Country	Project	Funding period	amount	By whom
Germany	Medical Informatics Initiative	2016-22	180 mio €	German Federal Ministry of Education and Research
	Hospital Future Act (KHZG)	2020-2023	4,3 bn €	German Federal government (70%) + states (30%)
Switzerland	Swiss Personalised Health Network	2017-20 2021-24	68 mio CHF 66.9 mio CHF	Swiss Federal Government
France	HealthDataHub	2020-23	36 mio € 40 mio €	Ministry of Solidarity and Health ONDAM (part of sick funds)
UK	HealthDataResearch	2017-22	50 mio £	Several public partners
NL	Health-Research Initiative PHT (Personal Health Train)	2021-	65 mio	Government

3.4 European Health Data Space

The creation of a European Data Space, which would include the health sector, is one of the priorities of the Commission for the 2019-2025 period. A common European Health Data Space would promote better exchange and access to different types of health data (electronic health records, genomics data, data from patient registries, etc.), not only to support healthcare delivery (so-called primary use of data) but also for health research and health policy making purposes (so-called secondary use of data).

Preparatory work was conducted in 2020 through a series of workshops and a study to provide a framework for the primary and secondary use of health data in the Member States. This was done by mapping how the GDPR would be implemented in the health sectors of the different countries, including:

- An overview of the legal and technical modalities applicable to health data sharing for primary and for secondary uses in the EU countries;
- An overview of the existing governance structures for secondary use of health data in the EU countries;
- Recommendations for possible actions, legislative, and non-legislative, at the EU level to facilitate health data sharing across the EU for primary and secondary uses.

3.5 Finland, a guiding country for RWD

One of the first countries to enact a law on the secondary use of health and social data was Finland. The purpose of the act is to facilitate the effective of and safe processing and access to personal, social, and health data for steering, supervision, research, statistics, and development in the health and social sector. The secondary use of health and social data means that the customer and register data created during health and social service sector activities will be used for purposes other than the primary reason for which they were originally saved. The president of the republic approved the Act on the Secondary Use of Social and Health Data on April 26, 2019. The Act went into effect on May 1, 2019.

3.6 RWD framework structure

A structure for the RWD framework was created based on the literature review and experiences gathered from other European countries (figure 5). The structure of the RWD framework consists of two circles:

- The inner circle focuses on the **data processing steps**: data collection, data quality, and data processing;
- The outer circle allows us to dig into the **enabling foundation** that is needed to support the data process steps, such as governance, funding, and data privacy and security.

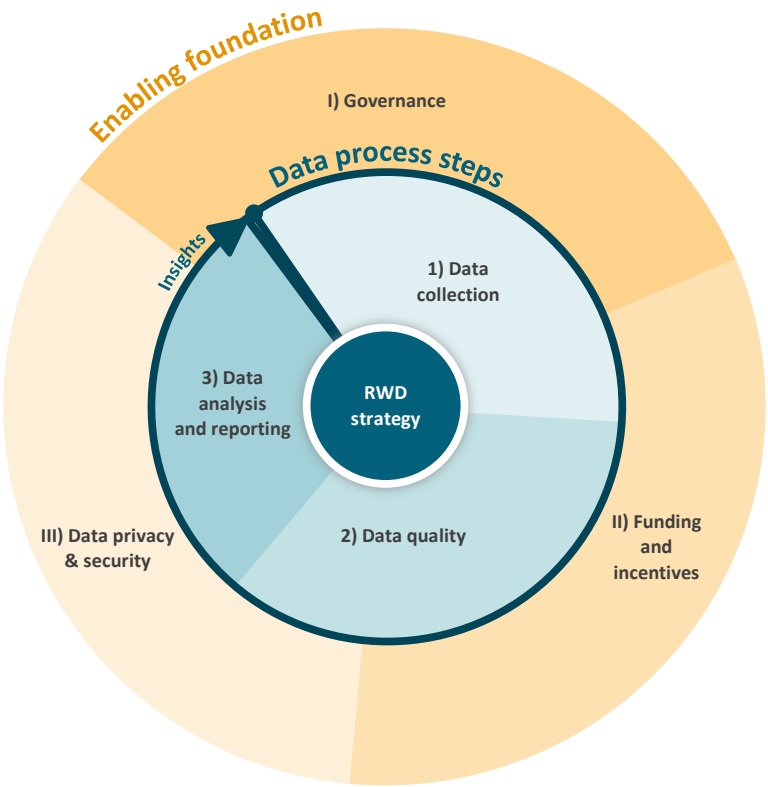

Figure 5: . Framework for real-world data strategy

3.7 Solutions for the RWD framework building blocks

Based on the literature and cases from abroad, potential solutions for each of the building blocks of the data process steps and the enabling foundation have been listed.

