Development of a robust real-world data platform for rare diseases

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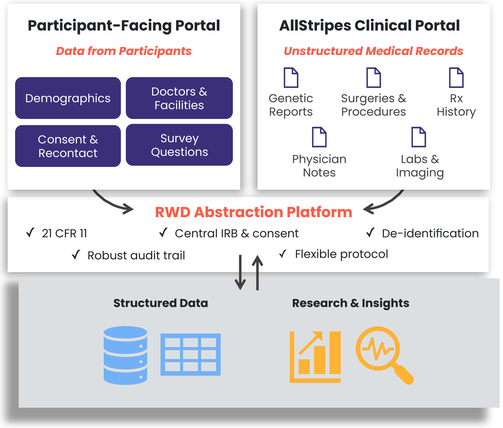
Introduction

Drug development for rare diseases is limited by geography and lack of natural history data. Real-world data (RWD) can be utilized to assess natural history, health utilization, and outcomes. While medical records are a rich source of RWD, there is a need to develop new methodologies that ensure high-quality data capture in an efficient manner. Our objective here is to describe the development of a rare disease RWD platform and associated best data practices. A cohort of patients with chronic demyelinating polyneuropathy (CIDP), a rare disease, is used as a case example.

Methods

Figure 1: AllStripes RWD Platform Workflow



This work was performed in compliance with Western IRB. A broad, umbrella consent was developed to allow for de-identified data from medical records to be used in minimal risk research.

Cohort: Recruitment occurred via digital marketing. Patients were asked to sign a HIPAA release, provide a list of hospitals and clinics where the patient receives care, and sign a consent form approved under a central IRB. Complete medical records were requested and digitized; re-requests were made every 12 months. Individuals were included in the study if clinical notes confirmed a diagnosis of CIDP, the majority of patient documents were received, and the patient record contained at least 3 neurology notes.

Methods

Clinical Data Abstraction: Record completeness and depth are critical elements of data quality. Completeness was evaluated by record receipt, recency, gaps in care, and presence of key clinical documents. Gaps in data were resolved by contacting hospitals or patients. To assess depth, an iterative protocol consisting of clinical modules that define data to abstract from medical records was developed. When possible, modules were designed according to CDASH standards. Modules included demographics, diagnosis, surgeries and procedures, healthcare utilization (ER visits and hospitalizations), EMG results, and speech/physical/occupational therapy. During abstraction into the AllStripes database, an electronic audit trail to the source documents was maintained for quality assurance.

Data Analysis: Structured, de-identified data was exported, and analysis was performed using descriptive statistics. Analysis was performed only on data abstracted from patients who had consented to research.

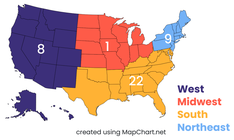
Results

Figure 2: CIDP Cohort Demographics

Forty patients met the screening criteria for record completeness. The mean patient age was 54.7 years (SD±12.1). The cohort was half male and half female, and a majority of participants were from the South census region of the United States.

Patients	*N*	Female (%)	Male (%)
Consented with Records	40	20 (50%)	20 (50%)

Geographic Distribution (*N*)



Current Age (Years)

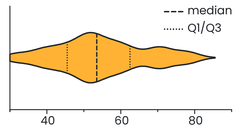
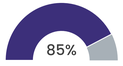


Figure 3: Medical Record Assessment

The majority of patients listed >1 hospital or clinic. Medical records were requested from 5 years prior to self-reported date of diagnosis. All clinical documents were classified by specialty and note type. All patients had at least 3 neurology notes available for review.

