

# Information is Power: Expanding Access for Rare Disease Families and Patients

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National Center for Advancing Translational Sciences (NCATS)

**National Press Foundation**  
November 13, 2023



# Rare diseases capture human stories: Fears, tragedies, hopes, resilience



<https://ncats.nih.gov/news-events/events/rdd>



# Who I think of when I hear rare diseases?



- Patients and Families
- Advocates
- Community Leaders
- Health Care Providers
- Researchers

APAICS Flickr: <https://www.flickr.com/photos/apאים/53188707677/in/album-72177720311232854/>



# The Public Health Challenge

**10,000**

**Diseases**



and only

**5%**

Have  
Treatments  
or Cures



Time from early  
development to the  
medicine cabinet takes  
**10-15 years.**

**9** out of **10**

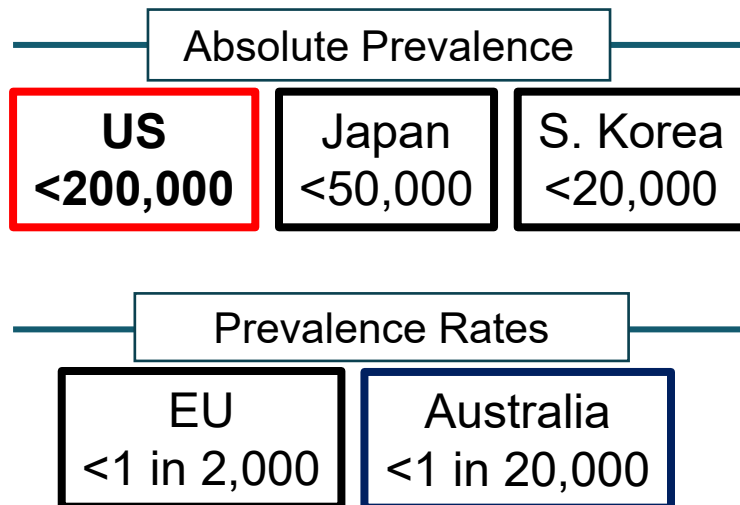
Promising therapeutic candidates  
that enter clinical trials fail.



# What are Rare Diseases?

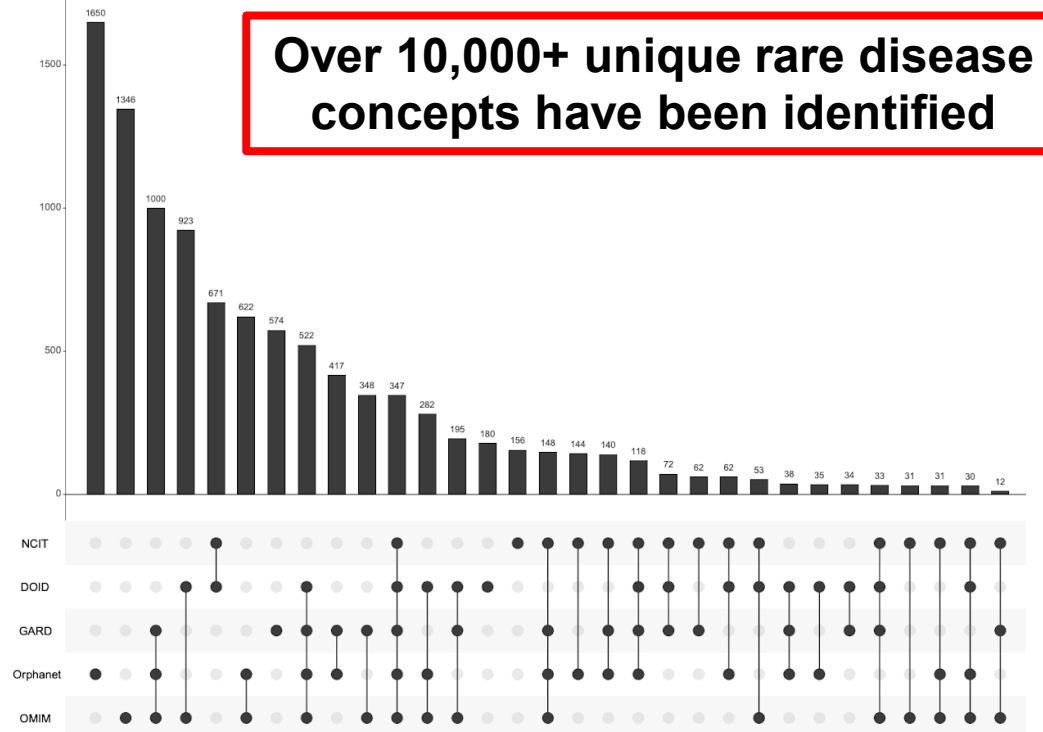
## “Rare” is a Legislative Definition

In the US, the Orphan Drug Act was passed by Congress in 1983 to incentivize the development of drugs to treat rare diseases and defined a rare disease as a disease or condition that affects less than 200,000 people in the United States.



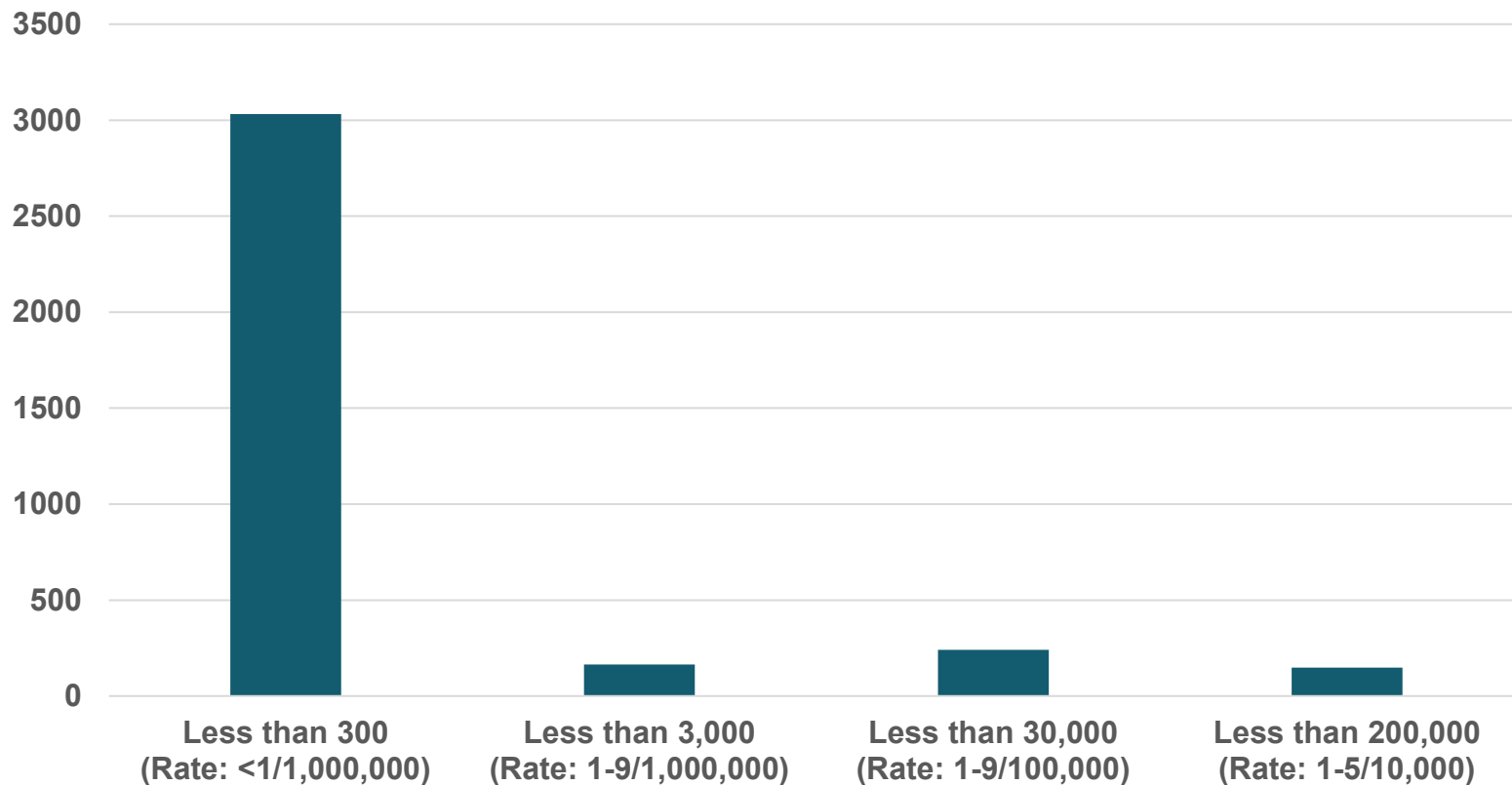
## How many rare diseases are there?

Melissa Haendel<sup>1\*</sup>, Nicole Vasilevsky<sup>1</sup>, Deepak Unni<sup>2</sup>, Cristian Bologa<sup>5</sup>, Nomi Harris<sup>2</sup>, Heidi Rehm<sup>4</sup>, Ada Hamosh<sup>5</sup>, Gareth Baynam<sup>6</sup>, Tudor Groza<sup>7</sup>, Julie McMurry<sup>8</sup>, Hugh Dawkins<sup>9</sup>, Ana Rath<sup>10</sup>, Courtney Thaxon<sup>11</sup>, Giovanni Bocci<sup>3</sup>, Marcin P. Joachimiak<sup>2</sup>, Sebastian Köhler<sup>12</sup>, Peter N. Robinson<sup>13</sup>, Chris Mungall<sup>2</sup> and Tudor I. Oprea<sup>3\*</sup>





# The majority of rare diseases have an extremely small population



**Need for scalable solutions  
in rare diseases research**



# Individually Rare, Collectively Common

Yahoo

## Céline Dion Just Shared A Rare Photo With All Of Her Children Amid Health Diagnosis

Amid her stiff-person syndrome diagnosis, singer Celine Dion had fans emotional after she posted a surprise health update on Instagram.

2 days ago



Daily Mail

## EXCLUSIVE: Florida woman, 31, reveals how a car crash triggered her stiff person syndrome - the one-in-a-milli

Jomana Houssari, 31, of Florida, was an aspiring police officer when she was diagnosed with stiff person syndrome, the disabling...

1 day ago



People

## Céline Dion Makes Rare Public Appearance – Her First in 3½ Years – amid Stiff-Person Syndrome Diagnosis

Amid her stiff-person syndrome diagnosis, Céline Dion made her first public appearance since April 2020 at an NHL hockey game in Las Vegas...

2 weeks ago



ABC

## Celine Dion makes rare public appearance almost a year after stiff person syndrome diagnosis

The Canadian singer was seen at an ice hockey game on Monday night, with fans happy to see the star joking and laughing after she revealed...

2 weeks ago



HELLO! Magazine

## Celine Dion 'praying for a miracle' amid Stiff Person Syndrome battle, sister says: exclusive

Celine Dion's sister Claudette Dion tells HELLO! that the singer is 'doing everything to recover' amid her battle with Stiff Person Syndrome...