Table 2: Recommended solutions for the RWD strategy

Recommended solutions	• Data strategy and plan: a strong data strategy helps an organization move from using data to describe the past to using it to help adapt its business for the future; • Stakeholders decide in early dialogue what to do with data (primary and secondary use), and which data will be collected; • Core data set: clinical data, PROMs, admin data, etc.

Table 3: Recommended solutions for the data processing steps

1) Data collection	
Recommended solutions	• **Data collection tools** to be validated, feasible to use in practice, extract EHR data without major effort from HCPs; • **Decision on the core data set:** consisting of clinical data, PROMs, admin data, etc.; • **Who collects data?** Clinicians, hospitals, patients, government; • **Who protects data** and takes responsibility?
2) Data quality	
Recommended solutions	• Data collected with **harmonized definitions**, common coding system (international codification standards), and common data entry procedures; • **Investment in data quality is key:** quality control/validation, quality monitoring, data cleaning to ensure data quality.
3) Data analysis and reporting	
Recommended solutions	• Analysis by **expertise centers** and others; • Access to **raw** data/**aggregated** data.

Table 4: Recommended solutions for enabling the foundation and governance

I) Governance	
Recommended solutions	• A **national charter** (inspired by Finnish law) is needed, describing which data can be collected and how it will be handled and used; • **Consent** and approval for reuse of data; A legal framework for the **national consent** and approval model (opt-out model) for the reuse of data is required (most patients have no problem sharing their data for secondary use, if properly explained by HCPs);

	• **Data access** procedures and committee: data access decisions should be **governed by a multistakeholder representation** of domain experts (clinicians and hospitals), authorities (payers), industry (represented by pharma.be), patient representatives and other stakeholders (specific registry holders such as occupational health, pension, etc.); • The existing Information Safety Committee, the eHealth Platform and the Belgian Data Authority should **operationalize governance**; • **FAIR** principles will form the basis; • Places to keep data: **centralized** (public/private), **federated** (on premise); • **Communication** to increase transparency and inform the public.
II) Data privacy & security	
Recommended solutions	• **A light consent model** and **legal framework** for **data reuse** in a GDPR-conforming way is required; • A **federated data model is preferred in a privacy-preserving infrastructure;** • **Raw, aggregated, or synthetic data** will be available for access, depending on the request, with the appropriate data de-identification/pseudonymization/ anonymization; • Data **de-identification/pseudonymization;** • Data **anonymization;** • Data security and management practices are key to meeting legal requirements and public expectations. A recommendation or obligation of ISO27001 could be a good start.
III) Funding & incentives	
Recommended solutions	• **Public/private funding** is needed for set-up and maintenance of the necessary infrastructure; • **Financial compensation** should be provided for "data quality efforts"; • **Hospital financing** should be **linked to the obligation** to supply requested data in the appropriate format (based on milestones with penalties in case of missed deadlines).

4. Proposal for a Belgian RWD framework based on multi-stakeholder engagement

The common ground solutions for each of the key elements of the framework, for all stakeholders, were collected through interviews. All stakeholder groups in the Belgian healthcare system were interviewed. Solutions to improve data collection to enable reuse of routine care data, as well as to improve data quality and support data analysis, have been identified. An appropriate data governance model to support data reuse that is convenient for patients, HCPs, and other stakeholders (such as authorities and life-science research companies) but respects privacy and security to maintain trust has been proposed. Finally, the incentives and funding for data collection and analysis have also been defined (figure 6).

