Enhanced CARE for RARE Genetic Diseases in Canada

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FORGE
CANADA CONSORTIUM

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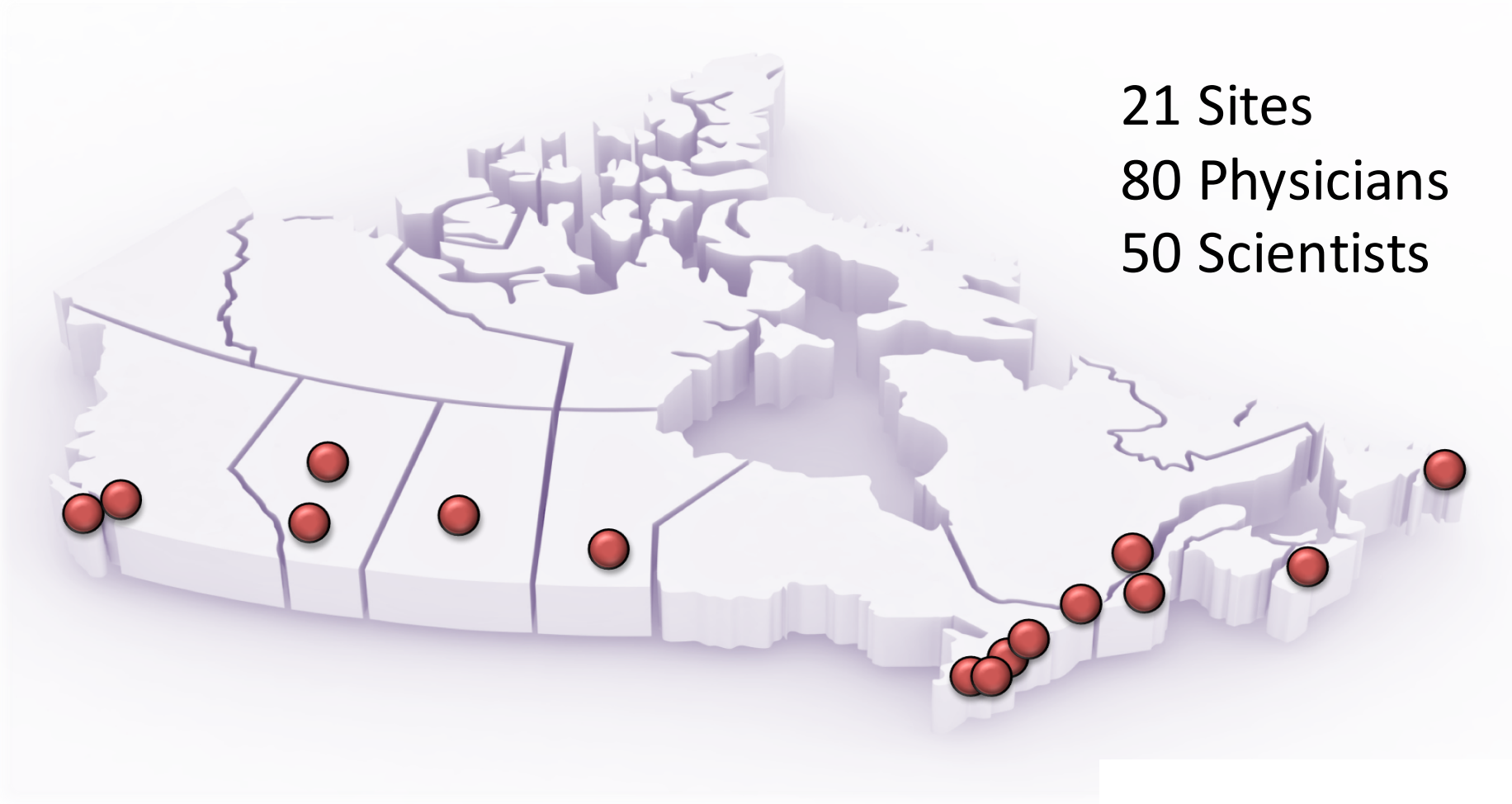

21 Sites
80 Physicians
50 Scientists

Shared Pipeline and Resources

>1300 Diseases Proposed

- Caused by 1 gene?
- All clinical testing complete?
- Patient lives in Canada?