Aug 31, 2023

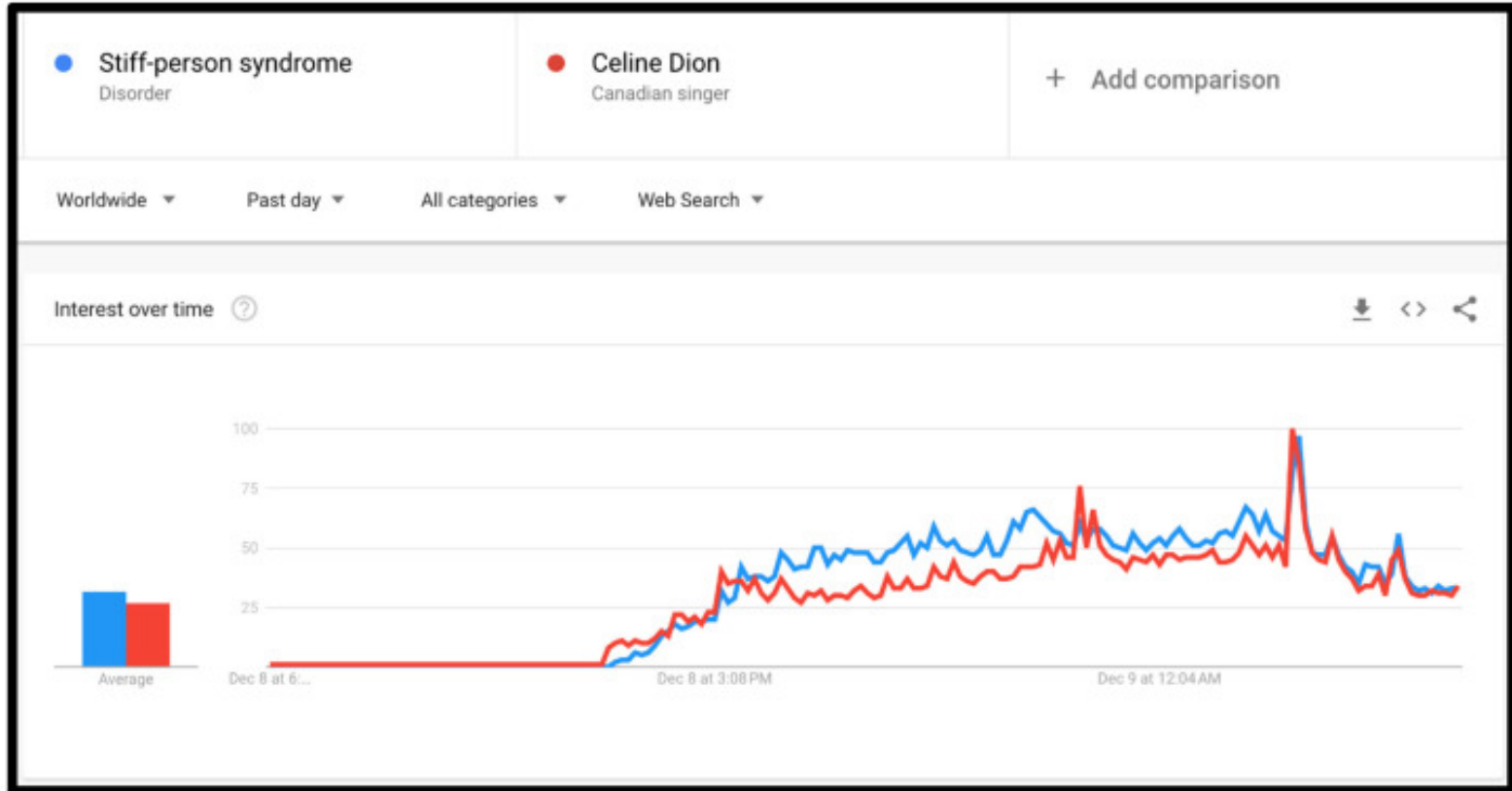


Billboard

## Celine Dion Makes First Appearance in More Than 3 Years Amid Battling Stiff-Person Syndrome

Celine Dion was seen for the first time in over three years at the Montreal Canadiens and the Las Vegas Golden Knights NHL games on Oct. 30.

2 weeks ago



Elsalti A, Darkhabani M, Alrifaii MA, Mahroum N. Celebrities and Medical Awareness-The Case of Celine Dion and Stiff-Person Syndrome. Int J Environ Res Public Health. 2023 Jan 20;20(3):1936. doi: 10.3390/ijerph20031936. PMID: 36767301; PMCID: PMC9914970.