4.1 Stakeholder interviews to define common ground

To gain deeper insights, several representatives of key Belgian healthcare system stakeholders were interviewed. On top of that, representatives of the hospital community were also interviewed. The interviewees selected are considered experts in the use of health data and perform very different roles in the hospital. For these extensive interviews, a questionnaire was developed covering the following:

- The use of real-world data: best practices, hurdles, and barriers;
- Current use of data at the interviewee's hospital: data strategy, organization, sharing of data, financing, resources, etc.
- The interviewee's view on the proposed governance framework to create a supporting base and solution for the use and reuse of RWD in research.

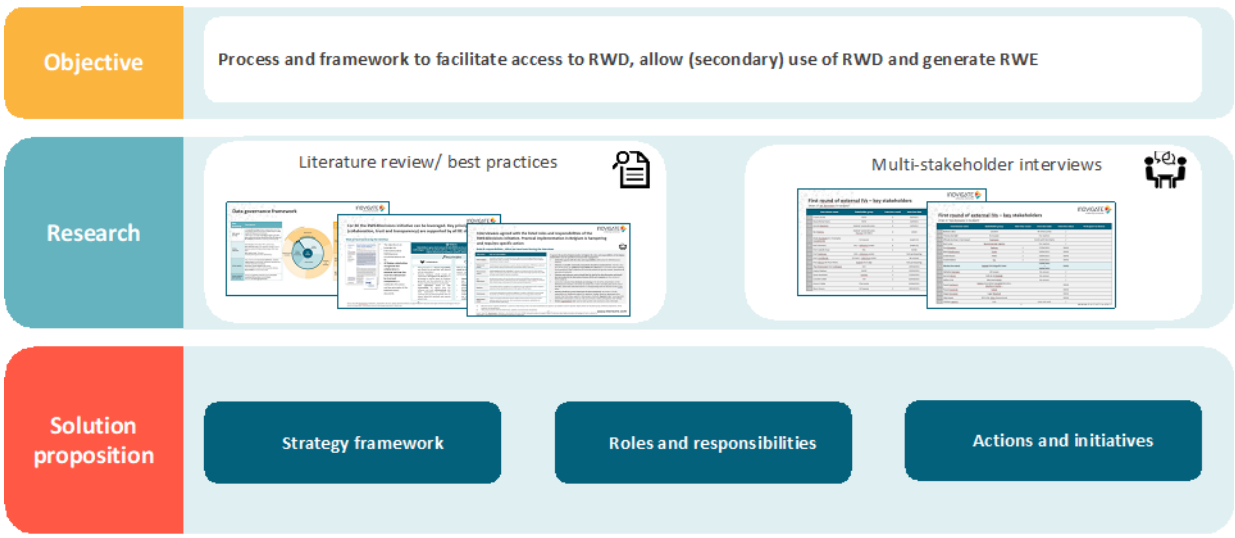

Figure 6: Objective, method and results of this project

The insights from the interviews were compiled and led to common ground solutions per building block of the RWD framework. These common ground solutions have been proposed to the hospital round table participants and have been subject to debate with the aim of creating a support base for the use and reuse of health data. For each of the RWD framework building blocks, roles, and responsibilities among the different parties involved, were also proposed.

4.2 Common ground solutions

Based on the framework with the recommended solution and input gathered during the interviews, the common ground solution across stakeholders for each building block of the framework has been defined.

Table 5: Common ground solution for data processing

Common ground solution	
• Data sharing is a **societal obligation** and should be linked to medical practice and guidelines; • Gathering RWD is **inevitable**; • **All stakeholders, including the general public, need to be convinced** of the positive message that sharing data improves everybody's health.	
RWD strategy and plan	• A **strong data strategy** should be developed **at Belgian federal authority** level and adopted by hospitals; • **HCPs and hospitals should be empowered** and made responsible; • Clarify **when, by whom, and how RWD should be collected to generate RWE** that **meets the needs** of patients and healthcare systems.

1) Data collection	• **A core dataset** should be **defined by a specialist commission** (data scientists, medical experts) per disease:
	  • The composite dataset should contain clinical data, PROMs, safety data and data, on side effects;
	  • The composite dataset should include processes, results, and costs, to allow benchmarking and evidence-based healthcare.
	• Data collection **by clinicians/hospitals/patients/primary care,** each in their own domain;
	• **To support the exchange of data, structured and up-to-date EPD systems** and data repositories are needed. Many hospitals must prepare their databases (and even obtain a usable EPD);
	• **At the hospital level, a data warehouse** should be set up to allow the exchange of data with external parties;
	• **Automated data harvesting** from different sources to reduce major efforts for HCPs;
	• **On-premise** is the preferred place to keep data;
	• **Within BE, Benelux, and EU, health data spaces must be created** for better exchange and access of health data.