>1000 Diseases Selected for Study

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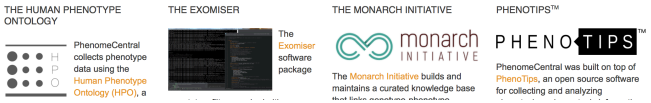
Shared Pipeline and Resources

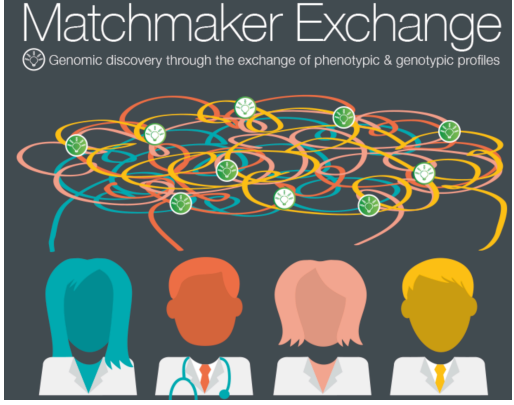
Clinical Database

PhenomeCentral



Analysis Teams

Matchmaker exchange



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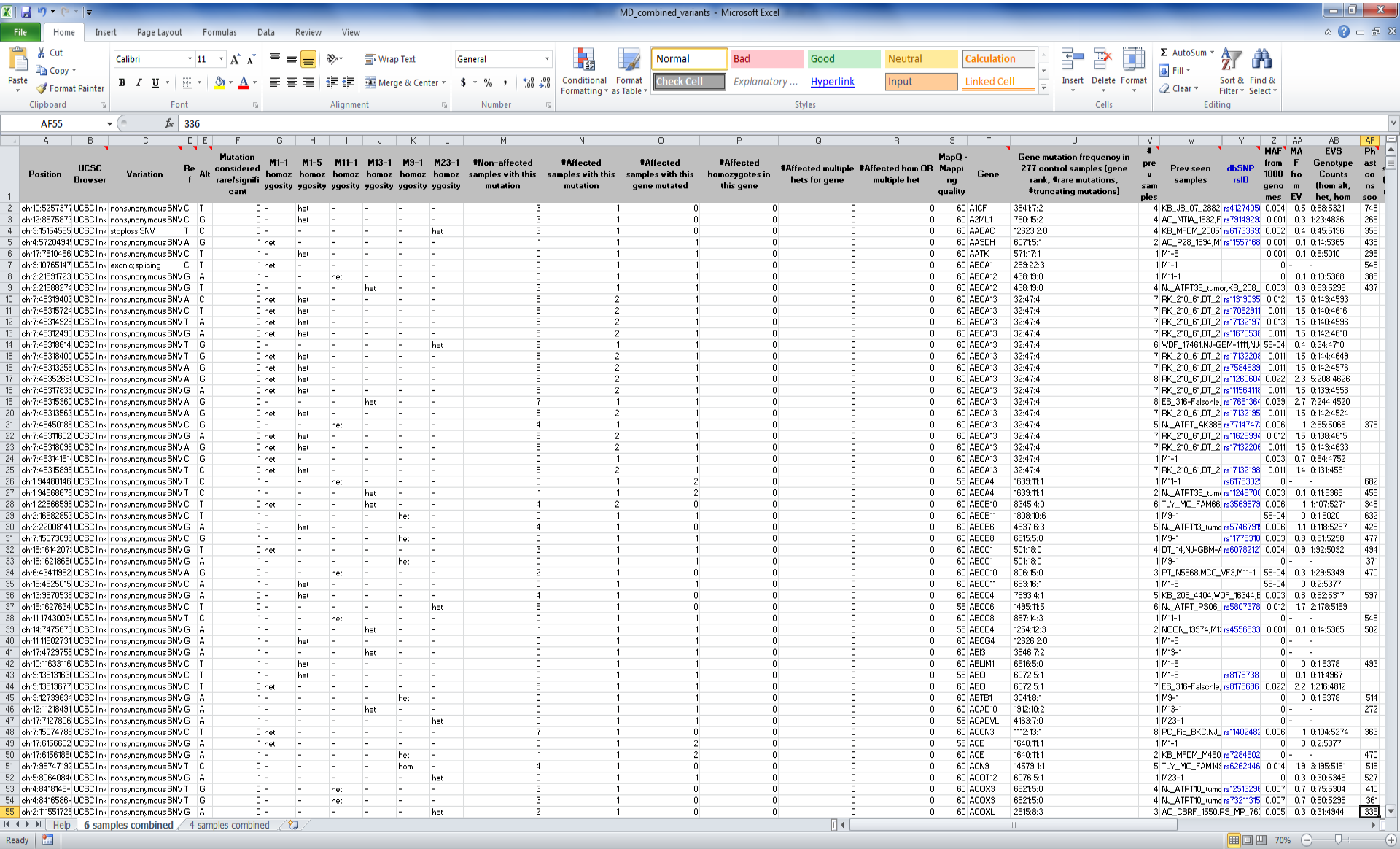
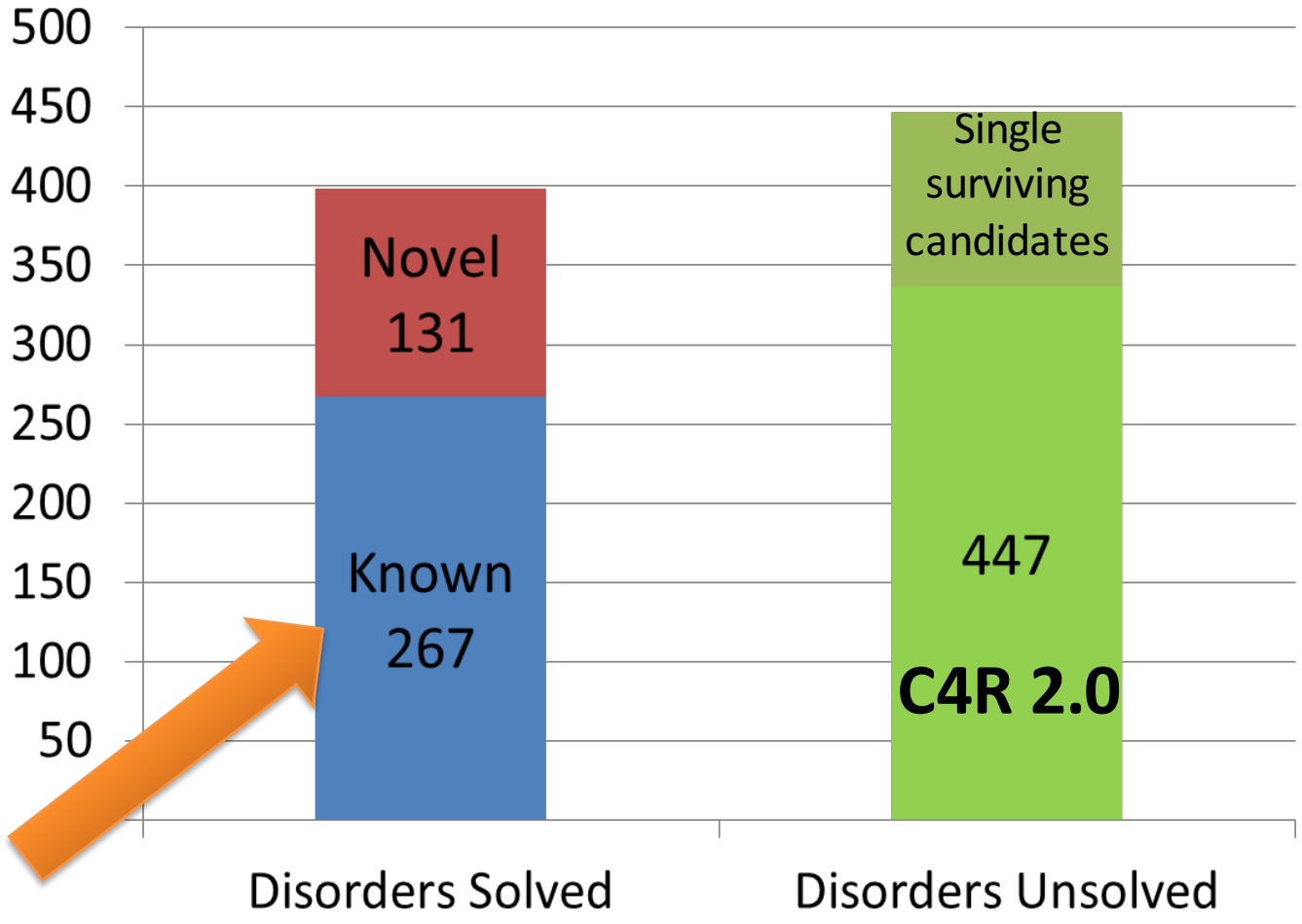
Exome sequencing