NIH National Center for Advancing Translational Sciences

# Individually Rare, Collectively Common

*One of Many  
Rare Disease Heroes*



NCATS Flickr: <https://www.flickr.com/photos/64860478@N05>

FDA Flickr: <https://www.flickr.com/photos/fdaphotos/8516116474>

**FARA** | Friedrich's  
Ataxia  
Research  
Alliance



**NIH** | National Center  
for Advancing  
Translational Sciences

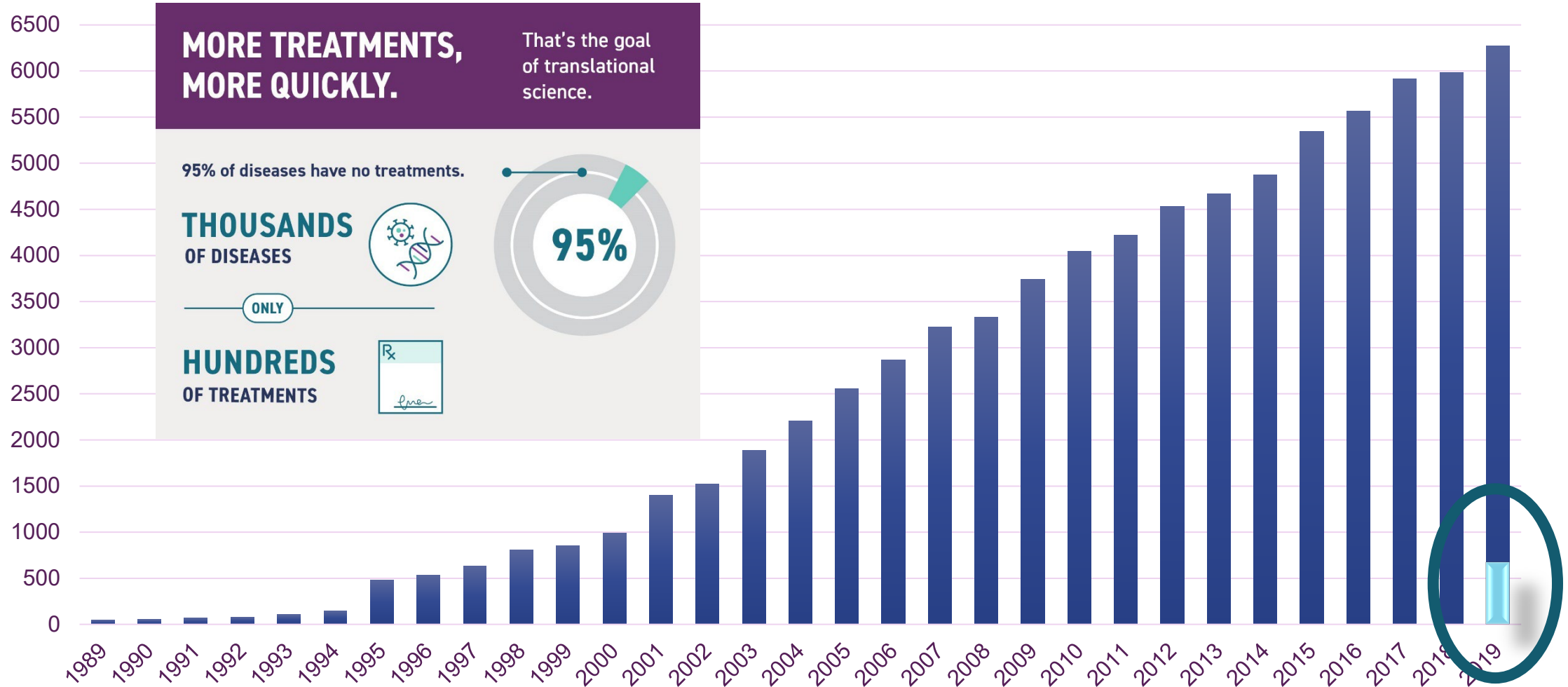


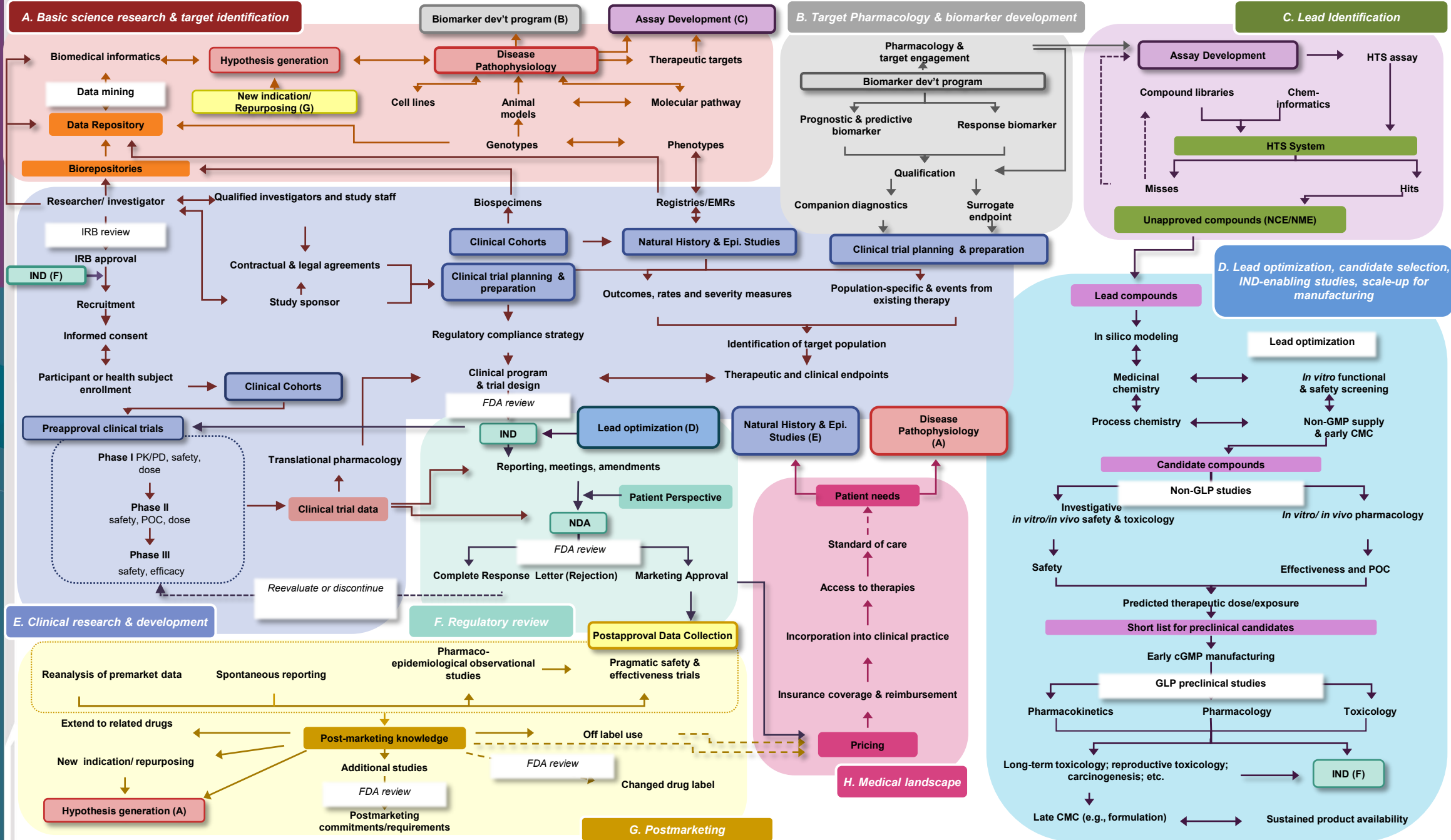
# NCATS' VISION

**More treatments for all people  
more quickly**

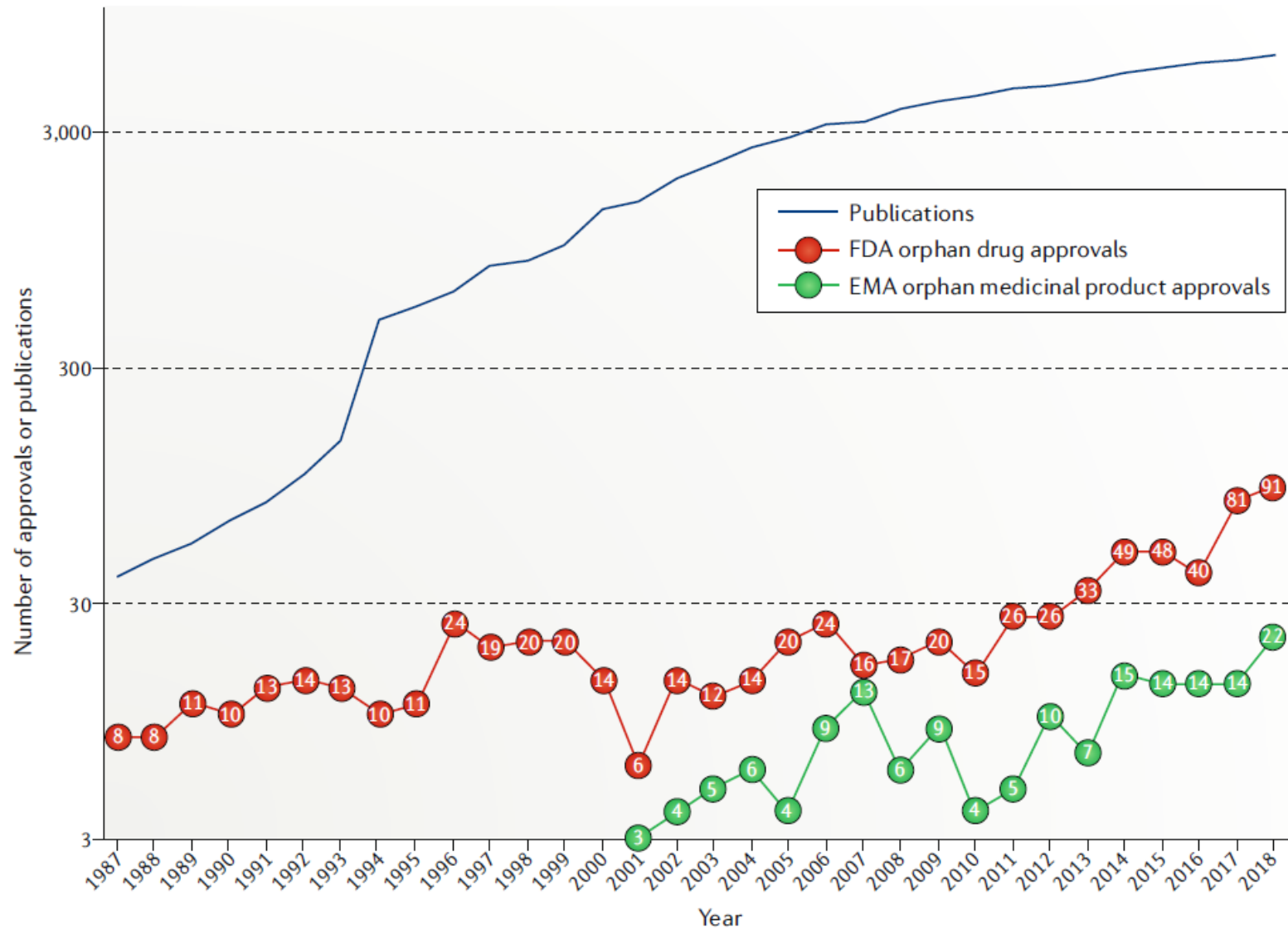


# Diseases of Known Molecular Basis with Treatments





# Gap between research and clinical care

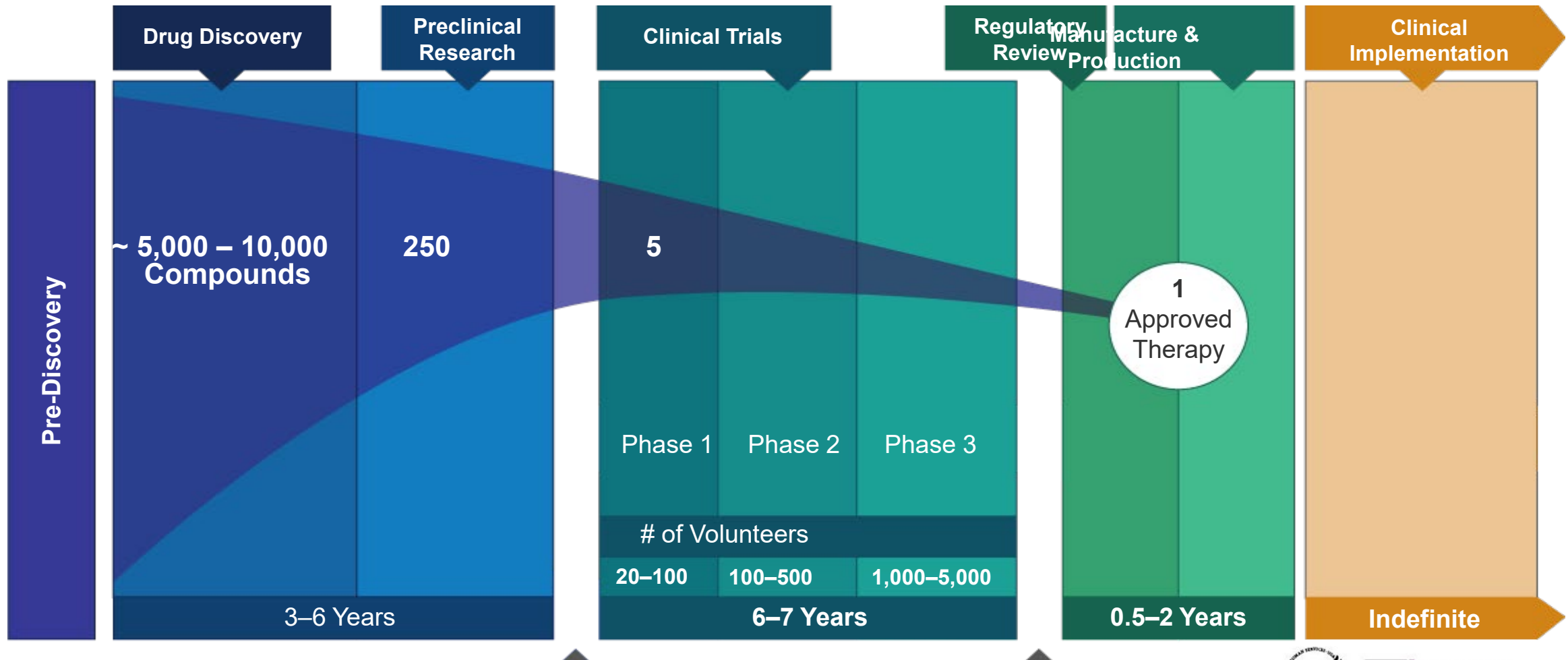


Tambuyzer, E., Vandendriessche, B., Austin, C.P. *et al.* Therapies for rare diseases: therapeutic modalities, progress and challenges ahead. *Nat Rev Drug Discov* **19**, 93–111 (2020). <https://doi.org/10.1038/s41573-019-0049-9>



# Gap between research and clinical care

Time: 10-15 Years, Cost: Billions, \*Not Linear\*



# This a Translational Science Problem

**ONLY 5% OF  
RARE DISEASES**

**HAVE APPROVED TREATMENTS**



Understanding what's similar across diseases to help develop multiple treatments at a time



Developing models that better predict a person's reaction to a treatment



Enhancing the design and conduct of clinical trials so the results more accurately reflect the patient population





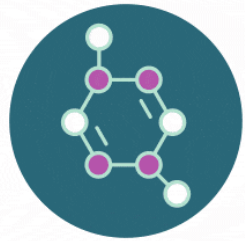
# ABOUT NCATS

**We tackle ongoing challenges  
in translational research so that  
new treatments reach people faster**



# Re-engineering the Translational Pipeline

NCATS addresses long-standing bottlenecks in the translational research pipeline so that new treatments reach people faster.