2) Data quality	• **Investment in data quality is key**, including data cleaning, curation, completing missing data, control/validation, data quality monitoring, and auditing; • Data should be collected with **harmonized definitions** based on a **common coding system** (international codification standards) and **common data entry procedures** imposed **by the government.**

3) Data analysis and reporting	• **Data analysis** must be done **by medical experts,** who have sufficient knowledge/expertise to identify causal insights, in collaboration with data scientists; • **For primary use, analysis by hospitals;** • **Access by academia/third parties (industry)/payers if request is part of agreed upon purposes;** • **Alternative: Data Permit Authority (e.g., Sciensano),** as the main processor of data including gathering, pseudo/anonymizing, analyzing and reporting (but requires necessary resources).

Table 6: Common ground solution for foundation

Common ground solution	
I) Governance	• **A national 'charter'** (inspired by Finnish law) is needed, describing which data can be collected and how it will be handled and used; • A **legal framework** for the **national consent and approval model** (opt-out model) for the reuse of data is required. (Most patients have no problem sharing their data for secondary use if properly explained by HCPs); • **Data access decisions should be governed by a multistakeholder representation** of domain experts (clinicians), authorities (payers), industry (represented by pharma.be and Be MedTech), patient representatives, and other stakeholders (specific registry holders such as occupational health, pension, etc.); • The existing **Information Safety Committee**, the **eHealth platform,** and the **Belgian Data Authority** should **operationalize governance;** • Based on **FAIR principles.**
II) Funding and incentives	• **Public/private funding** is needed for setup and maintenance of the necessary infrastructure; • **Financial compensation** should be provided for "data quality"-efforts; • **Hospital financing** should be **linked to the obligation** to supply requested data in the appropriate format (based on milestones with penalties in case of missed deadlines).
III) Data privacy and security	• **A light consent model** and **legal framework** for **data re-use** in a GDPR-conforming way is required; • A **federated data model is preferred,** in a **privacy-preserving infrastructure;** • Depending on the request, access to **raw, aggregated, or synthetic data** will be available with the appropriate data deidentification/pseudonymization/anonymization.

Aside from the common ground solution, roles and responsibilities have also been defined, based on multi-stakeholder input during interviews.

Table 7: Roles for data processing

Roles	
RWD strategy and plan:	• **Scientific community, authorities, and industry** should decide in early dialogue which data is to be collected.
1) Data collection:	• **Clinicians and health care professionals** are required to collect data and educate patients about donating data; • **Patients** are obligated to donate data; • **Others** (occupational health, social security, e-prescription, payers, and sick funds (IMA), population information systems, etc.).
2) Data quality	• **HCPs** play a key role in data quality; • **Patients** can also ensure data quality for certain types of data; • **Authorities** must impose data quality standards and requirements.
3) Data analysis and reporting	• **Sciensano**: data aggregation and analysis; • **HCPs and academia**: data analysis to update guidelines and patient pathways; • **Companies:** to provide RWE for their products in conditional reimbursement and managed entry agreements and for post-market surveillance.

Table 8: Roles for data foundation

Roles	
I) Governance	• **Federal Authorities** should organize governance; • **Multi-stakeholder consortium** should operationalize.
II) Funding and incentives	• **Federal authorities** should impose the obligation to share high-quality data and link it to hospital financing; • Joint funding by **government/industry** for registries pays HCPs and independent Third Trusted Party (TTP)for quality control.
III) Data privacy and security	• **Authorities:** must guarantee data privacy and security of data (via Data Protection Authority?); • **And all other stakeholders** must be made responsible.

5. Hospital roundtable debate

Hospitals are important stakeholders for the establishment of a "routine care data reuse environment". Hospitals are increasingly applying EMRs to collect patient information and data. Many hospitals have started to develop data strategy and infrastructure for their own use to improve their quality of care, but also to support research and innovation. They realize that we are on the eve of data-driven medicine and personalized care. Therefore, we partnered with the Belgian Association of Hospital Managers to hold a roundtable to **discuss common ground solutions** obtained from multi-stakeholder interviews. Using these solutions, we formulated recommendations and actions for safe and secure reuse of routine care data.

