Integrating Real-World Evidence and digital health Innovations to transform rare disease patient outcomes

A Strategic Framework for Global Access and Personalised Care

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Introduction and regulatory background

Rare diseases, while individually uncommon, collectively affect over **300 million people** worldwide: about 3.5-5.9% of the global population. [1, 2, 3]

Despite this significant impact, **more than 90% of rare diseases lack approved treatments**, leaving patients with either fewer therapeutic options, or none at all. [3, 4, 5] Many rare diseases are chronic, progressive, and life-threatening, often starting in childhood and placing a heavy burden on patients and their families. [1, 4]

Rare and orphan diseases present unique challenges in healthcare, including delayed diagnoses, fragmented patient access, and limited clinical trial and real-world data to inform treatment strategies. [6] As pharmaceutical companies and biotech innovators develop targeted therapies, bridging the gap between clinical trial efficacy and real-world effectiveness remains critical. **Sciensus, with 30+ years of expertise in rare disease pharmaceutical services, has pioneered a patient-centric model** that combines bespoke supply chain solutions, real-world evidence (RWE) generation, and digital health technologies to optimise outcomes for patients and partners alike. [7, 8]

The integration of RWE into regulatory and health technology assessment (HTA) frameworks is increasingly de-risking its use for rare disease drug development. The European Medicines Agency (EMA)'s 2023 review of RWE studies highlights its acceptance in both pre and post-authorisation evaluations, particularly for rare diseases where traditional randomised trials are impractical. [9, 10] Similarly, the US Food and Drug Administration (FDA)'s 2018 RWE framework and subsequent guidance (e.g., 2023 final guidance on real-world data (RWD / RWE) provide a structured pathway for leveraging observational data to support regulatory decisions, including new indications or post-marketing requirements. [11, 12] These frameworks reduce uncertainty for developers by clarifying methodological standards, such as the use of natural history studies as external controls or RWE to confirm single-arm trial results. [11, 10]

For rare diseases, this regulatory validation aligns with HTA bodies' growing openness to RWE – particularly in the UK and Spain – where it has been used to substantiate efficacy claims or contextualise disease burden. [13] For example, therapies like Zolgensma® (for spinal muscular atrophy) and Soliris® (for atypical haemolytic uraemic syndrome) secured approvals and reimbursements partly through RWE demonstrating their effectiveness. [13]

Furthermore, the **new Joint Clinical Assessment, the EU-wide clinically focused HTA that takes place in parallel with marketing authorisation, is expected to make use of RWE**. This is because the assessment process will investigate the comparative effectiveness and safety of drugs in all member states, something that is unlikely to be addressed by evidence from well-controlled studies alone. [14] By standardising RWE's role in evidentiary packages, regulators and HTAs are lowering barriers for developers, accelerating timelines, and improving investor confidence in rare disease pipelines. [15, 16] This convergence of regulatory and HTA acceptance directly supports the thesis of our white paper: RWE is transitioning from a supplementary tool to a cornerstone of de-risked, patient-centric drug development for rare conditions.

Our white paper will outline our strategic framework to optimise early/accelerated access, personalise care, and secure reimbursement, with the end goal of transforming rare disease patient outcomes.

The actual framework involves integrating patient support programmes, validated RWD collection, and an agile supply chain infrastructure, a discussion of which is beyond the topic of this white paper. Key considerations include:

1. **Enable early access through agile, regulatory-aware distribution:** Accelerate patient access through regulatory-compliant early access programmes (EAPs); leverage targeted patient identification via partnerships with healthcare providers (HCPs), real-world data collection opportunities, and registries, and advocacy groups, using cold chain coordination to ensure safe and rapid therapy delivery across geographies.

- **Patient benefit:** Get life-altering therapies faster, even before formal approval

2. **Personalise care with digitally enabled patient support programmes (PSPs) and real-world insights:** Deploy hybrid PSPs that incorporate human and digital elements that can simultaneously collect real-time patient data and adapt interventions dynamically, using analytics of clinical and patient-reported data driven by artificial intelligence (AI).