## Bottlenecks in rare diseases:

- Traditional “One size fits all” approach to research may be limiting in rare diseases
- Small patient populations lead to inadequate business interest for investment in R&D
- Shortage of researchers leads to gaps in current research understanding

## Solutions:

- Cannot solve this 1 disease at a time
- Need for platform-based approaches to accelerate R&D for groups of rare diseases
- Repurpose existing drugs and therapeutics
- Leverage Team Science thinking



# NCATS Has a Home for Rare Diseases

**RESOURCES**  
to educate,  
engage and  
empower the  
rare diseases  
community.

**NCATS develops  
new ways to  
understand  
and treat  
rare diseases.**

**FUNDING**  
to accelerate  
medical  
research  
across rare  
diseases.

**DATA-DRIVEN SOLUTIONS**  
to shorten the diagnostic  
journey and lower the  
economic burden.



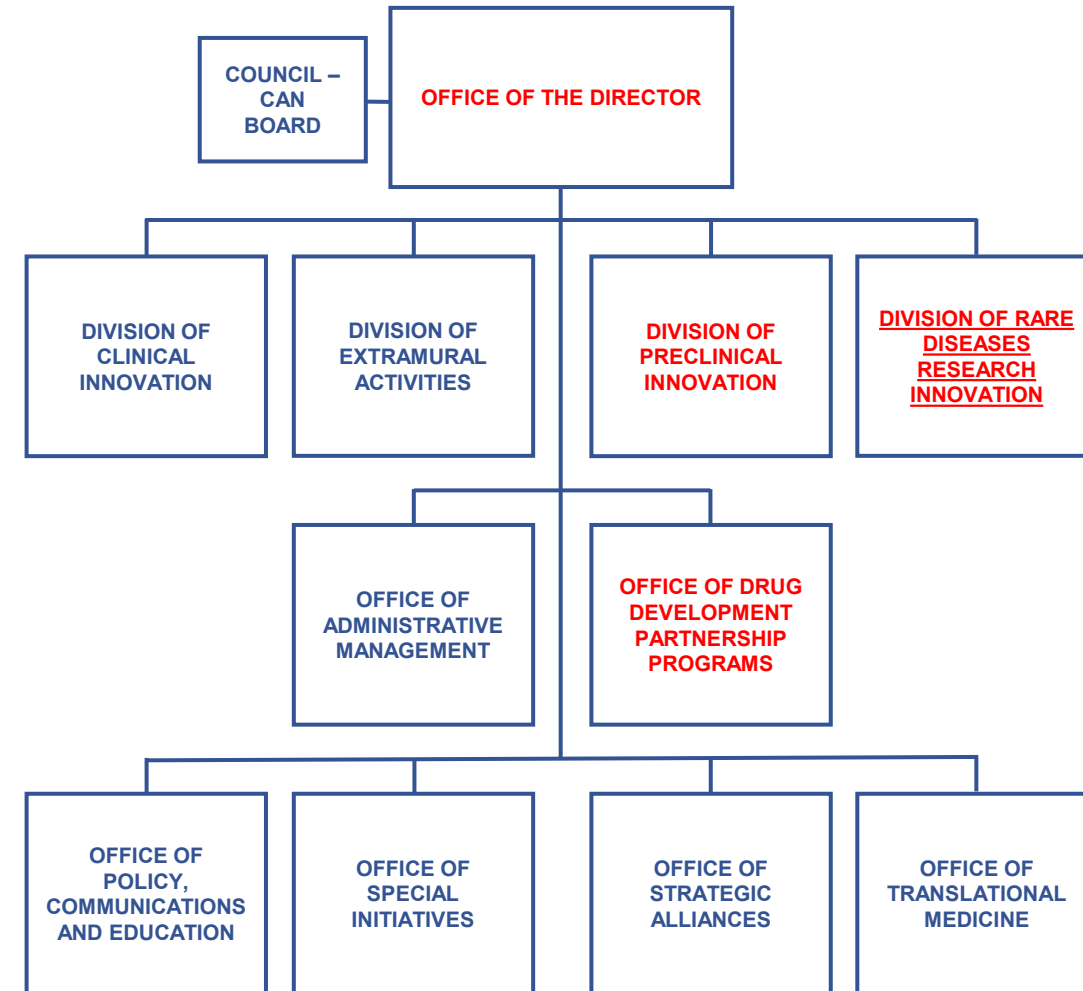
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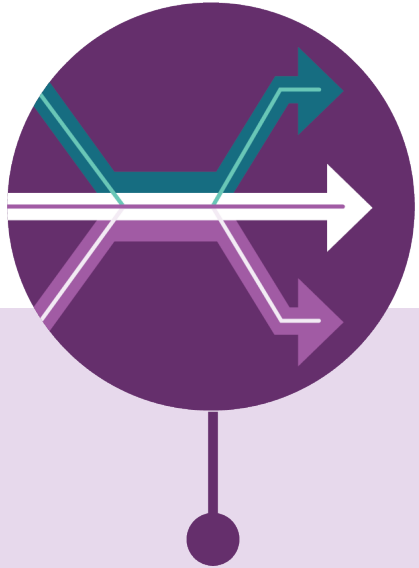
**NCATS develops  
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# Key NCATS Approaches



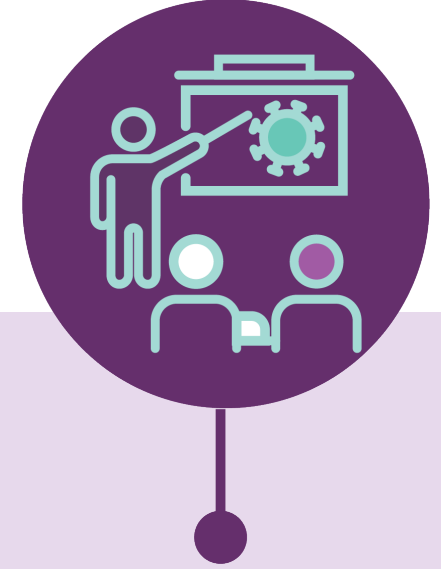
Understanding what's similar across diseases to spur multiple treatments at a time



Developing models that better predict a person's reaction to a treatment



Enhancing clinical trials so the results more accurately reflect the patient population



Leveraging real-world data and data science approaches to address public health needs

# Example: Jansen's Metaphyseal Chondrodysplasia (JMC)

Lead Investigators: Thomas Gardella, PhD and Harald Jueppner, MD, Massachusetts General Hospital

- Extremely Rare ~ 25 cases known
- Disease of bone development
- Caused by genetic mutations in PTH receptor type 1 (PTHR1)
- No effective treatment options



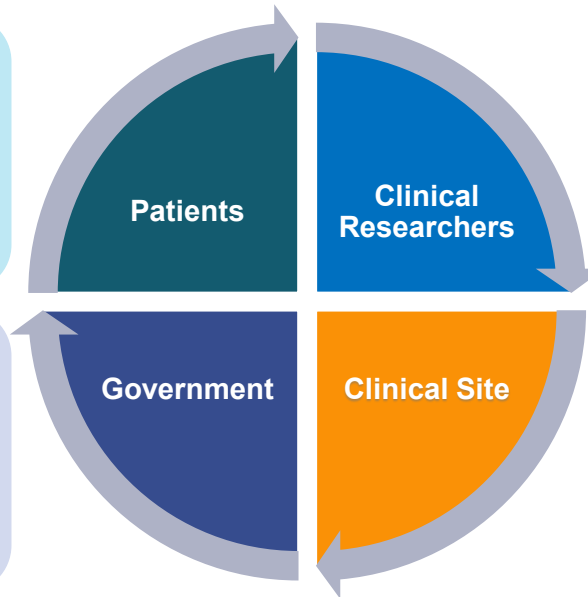
How do you do drug development for such a small patient population?

## Jansen's Disease Foundation

- Connect key partners
- Engage patient community in clinical research

## NCATS Preclinical Support

- Provide drug development expertise and coordination
- Enable transition from preclinical to clinical



## MGH Clinical Researchers

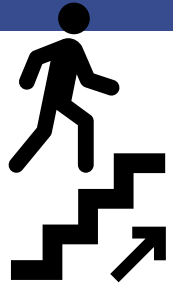
- Provide scientific and disease expertise
- Care for patients

## NIH Clinical Center

- Natural History Study
- Execute clinical trials



# Therapeutic Development Starts and Ends with Patients



## Outreach

Patient Advocates helped to initiate collaborations

- Clinicians
- Researchers
- Drug Developers

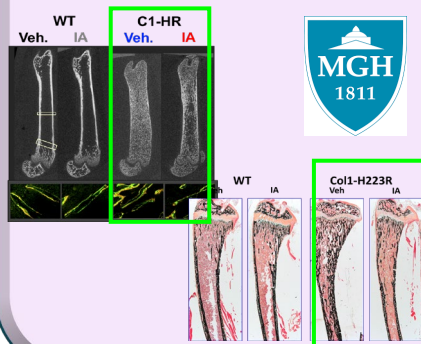
Participation in Natural History studies



## Academic Research

Identification of potential therapeutic candidate

Initial testing in mouse models of disease



## Preclinical Drug Development

Manufacture & Formulation of Drug Candidate

Toxicology studies

Regulatory IND support

Development of Clinical Assays



## Clinical Planning

Natural History

Phase 1/2 trial



## Treatment

Potential benefit to children from drug leading to improved quality of life



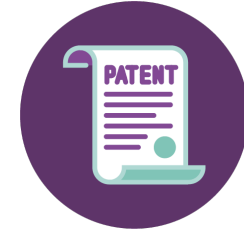
# Progression in rare diseases research requires engagement at all stages of research



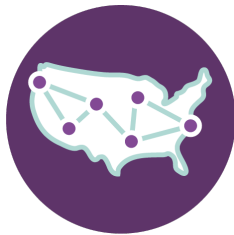
Pharmaceutical collection of  
~ **3,000 FDA-approved compounds**  
aids rapid development of new drugs  
for a variety of diseases



**243 active** intramural  
research collaborations



**356 patents issued to NCATS**,  
including 88 U.S. patents  
and 268 foreign patents



National network of more than  
**60 medical research  
institutions** innovating clinical  
trials, training and more



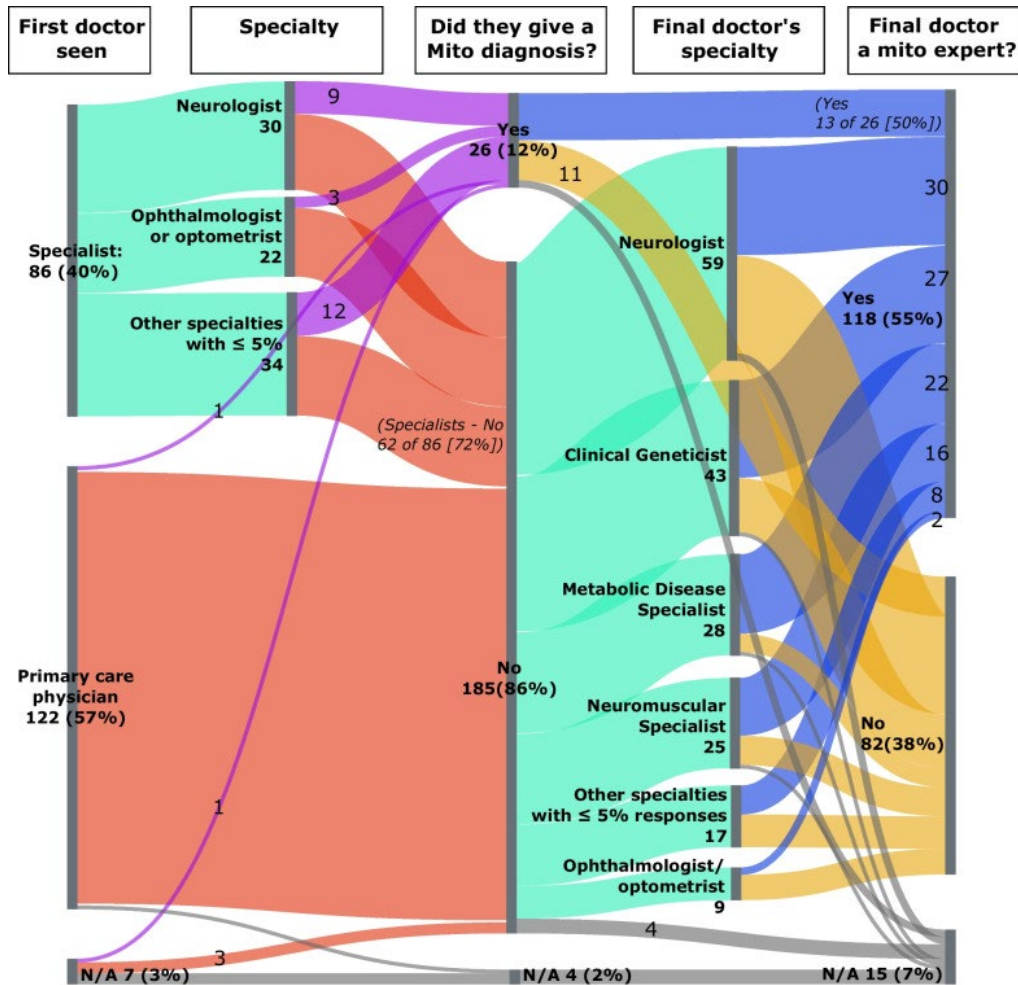
National network of research  
consortia advancing knowledge  
and treatments for more than  
**200 rare diseases**