Sixteen participants gathered on the October 26, 2021, representing a cross-section of stakeholders within the hospital community, both from the northern and southern part of Belgium, as well as academic and general hospitals. Participants in the roundtable are active in management (CEO, CSO, CIO, and CMO), care (department heads), or involved in governance (DPO, legal).
During the round table, three main topics were discussed:

- Why collect data and reuse it? And why now?
- Conditions for RWD reuse and the basic principles for sharing data.
- Proposed actions, initiatives, and roles.

Figure 7: Picture taken from the round table (1)

Figure 8: Picture taken from the round table (2)

The roundtable discussion brought many new insights, and a consensus emerged on the use and reuse of health data.
Based on the various findings and suggestions from the roundtable debate, **recommendations on the reuse of routine care data/RWD in Belgium** have been outlined.

5.1 Why collect data and reuse it? And why now?

During the roundtable, everyone was convinced of the need for an intensified use of real-world data and action needs to be implemented at all levels. Despite the challenges, there are major motivations for routine care data reuse. Improvement of the quality of care is the most important reason why we should collect data and reuse it. Not sharing data was considered as unethical by the participants at the roundtable, because access to any available data on patients is needed to give the best possible care. In the digital world, patients expect digital services and the use of data to support data-driven medicine. This is a duty. Reuse of clinical data is essential to fulfilling the promises for high quality healthcare, improved healthcare management and reduced healthcare costs. Moreover, quality measurement and learning healthcare systems, as well as effective clinical research are major objectives.

To achieve this, a **data culture must be established in which outcomes are compared and benchmarking between hospitals is performed**. To achieve this, hospitals should work together and take action to collaborate at all levels. We must be more ambitious and set ambitious goals. The Scandinavian use of registries is an excellent inspiration, but we must do better. Excellent, complete, and well-validated data allows improvement of care.

Table 9: Quotes and observations from the roundtable

The need for real-world data	
RWD offers advantages	• RWD is undeniably a means of facilitating and accelerating new research; • Secondary data use is needed to improve the quality of (personalized) care; • It is unethical *not* to share data: we need access to any available data on patients to give best possible care; • We owe it to our patients (to support data-driven medicine): in the digital world, people expect digital service; • Improvement of quality of care is the most important reason why we should collect data and reuse it.
We need to look at others and do better	• Other EU countries, (e.g., Finland), have already laid down ground rules on secondary use; • We must go further than what is already being done abroad and set ourselves ambitious goals; • Look at Scandinavian use of registries and do better: excellent, complete, and well-validated registries allow for great publications and improvement in care.
Based on international standards	• There is a need to establish international/European standards that facilitate data interoperability; • A clear legal framework needs to solve privacy and ethical issues, thereby increasing the confidence of the general public in careful handling medical data; • Develop a data culture: compare outcomes/benchmarking between hospitals, get rid of the "it is too difficult" answer; • We should work together and take action: collaboration is needed at all levels.

5.2 Conditions for real-world data reuse

If everybody agrees on the use of real-world data, the next step is to clarify what needs to be done to make it possible and acceptable.

Table 10: A summary of recommendations and observations from the panel

The minimum conditions for real-world data reuse	
Easy method	• Collect data only once (avoid duplication of efforts); • Make it pragmatic (not bureaucratic).
Responsibility	• Matter of trust; • It is all about accountability: shift away from disease-centered care to outcomes-based patient care/value-based healthcare; • A multi-stakeholder representation in the governance body, is required (including pharma); • Legal is an enabler and facilitator, not a block or a threshold.
Data collection	• Quality and completeness of data is important; • Also include data from outside the hospital, such as IMA/AIM and RIZIV/INAMI data (put them on OMOP) ; • Funding is needed for better data quality; • Impose a standard of exchangeability between EMR's. One could consider an EMR accreditation imposing this (as already done for GP software). This is already part of President Obama's Affordable Care Act; • Agree on a common internationally accepted data model to make data from different hospitals comparable.
Funding	• Hospital/network funding is linked to the obligation of sharing quality data for reuse; • Rewarding the output-driven behavior of hospitals; • Private/public funding could be a good approach.
Consent model	• One common patient consent model for the whole of Belgium (e.g. German example within MII*) based on opt-out. **The conference of all German federal and state level data protection authorities has agreed on a uniform template text for patient consent forms for research with pseudonymized patient data—milestone for Germany as a research center.*