Document Statistics	Per Patient *Median (Min–Max)*
Medical Facilities Listed	4 (1–22)
Clinical Documents Available	59 (18–781)
Neurology Notes	13.5 (3–73)
Years of Data	5.8 (1.3–23.7)

Patients with Pre-Dx Records Available

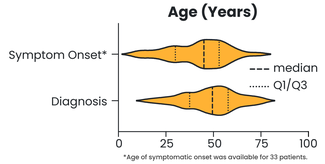


Results

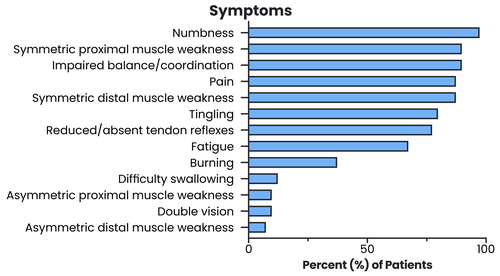
Figure 3: CIDP Diagnosis and Symptoms

To evaluate the depth of data available, diagnosis and key symptoms of CIDP were confirmed by reviewing patient medical records and patient-reported data from the point of sign-up. All patients had data related to CIDP symptoms in their medical record.

Age (Years)



Symptoms



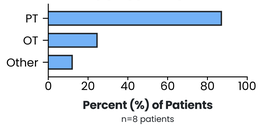
Patients	*N*	# Patients (%) *Remitting*	*Non-remitting*
Relapse Status Known	28	20 (71.4%)	8 (28.6%)

Figure 4: Healthcare Utilization

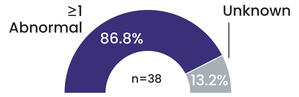
Once patient medical records have been evaluated for sufficient completeness and depth, the data can then be applied to a variety of use cases. For example, RWD from medical records can inform understanding of patient healthcare utilization. While utilization data is often challenging to obtain in rare diseases, it is critical for researching the social and economic costs of the condition and the potential for new therapies to decrease these costs.

CIDP-Related Test/Care	*N* (Patients)	# per Patient *Median (Min–Max)*
NCS/EMG Studies	38	2 (1–5)
Therapies (PT, OT, etc.)	8	1.5 (1–10)

Therapy Types by Patient



EMG Results

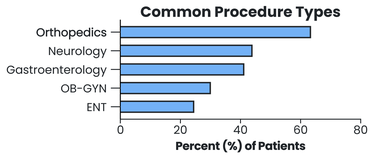


0 patients with available EMG interpretations had only normal results

Results

Figure 4: Healthcare Utilization (continued)

Common Procedure Types



n = 36 patients with procedures. Lumbar punctures represented the most common procedure (15/136 or 11%).

Healthcare Encounters	*N* (Patients)	# per Patient *Median (Min–Max)*
ER Visits	15	1 (1–10)
Hospitalizations	5	4 (1–11)
ER Visit → Hospitalization	10	2 (1–5)
Surgeries/Procedures	36	3 (1–9)

Discussion

Conclusion

High-quality RWD requires complete medical records with sufficient depth to address research questions of interest. We developed an audit-trailed platform allowing for record collection from all patient institutions, removing geographic restrictions common in rare disease research. An umbrella consent allows for patient recontact to resolve data gaps, and a flexible protocol enables high-level data capture to identify limitations before initiating larger studies. In the future, this work will be expanded across larger cohorts of patients. Additional elements of data quality, such as record accuracy and internal consistency, will also be incorporated.

Limitations

This was a small feasibility study and should not be considered a representative sample of all CIDP patients. Hospital lists are also provided by patients, and there may be unidentified gaps in care. Additionally, the results must be interpreted within the context of the limitations of RWD.

Acknowledgements

AllStripes would like to thank the patients and families who have generously contributed their data to help make this study possible.

References

1. "Chronic Inflammatory Demyelinating Polyneuropathy," NORD (National Organization for Rare Disorders). Accessed 14 September 2020. https://rarediseases.org/rare-diseases/chronic-inflammatory-demyelinating-polyneuropathy/

2. Dalakas, MC. Advances in the diagnosis, pathogenesis and treatment of CIDP. *Nat Rev Neurol* **7**, 507–517 (2011).