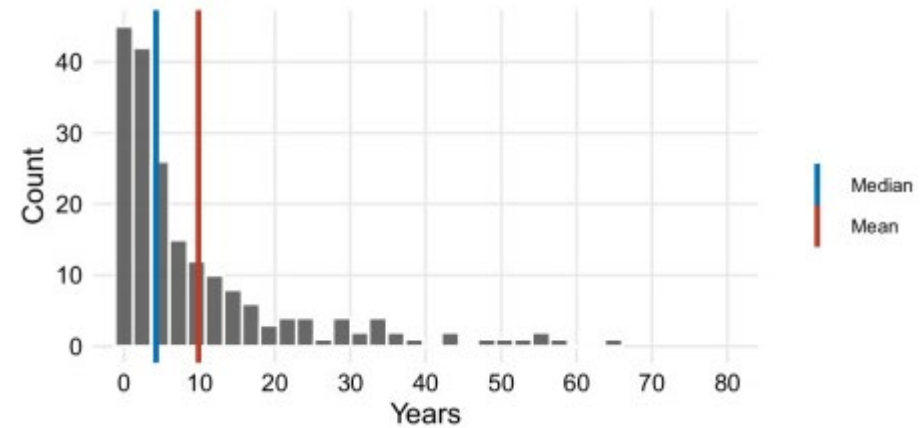
**48 investigational new drug (IND)  
applications**, including 42 U.S.  
INDs and 6 foreign INDs

# Patients face Common Obstacles

Transition in mitochondrial disease diagnosis by specialty of diagnosing clinician



Time from first symptoms to diagnosis of mitochondrial disease



Aggregate results of diagnostic odyssey for many rare diseases



**16.5**  
YEARS

Since first RD symptom (mean)

**6.3**  
YEARS

Suffering without RD diagnosis (mean)

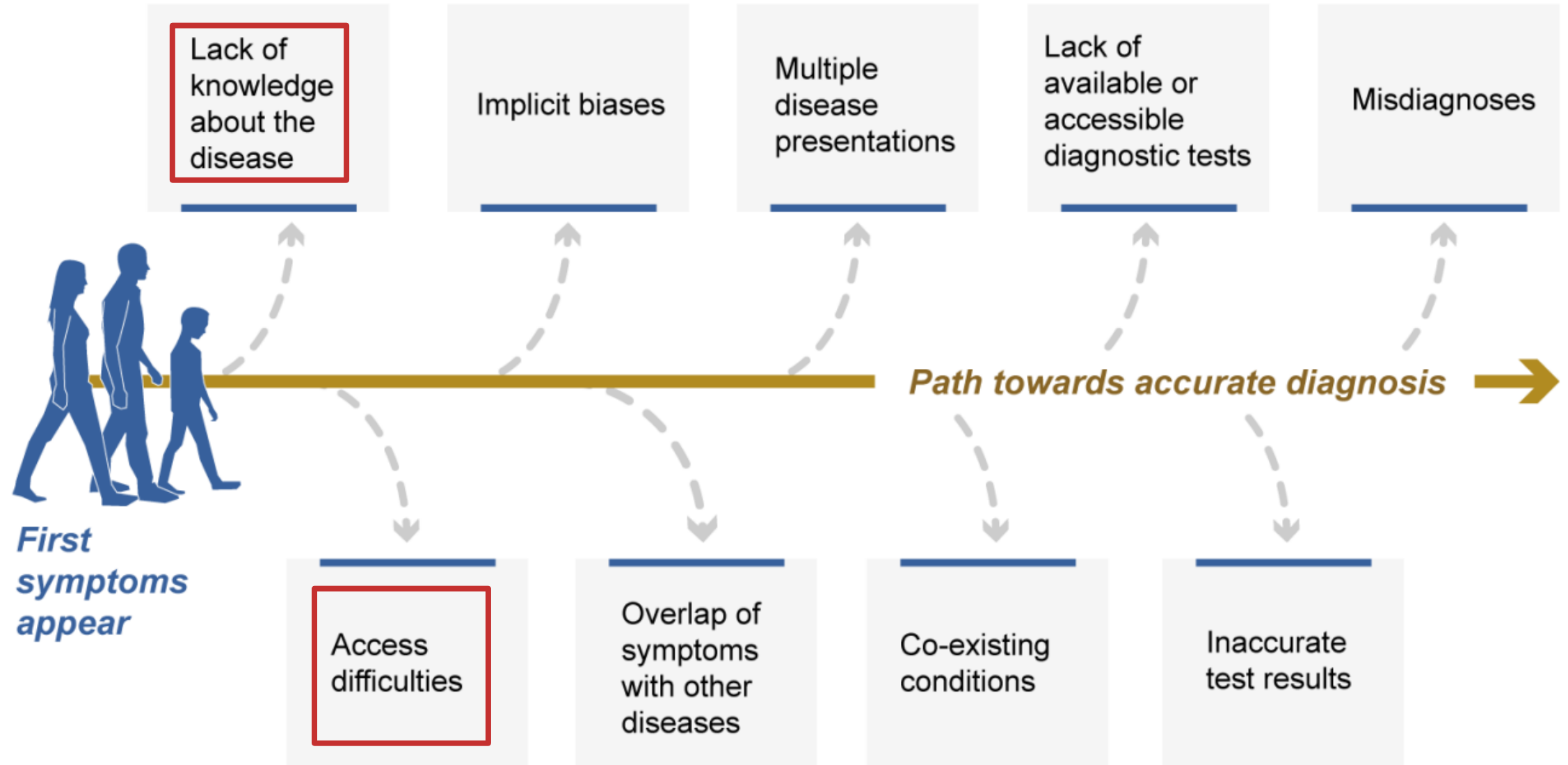
**10.2**  
YEARS

Years since RD diagnosis (mean)

**16.9**

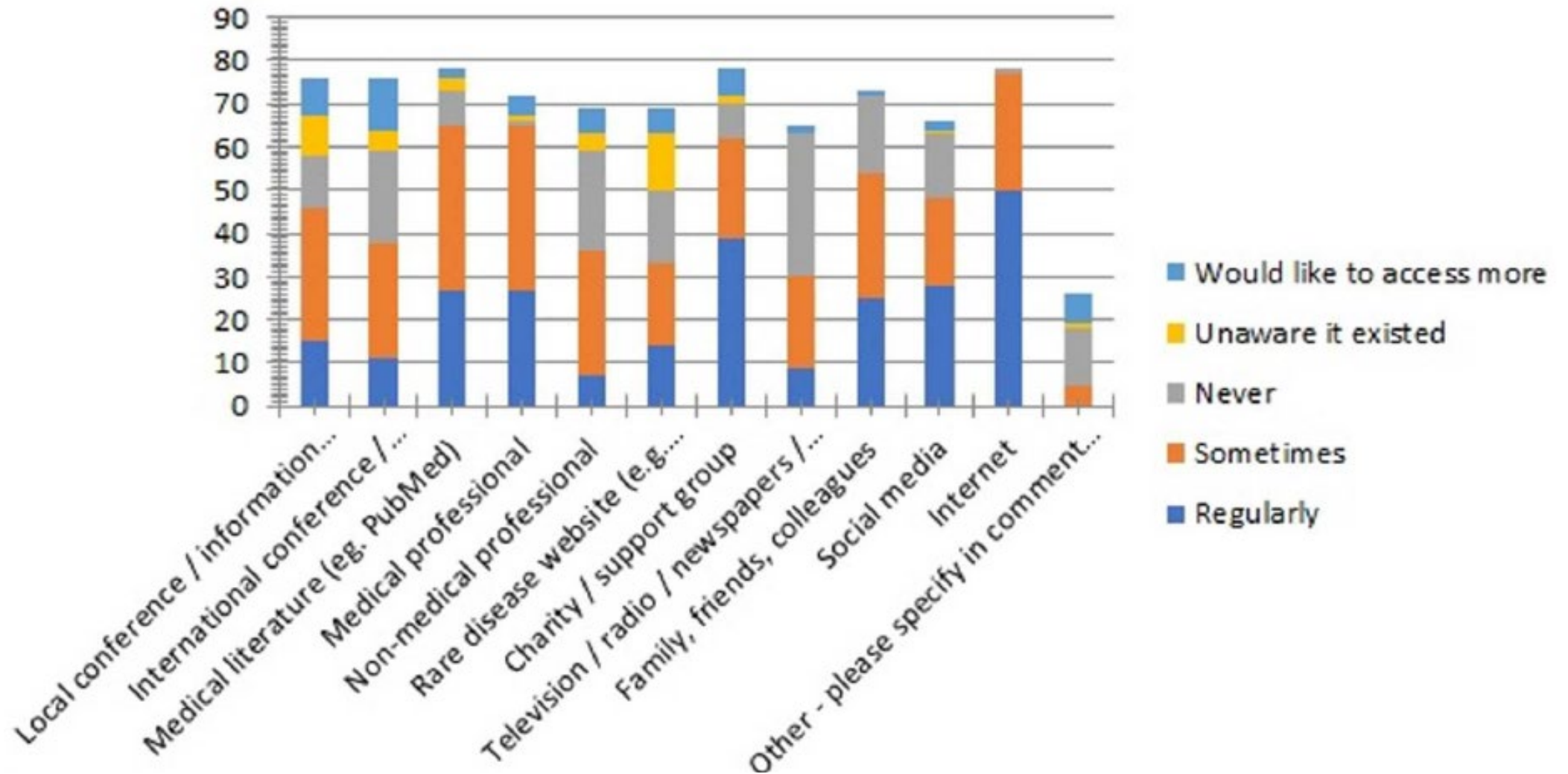
Average number of specialists seen since first RD symptom