5.3 Basic principles for routine care data reuse

Principle 1: Key principles agreed upon during the roundtable for data collection are to be pragmatic in defining which data to collect and collect data only once to avoid duplication of efforts. **One common patient consent model for the whole of Belgium** (e.g., German example), based on an opt-out mechanism, is preferred. Data collection should go beyond the hospital and should also include IMA data, containing data from the sick funds, as well as RIZIV data. In addition, PROMs should be collected. Hospitals are also accountable for supporting outcomes-based patient or value-based healthcare instead of today's disease-centered care. Key to this is the establishment of a rewarding mechanism that supports **output-driven** behavior.

Principle 2: A **minimal standard of exchangeability should be imposed via EMR accreditation**, similar to what is required as for general practitioners' software, and as in the Obama Care Act, and via hospital and hospital network funding linked to the obligation of data reuse. A common internationally accepted data model between hospitals should be agreed upon. Data should be standardized and put on the OMOP common data model.

Principle 3: **The quality and completeness** of data is important. Therefore, funding, and compensation for data quality efforts should be made possible.

Principle 4: A **combined method of private/public** funding is considered a good approach to support the interests and capabilities of both.

Principle 5: A **governance model on the hospital network level** must be established.

Principle 6: On a Belgian level, a **multi-stakeholder representation in the governance body** that decides on data access, is required. This governance body should include all stakeholders, including pharma.

This report will be used to further align with authorities and the governments as well as the broader multi-stakeholder community to define a safe and secure data environment, which makes Belgium a top region for health data-enabled research and innovation. This report provides policy input for holding further multi-stakeholder dialogues. Multi-stakeholder engagement and dialogue are key for the development of a successful long-term strategy and plan.

5.4 Recommendations to support the reuse of RWD

Besides the above-mentioned six principles for routine care data reuse, two recommendations have been brought up during the roundtable. What we need is a bottom-up and a top-down approach, as well as a Belgian Independent Health Data Institute.

Recommendation 1: Top-down and bottom-up actions and initiatives, including roles for hospitals and government

Top-down approach

From a top-down angle, the government needs to ensure that the **legal framework** is in place to facilitate the safe and ethical reuse of health data for research. Patients also need to be made aware of the importance of sharing data, as it helps improve healthcare for all. As with organ donation, we need an 'opt-out' system for data donation rather than an active 'opt-in' method. This is already being done in Scandinavian countries.
The government acts to implement the framework and motivate hospitals.
It should **impose standards**, including interoperability standards for hospital EMR. One national charter and data committee consisting of representatives of all stakeholders are needed, including domain experts, along with one national ethics committee. Also, one national patient consent form with a common privacy declaration and opt-out mechanism

is needed (like organ donation). The government should provide a legal and ethical framework with an incentive model that supports data collection for reuse (if you do it right, you get a reward).

Bottom-up approach

From the bottom-up angle, hospitals must develop a better strategy to organize their data internally and make it accessible. Some hospitals in Belgium have dozens of different internal systems and data bases with patient data. Simple questions like, 'Does the patient smoke: yes/no?' might be stored in many different locations, making the information very hard to access both internally and between hospitals. The data landscape is extremely fragmented within the healthcare system. There are plenty of technical solutions to data problems, but leaders need to agree on which to implement.

In the bottom-up approach, hospitals will take action to develop the framework. Hospitals must **take the initiative to securely share data between them using a common data model to enrich data**. Investment in a good EMR is essential because it will solve a lot of the challenges related to data reuse, as data will be collected in a structured way. There are no legal or other hurdles to start with data curation. This could be done immediately. Hospitals should demonstrate proactivity by setting up a data strategy and starting initiatives to share data among them. The should be done using the common data model to enrich data. Several ambitious hospitals have already started to act together in a coalition of the willing to start pilot projects based on various use cases as demonstration projects to showcase what is possible. Finally, organizations like BAHD should push for digital enabled healthcare services.