- **Patient benefit:** Receive care that evolves around their condition and lifestyle

3. **Demonstrate therapeutic value through patient insights:** Collect robust, longitudinal real-world evidence through integrated PSPs and digital tools; use AI to identify adherence patterns, adverse events (AEs), and long-term treatment effects; support reimbursement submissions with evidence relevant to payers and regulators.

- **Patient benefit:** Sustain access to therapies that provide value in real-life – not just in clinical trials

The collaboration between Sciensus' rare disease strategy teams and medical affairs experts ensures that these components are integrated into a unified service model. By prioritising the patient voice – as highlighted in Sciensus' internal Rare Disease Day initiatives – the framework aligns clinical, operational, and ethical priorities to drive sustainable innovation. [17, 18]

Case studies outlining these principles are provided below.

Case Study 1:

Enabling early access through agile, regulatory-aware distribution

Client: US-based biotech [6]

Challenge: Distributing a life-extending therapy for a disorder in Europe pre-EMA approval, requiring compliance with 27+ national regulatory systems and EAPs.

Solution:

- Leveraged Sciensus' wholesale distribution authorisation (WDA) to import the drug to the EU
- Established a new EU entity and secured EMA marketing authorisation within four months post-approval
- Implemented a tailored governance model with quarterly business reviews and bi-weekly operational meetings

Outcome:

- Enabled France's first EAP for unlicensed medication
- Achieved Germany's first licensed launch four months post-EMA approval
- Supported global patient identification and delivery via cold chain coordination

Case Study 2:

Personalised Care with Digitally Enabled PSPs and Real-World Insights

Partner: Nottingham University Hospitals NHS Foundation Trust [19]

Challenge: Reducing hospital bed occupancy for a patient requiring six-week IV antibiotics, while maintaining care quality.

Solution:

- Deployed Sciensus' virtual ward with remote monitoring and nurse home visits
- Provided real-time communication channels between patient and clinicians

Outcome:

- Enabled patient to complete treatment at home, attending daughter's milestone events
- Freed NHS beds for urgent cases, aligning with post-pandemic service recovery goals
- 100% patient satisfaction reported, citing initiative-taking care and reduced family stress

Case Study 3:

Demonstrate Therapeutic Value through Patient Insights

Initiative: Sciensus Rare Disease PSPs (Pan-European) [20]

Challenge: Demonstrating orphan drug effectiveness beyond clinical trials for payer reimbursement.

Solution:

- Implemented digital/human hybrid PSPs with clinician-reported outcome tracking
- Integrated wearable devices (e.g., motion sensors) to capture real-world treatment responses

Outcome:

- Generated validated datasets on medication adherence and symptom progression
- Supported more than three orphan drug reimbursement approvals in EU markets (2024–2025) [21]
- Enhanced care personalisation through AI analysis of patient-reported data streams

The Space for Artificial Intelligence and Digital Tools in RWE Generation[22]

Digital tools and AI are unlocking new opportunities for enhancing RWE generation.

With electronic health records (EHRs) and digital tools such as apps integrated into PSPs and RWE studies, access to RWD has significantly improved. This enables patient behaviour, treatment adherence, and clinical outcomes to be tracked more precisely than ever before.

Machine learning (ML) algorithms can predict patients at high risk of discontinuation, allowing initiative-taking, tailored interventions to improve adherence and clinical outcomes. Similarly, natural language processing (NLP) accelerates the detection of adverse events by scanning unstructured data sources, such as clinical notes, improving pharmacovigilance efficiency. Identifying AEs has previously been labour-intensive, requiring mining through data inputs to track and log actual events.

Meanwhile, AI tools can standardise and analyse data.

Aggregating and analysing secondary data from diverse sources has historically required manual input. Today, AI tools can automate this process using common data models, significantly reducing time, and improving scalability. Tools like Google's AI Co-Scientist demonstrate the power of hypothesis validation through real-world experimentation.