# Examples of Factors That May Interfere with Accurate Diagnosis



Source: GAO analysis of published literature on rare diseases. | GAO-22-104235

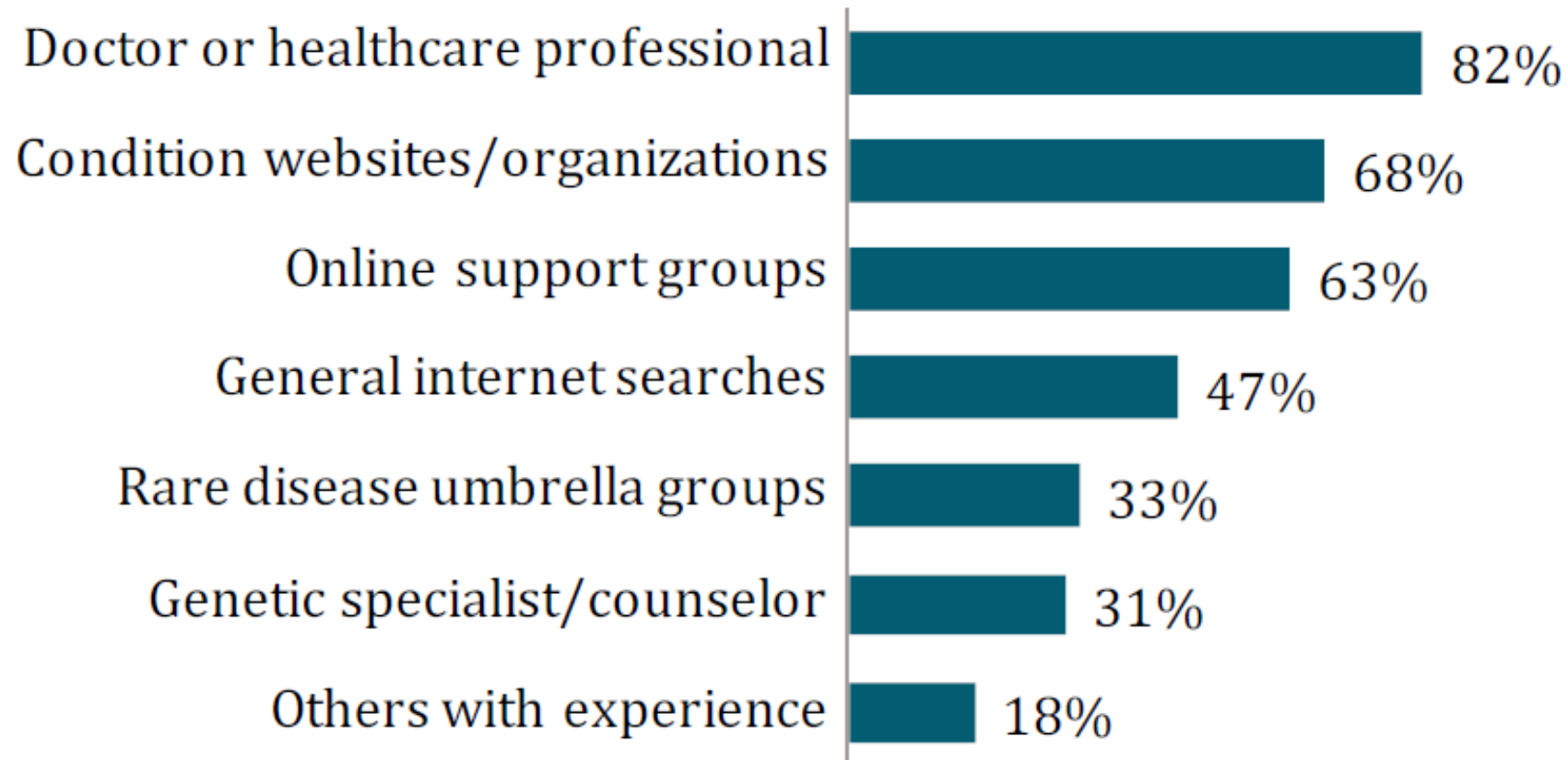
# Where do Patients seek Information?



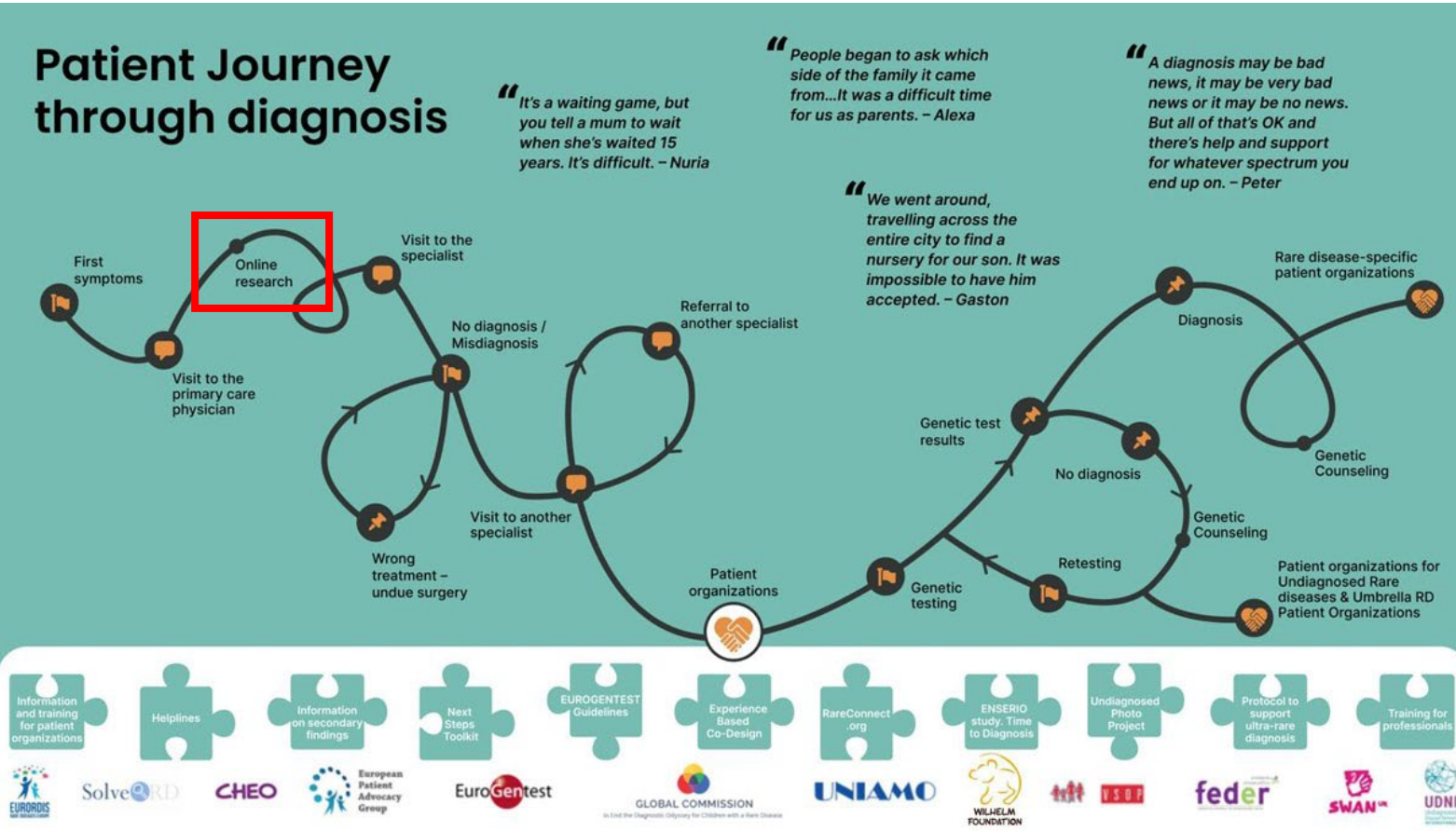
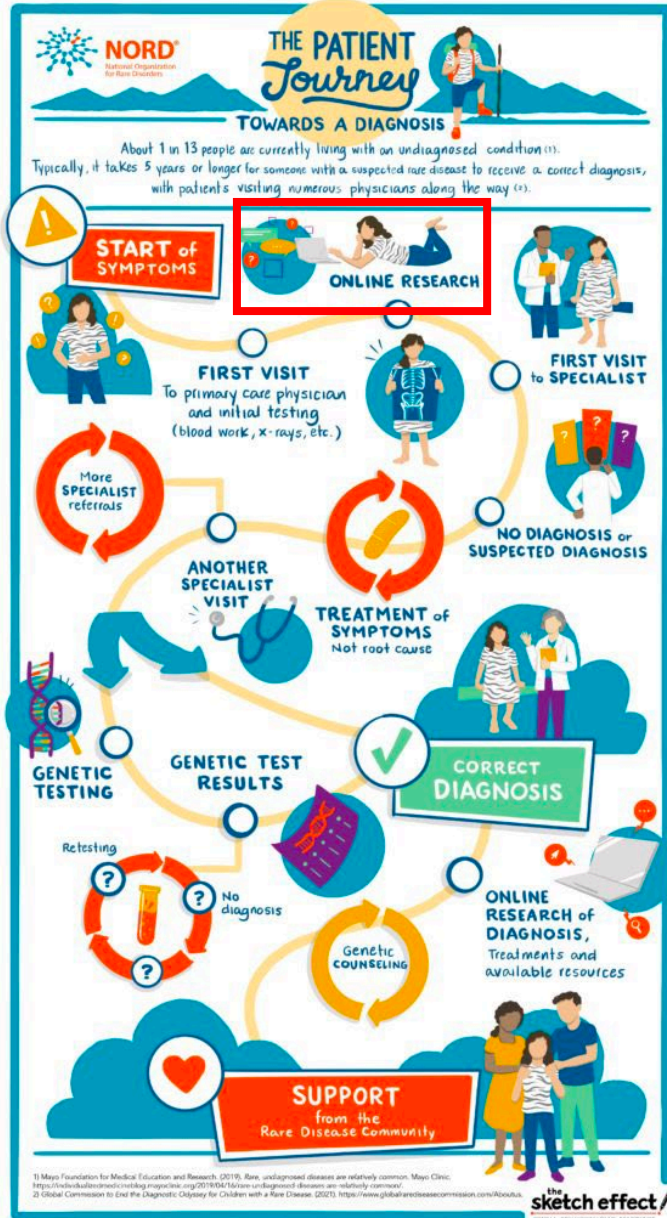
# Where do Caregivers seek Information?