Recommendation 2: Belgian Independent Health Data Institute

An integrated data policy in Belgium requires the setup of an overarching Health Data Institute to improve health data policy in the future. This institute, with clear responsibilities, would consolidates on a permanent basis, all the key roles, players, and expertise in health data, including federal and regional policy makers, health authorities and health insurance funds, academics, researchers, and companies.

The institute would **develop and oversee the implementation of a health data vision and policy**. This would include defining priorities, actions, and initiatives, and timelines, as well as a proactive future strategy and plan. In addition, the institute would have its own budget, bringing together existing scattered budgets to make budget decisions and allocation of budgets more efficient. To this end, (1) the institute would have to define the data infrastructure, (2) it would ensure alignment in data collection and its structural analysis, as a basis for the development of the best available evidence supporting policy, and (3) it would be organized according to the most modern principles of transparency regarding everyone's role and responsibility; evidence-based decisions would be made public, and the institute would develop a code for the proper management of potential conflicts of interest. The institute should also (4) take care of health data and data science expertise, including data technology expertise. It should also taking care of the awareness and education of the Belgian stakeholders and the broader public. Finally, (5) all expertise should be pooled and made available to the Belgian ecosystem stakeholders.
The institute should be based on a dynamic model that evolves together with the evolution in needs instead of having a fixed structure. The government should facilitate the set-up but should not control it. The governing board of the institute should consist of representatives of all Belgian health data stakeholders to be able to balance the interests of all.

6. Conclusion

Call to action

Belgium is home to **one of the world's strongest health clusters** and has long been ranked as the best country in the EU for clinical trials. However, if Belgium is to maintain this attractivity, and its quality of health and healthcare system, the country needs to **improve its position regarding the use and reuse of health data for research.** We have all the right ingredients in place in Belgium. In three years, we could be one of the top countries in Europe for real-world data. But we must act now.

Uniting the ecosystem for better data science in Belgium

Extensive multi-stakeholder engagement has resulted in this report. It provides **input for holding further dialogues with stakeholders** responsible for the RWD framework implementation, hospitals, care providers, government, sick funds, payers, and industry. Multi-stakeholder engagement and dialogue will be key to further detailing the plan and the priority actions and building consensus to put them in practice.

Data use is integral to the future of healthcare; therefore, stakeholders from across the ecosystem need to come together to usher in a change in Belgium. By joining forces, we will be able to make a real difference to peoples' health, while also supporting the best interests of our different stakeholder groups. By working together, we can advance personalized healthcare and pave the way forward for the country.

Next steps

To implement the RWD framework, the following three steps are proposed:

- **Create a three-year plan** based on the RWD framework for Belgium;
- Start a **multi-stakeholder collaboration** to implement the plan. Set up a working group at the BAHM to continue the discussions from the round table and provide bottom-up input to the government and other stakeholders;
- **Start pilot projects**: there are already collaborations between hospitals to work on data systems. Build a coalition of the willing with hospitals and start pilot projects as examples for others to demonstrate that it can work.

Figure 9: Call to action

Let us be ambitious and begin with a coalition of the willing to make Belgium a top region for reuse of health data for research and innovation.

Abbreviations list

ABDH-BVZ.	Association Belge des Directeurs d'Hopitaux- Belgische Vereniging van Ziekenhuis Directeurs
DPO	Data protection officer
HER	Electronic health record
EPR	Electronic patient record
FAIR	Findable, accessible, interoperable, re-usable
FDA	Food and Drug Administration, USA
GP	General practitioner
HCP	Healthcare professional
HTA	Health technology assessment
IMA-AIM	Intermutualistisch Agentschap- l'Agence Intermutualiste
MD	Medical doctor
NIHDI	National Institute for Health and Disability Insurance (= RIZIV/INAMI)
OMOP	Observational Medical Outcomes Partnership (OMOP) Common Data Model
PROM	Patient Reported Outcomes Measures
RCT	Randomized controlled trial
RIZIV-INAMI	Rijksinstituut voor Ziekte- en InvaliditeitsVerzekering – Institut National d'Assurance Maladie-Invalidité
RWE	Real world evidence
RWD	Real world data
WHO	World Health Organization

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