AI can also support value assessments by comparing the treatment effectiveness of a particular drug or therapy and ensuring, from a payer's perspective, that the prescribed treatment is meeting cost-effectiveness and clinical benefit thresholds.

The availability of whole-genome sequencing enables further personalisation. Medical scientists and physicians will be able to rely on AI to better determine if a patient is at high risk of developing certain diseases. Using learned predictive modelling, as well as any available secondary data sources, a patient's profile can be compared with these models to identify risk markers.

Additionally, digital solutions underpin the success of hybrid and decentralised trials by enabling remote participation, supporting diverse data capture, and reducing geographic constraints. This is especially important for rare disease populations where traditional site-based approaches limit enrolment.

Finally, the concept of digital twins is gaining traction as precision medicine. By creating virtual models of patients based on genetic and phenotypic data, researchers can simulate responses to therapies, aiding the design of highly individualised treatment plans for genetically driven rare conditions.

Outlook and conclusion[23-28]

The future of rare disease care is set for transformative advancements through the integration of RWE and AI. Emerging trends indicate that these technologies will play a pivotal role in enhancing patient outcomes and driving innovation in the rare disease community.

One of the key directions is the use of AI to analyse vast amounts of RWD, enabling more precise diagnostics and personalised treatment plans. AI models can predict patient responses to therapies, identify high-risk individuals, and optimise treatment pathways. This not only improves clinical outcomes but also ensures that therapies are tailored to the unique needs of each patient.

RWE is becoming increasingly accepted by regulatory bodies and HTA frameworks. This acceptance reduces uncertainty for developers and accelerates the approval and reimbursement processes for rare disease therapies. By leveraging RWE, stakeholders can demonstrate the real-world effectiveness of treatments, making it easier to secure funding and support for new therapies.

Ethical considerations and bias mitigation in AI models are crucial to ensure that underserved rare disease patients are included in real-world datasets. It is essential to prioritise inclusivity and fairness in data collection and analysis to avoid disparities in healthcare access and outcomes.

As we move forward, the collaboration between Sciensus' rare disease strategy teams and medical affairs experts will continue to drive sustainable innovation. By harnessing the power of AI and RWE, we can transform rare disease care, making it more patient-centric, efficient, and impactful.

Sciensus' strategic framework – validated by the case studies above – provides a replicable model for stakeholders to:

- **Optimise access:** Navigate regulatory complexity and deliver therapies faster through agile supply chains
- **Personalise care:** Use digital tools like virtual wards and wearables to tailor interventions to individual patient needs
- **Secure reimbursement:** Leverage RWE from PSPs to demonstrate therapeutic value in real-world settings

For biopharma companies, this approach reduces time-to-market while ensuring compliance; for healthcare systems, it alleviates resource strain without compromising outcomes. Critically, it centres on a patient's quality of life, a priority reflected in Sciensus' Rare Disease Day initiatives, which amplify patient voices in service designs.

The future of rare disease care hinges on seamless AI/RWE integration. By harnessing AI for precision diagnostics and RWE for evidence generation – both pre and post-approval – stakeholders can:

- Shorten time-to-market through hybrid trials with AI-optimised external controls
- Extend therapeutic durability via continuous RWE feedback loops
- Democratise access by proving value in diverse real-world populations

As rare disease therapies grow more targeted, the industry must adopt integrated strategies that unify clinical, operational, and ethical imperatives. By combining decades of rare disease expertise with innovative digital health solutions, Sciensus exemplifies how collaboration and innovation can turn systemic challenges into sustainable victories for patients worldwide.

As shown in Sciensus' PSP case studies, this approach transforms passive data collection into initiative-taking care optimisation. With 70% of 2024–2025 orphan drug approvals incorporating RWE, the industry is poised to deliver therapies that are not only scientifically valid but also pragmatically impactful – turning the rarity of diseases into a catalyst for innovation.

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