Figure 11: Information Sources

(n=1,406)



# Start with the Patient Journey



Retrieved from National Organization for Rare Diseases (NORD): <https://rarediseases.org/new-patient-journey-infographic-gives-a-glimpse-into-the-diagnostic-odyssey/>  
Retrieved from Eurodis: <https://www.eurordis.org/publication/diagnosisjourneyinfographic>



National Center for Advancing Translational Sciences

# Finding Reliable Online Information

NIH NATIONAL CANCER INSTITUTE

1-800-4-CANCER Live Chat Publications Dictionary

ABOUT CANCER CANCER TYPES RESEARCH GRANTS & TRAINING NEWS & EVENTS ABOUT NCI search

Home > About Cancer > Managing Cancer Care

## How to Find Cancer Resources You Can Trust

MANAGING CANCER CARE

- Finding Health Care Services
- Costs & Medical Information
- Advance Directives
- Using Trusted Resources

National Library of Medicine

MedlinePlus® Trusted Health Information for You

Search MedlinePlus GO

About MedlinePlus What's New Site Map Customer Support

Health Topics Drugs & Supplements Genetics Medical Tests Videos & Tools

Health Topics Find information on health, wellness, disorders and conditions

Drugs & Supplements

If you are sexually active, getting tested for STDs is one of the most important things you can do to protect your health.

NIH National Center for Complementary and Integrative Health

Health Info Research Grants & Funding

Home > Health Information > Finding and Evaluating Online Resources

## Finding and Evaluating Online Resources

### What's the Bottom Line?

How much do we know about health approaches?

The number of web articles about complementary and alternative medicine is growing rapidly.

What do we know?

- Some online sources are useful, but others are not.
- Don't rely on online information you're considering for your care provider.

National Center for Advancing Translational Sciences

NIH National Center for Advancing Translational Sciences GARD Genetic and Rare Diseases Information Center

Browse by Disease About GARD Contact Us

## Search for a disease

### Providing Health Information on Rare Diseases since 2002

The Genetic and Rare Diseases (GARD) Information Center is a public health program of the National Center for Advancing Translational Sciences (NCATS) and the National Institutes of Health (NIH) that provides understandable and actionable information about rare and genetic diseases for patients, caregivers, and the public.

Learn more about GARD →

Check out our free publications. Order here!

NIH National Institute on Aging

COVID-19

Get the latest public health information from CDC » Get the latest research information from NIH »

HEALTH INFORMATION RESEARCH & FUNDING NEWS & EVENTS

Home / Health Information / Online Health Information: Is It Reliable?

## Online Health Information: Is It Reliable?

On this page:

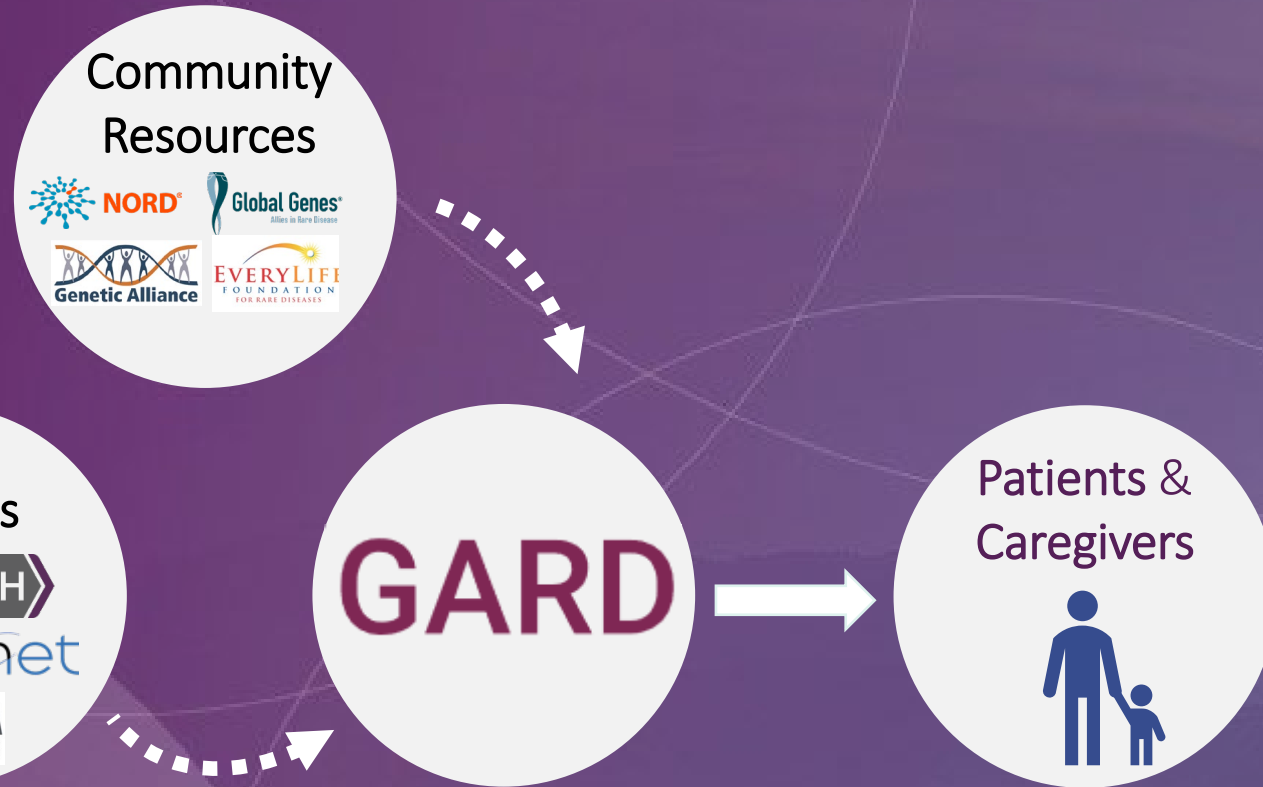
- Where Can I Find Reliable Health Information Online?
- Questions to Ask Before Trusting a Website
- Health and Medical Apps
- Social Media and Health Information
- Trust Yourself and Talk to Your Doctor

<http://rarediseases.info.nih.gov>



# GARD Genetic and Rare Diseases Information Center

A complete reimaging of the GARD Website is in-development to scale the translation of complex disease ontology data into accessible and actionable information for patients and caregivers



<https://rarediseases.info.nih.gov>

**Cystic fibrosis**

Other Names: CF; Mucoviscidosis

Home | Browse by Disease | Cystic Fibrosis

About the Disease | Diagnosis & Treatment | Living with the Disease | Research

Disease at a Glance | Symptoms | Causes | Next Steps

### Disease at a Glance

**Summary**

Cystic fibrosis (CF) is a genetic disorder that causes mucus to build up and damage organs in the body, particularly the lungs and pancreas. Signs and symptoms may include salty-tasting skin; persistent coughing; frequent lung infections; wheezing or shortness of breath; poor growth; weight loss; greasy, bulky stools; difficulty with bowel movements; and in males, infertility. Over time, mucus buildup and infections can lead to permanent lung damage, including the formation of scar tissue (fibrosis) and cysts in the lungs. CF is caused by genetic changes in the CFTR gene and inheritance is autosomal recessive.

**What Information Does GARD Have For This Disease?**

Many rare diseases have limited information. Currently GARD is able to provide the following information for this disease:

- Population Estimate
- Symptoms Onset
- Symptoms
- Cause
- Specialists
- Genetic Testing
- +3 Info tags

**Estimated Number of People with this Disease**

In the U.S., there may be between **30,000 to 200,000**

**When do symptoms of this disease begin?**

The most common ages for symptoms of a disease to begin is called age of onset. Age of onset can vary for different diseases and may be used by a doctor to determine the diagnosis. For some diseases, symptoms may begin in a single age range or several age ranges. For other diseases, symptoms may begin any time during a person's life.

The common ages for symptoms to begin in this disease are shown above by the colored icon(s).

**Symptoms**

These symptoms may be different from person to person. Some people may have more symptoms than others and symptoms can range from mild to severe. This list does not include every symptom.

This disease might cause these symptoms:

**Digestive System**

**Digestive System**

The digestive system is made up of the esophagus, stomach, intestines, liver, pancreas, and gallbladder. Common symptoms of problems in the digestive system include blood in the stool, changes in bowel habits, severe abdominal pain, unintentional weight loss, or heartburn. Diseases affecting the digestive system may be diagnosed and treated by a gastroenterologist (GI specialist).

**Medical Term: Biliary cirrhosis**

Frequency: Very frequent

**Description**

Progressive destruction of the small-to-medium bile ducts of the intrahepatic bile tree, which leads to progressive cholestasis and often end-stage liver disease.

**Synonym**

Primary biliary cirrhosis

**IF Sort by: Medical Term**

- Biliary cirrhosis
- Exocrine pancreatic insufficiency
- Hepatomegaly
- Immunodeficiency
- Malabsorption
- Pulmonary fibrosis
- Recurrent respiratory infections

# GARD Genetic and Rare Diseases Information Center

Provide understandable information about rare diseases to patients, caregivers, and the general public

Public Health Website

General Information

Contact Center (Phone & Email)

Individualized Support

## Rare Disease Knowledge

orphanet

5 YEARS MIM  
Human Genetics Knowledge for the World

GENEReviews

monarch INITIATIVE

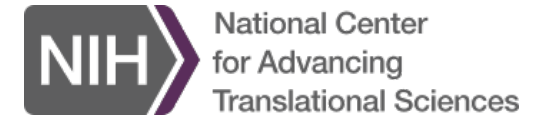
human phenotype ontology

DISEASE ONTOLOGY

## Information for Patients



## Rare Disease Information for Patients



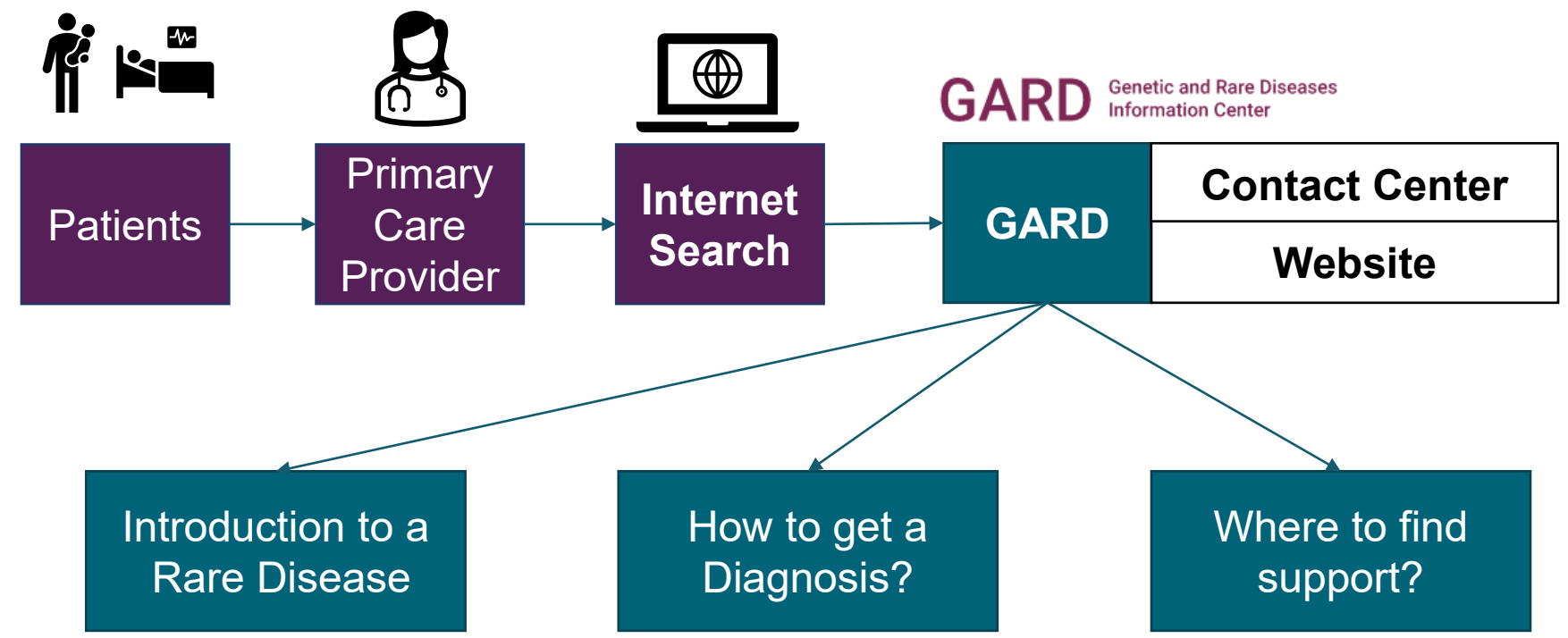
Many diseases at a time



Diagnostic odyssey

Can we bridge this divide?





Retrieved from National Organization for Rare Diseases (NORD): <https://rarediseases.org/new-patient-journey-infographic-gives-a-glimpse-into-the-diagnostic-odyssey/>  
 Also referenced by Eurodis: <https://www.eurodis.org/publication/diagnosisjourneyinfographic>



# Translational Science Aim #1



## Leverage existing Research Information



## ...to reach Patients



Symptoms may start to appear as a Newborn and as an Infant.

### Neurologist



or spine.

Neurologists are trained to diagnose, treat, and manage diseases that affect the nervous system. The nervous system controls the body's functions and is made up of the brain, spinal cord, and nerves. Neurologists commonly treat patients with thinking and memory issues, seizures, movement disorders, and muscular dystrophies. Neurologists often order tests that measure electrical activity or tests that provide images of the inside of the brain





# Health Literacy: Fit to patient/caregivers' perspectives & needs

## Building a Medical Team

Building a medical team can help speed diagnosis and improve medical care. The primary care provider (PCP) is usually the center of the team. The involvement of other specialists depends on the type of symptoms or the need for special evaluations or treatments. The need for different specialists may change over time. Members of the medical team for this disease may include:

- Primary care provider (PCP) +
- Geneticist -



A medical geneticist is a doctor who has specialized training in diagnosing, treating, managing, and counseling individuals with, or at risk for, diseases caused by a genetic change. They also evaluate and care for individuals with birth defects, metabolic diseases, and diseases caused by the interaction of genetic and environmental factors.

A genetic counselor is not a doctor, but has specialized training in medical genetics and counseling. They help individuals understand their medical history, genetic risks, genetic testing options, and the implications of test results.
- Psychiatrist
- Ophthalmologist
- Neurologist

## Getting a Diagnosis

Work with a Doctor

Prepare for Doctor Visit

Follow Up

Medical History and Physical Exam

Genetic Testing

Clinical Procedures

Laboratory Tests

Imaging Studies

### Genetic Testing

A doctor may use a genetic test to help diagnose this disease.

#### What is a genetic test?

A genetic test looks for changes in a person's DNA that are known to cause a disease or medical problem. There are different types of genetic tests and different reasons that a genetic test may be ordered. In many cases, genetic tests are used to confirm or rule out a diagnosis.

#### What do I need to know about getting a genetic test?

The steps to get a genetic test may vary slightly, but may include:

#### Talking to a Doctor

Genetic tests may be ordered by a primary care provider, a geneticist, or other specialist. Talking to a primary care provider about testing options, and possibly seeing a specialist, is an important first step.

#### Understanding Informed Consent

Informed consent for a genetic test involves learning the details, risks, and limitations of the test. Important information about the test includes the genes that are being tested, the type of sample needed, the accuracy of the



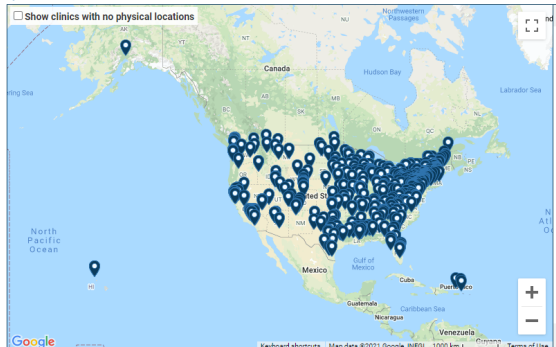
## Find a Genetic Clinic

ACMG's "Find a Genetics Clinic" allow individuals to search for genetics clinics across the United States. The directory contains the locations of genetics clinics that have requested to be listed.

Search by Clinic Name or Location. State    
 Example: "Cancer Risk" or "Miami, FL"

CLINIC LOCATIONS  CLINICS WITH NO PHYSICAL LOCATIONS

Show clinics with no physical locations



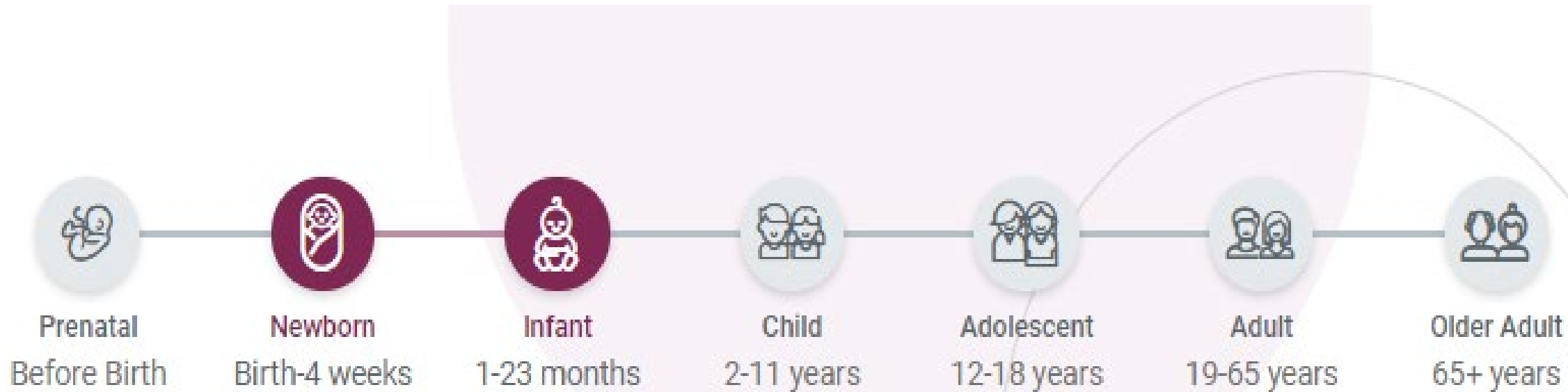
1285 clinic(s) found. Showing 1 to 20

**Amherst Center**  
 Roswell Park  
 Clinic Type: Outreach Clinic  
<https://www.roswellpark.org/become-patient/locations/amherst-center>  
 100 College Parkway  
 Williamsville, NY 14221  
 DETAILS →

**Cancer Center**  
 Community Medical Center - RWJ Barnabas Health  
 Clinic Type: Outreach Clinic  
<https://www.rwjbh.org/community-medical-center/treatment-care/genetic-counseling/>



# User Experience (UX): Tailor delivery of information to our audience



The common ages for symptoms to begin in this disease are shown above by the colored icon(s).

Launched a new GARD website **not as a final product**, but as a **starting point** to establish a dialogue with users

How are patients and caregivers searching for a Rare Disease?

National Center for Advancing Translational Sciences

NIH National Center for Advancing Translational Sciences | GARD Genetic and Rare Diseases Information Center

Browse by Disease About GARD Contact Us

Home Browse by Disease

# Browse by Disease

Browse the GARD list of rare diseases to find topics of interest. This list includes the main name for each disease as well as the alternate names for the disease. Inclusion on this list does not serve as official recognition by the NIH that a disease is rare.

Search

Sort by: Name 11

Showing 1 - 10 of 3215

**10q22.3q23 microdeletion syndrome**  
Other names: Del(10)(q22.3q23.3); Deletion 10q22.3q23.3; Monosomy 10q22.3q23.3

**11-beta-hydroxylase deficiency**  
Other names: Adrenal hyperplasia 4; Adrenal hyperplasia hypertensive form; Adrenal hyperplasia IV; CAH due to 11-beta-hydroxylase deficiency; Congenital adrenal hyperplasia due to 11-beta-hydroxylase deficiency; CYP11B1 deficiency; P450c11b1 deficiency; Steroid 11-beta-hydroxylase deficiency

**12q14 microdeletion syndrome**  
Other names: Del(12)(q14); Deletion 12q14; Monosomy 12q14; Osteopoikilosis-short stature-intellectual disability syndrome

**Body Location/Systems**

- Blood, Heart and Circulation
- Bones, Joints and Muscles
- Brain and Nerves
- Digestive System
- Ear, Nose and Throat
- Endocrine System
- Eyes and Vision
- Immune System
- Kidneys and Urinary System
- Lungs and Breathing
- Mouth and Teeth
- Skin, Hair and Nails
- Female Reproductive System
- Male Reproductive System



National Center for Advancing Translational Sciences

# NCATS Resources for Rare Disease Patients, Caregiver, and Patient Advocates

## **GARD** Genetic and Rare Diseases Information Center

Who: Patients/Caregivers/Public

What: Public Health Information



### **Contact Center**

- Individualized Support



### **Health Information Website**

- General Information about Rare Diseases and finding support

### ***Website Live & In-Development***

- Focuses on providing access to information for patients/caregivers and to develop via user experience

[RareDiseases.info.nih.gov](http://RareDiseases.info.nih.gov)

## **Toolkit** For Patient-Focused Therapy Development

Who: Patient Groups

What: Research & Development



### **Educational Website**

- Educational information, resources, and best practices for collaborating with researchers, industry, and regulators on Therapy Development

[Toolkit.ncats.nih.gov](http://Toolkit.ncats.nih.gov)

## **RaDaR** Rare Diseases Registry Program

Who: Patient Groups & Scientists

What: Patient Registries



### **Educational Website**

- Stepwise educational information, resources, and best practices for starting a Registry and best practices around registry data governance and stewardship

[Registries.ncats.nih.gov](http://Registries.ncats.nih.gov)



# As journalists, you will give voice to the stories of rare diseases patients & their families



<https://ncats.nih.gov/news-events/events/rdd>



# Thank You!

## Learn More Today

About Rare Diseases at [rarediseases.info.nih.gov](https://rarediseases.info.nih.gov)

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Work with us [ncats.nih.gov/workwithus](https://ncats.nih.gov/workwithus)

My Contact Information: [eric.sid@nih.gov](mailto:eric.sid@nih.gov)

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