845 disorders out of the pipeline

47% Solved



32% diagnosis
in known gene

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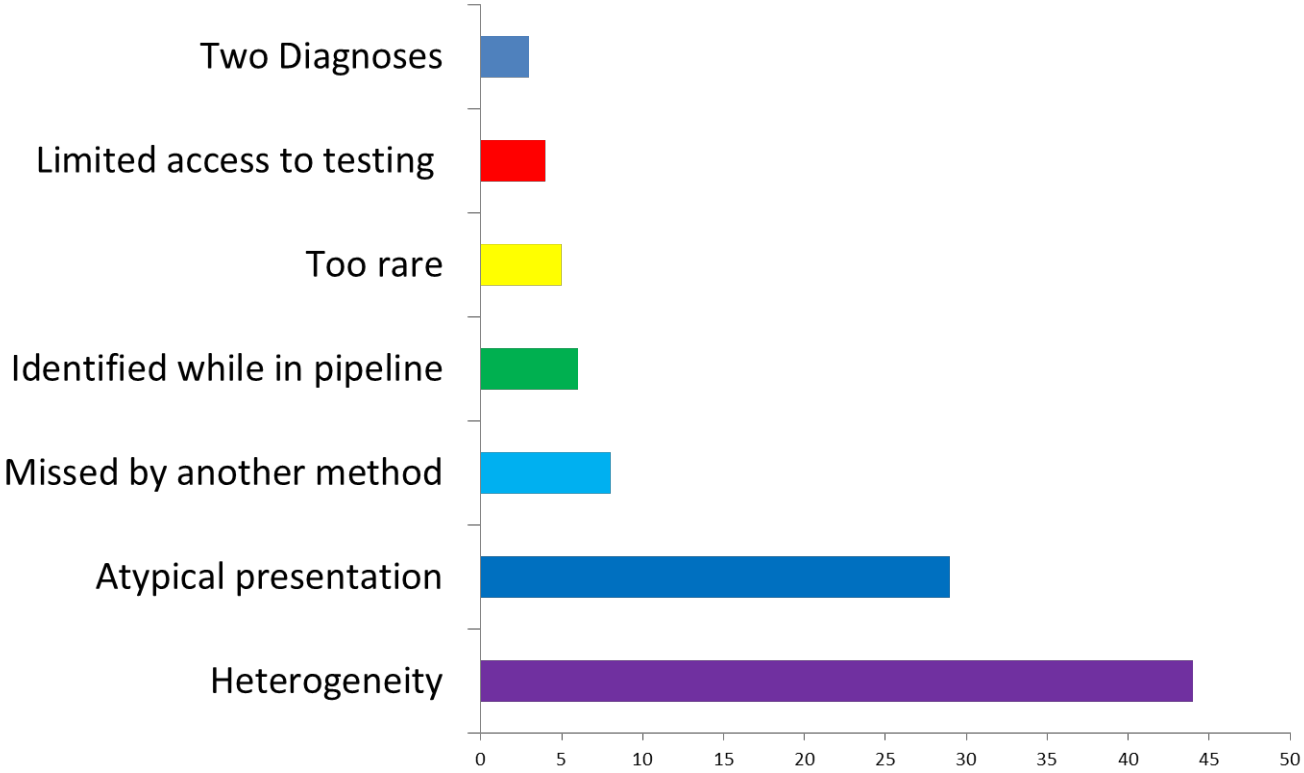
Why were known genes not identified in the clinic?



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Diagnostic utility

CLINICAL GENETICS An International Journal of Genetics, Molecular and Personalized Medicine

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CLINICAL GENETICS
doi: 10.1111/cge.12654

Review

Utility of whole-exome sequencing for those near the end of the diagnostic odyssey: time to address gaps in care

Sawyer S.L., Hartley T., Dyment D.A., Beaulieu C.L., Schwartzentruber J., Smith A., Bedford H.M., Bernard G., Bernier F.P., Brais B., Bulman D.E., Warman Chardon J., Chitayat D., Deladoëy J., Fernandez B.A., Frosk P., Geraghty M.T., Gerull B., Gibson W., Gow R.M., Graham G.E., Green J.S., Heon E., Horvath G., Innes A.M., Jabado N., Kim R.H., Koenekoop R.K., Khan A., Lehmann O.J., Mendoza-Londono R., Michaud J.L., Nikkel S.M., Penney L.S., Polychronakos C., Richer J., Rouleau G.A., Samuels M.E., Siu V.M., Suchowersky O., Tarnopolsky M.A., Yoon G., Zahir F.R., FORGE Canada Consortium, Care4Rare Canada Consortium, Majewski J., Boycott K.M. Utility of whole-exome sequencing for those near the end of the diagnostic odyssey: time to address gaps in care.
Clin Genet 2015. © 2015 The Authors. *Clinical Genetics* published by John Wiley & Sons A/S. Published by John Wiley & Sons Ltd., 2015

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Value and Economic Impact

Education

Analysis and Interpretation

Tools and Guidelines

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Value and Economic Impact

Cost of Rare Disease

Genetic disease patients cost :

- 20x more than healthy individuals
- 5x more than chronic diseases

(asthma, diabetes)

Chart review of 300 patients with a molecularly-diagnosed genetic disease

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Value and Economic Impact

Value of a Diagnosis

Discrete Choice Experiment survey with 300 Canadian rare disease families

Families are willing to spend $5,000 out-of-pocket for a diagnosis

Most important attributes:

1) time to obtain an answer;
2) chance of diagnosis;
3) cost;

Least Important attributes:

1) type of test;
2) impact of results.

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Education

Education Program

Audience: medical genetics trainees, and interested individuals in current medical genetics practice

Module 1: Technical Aspects

Module 2: Ethical Issues

Module 3: Clinical Reporting

Module 4: Clinical Cases

Plan to develop into Podcasts

ROYAL COLLEGE
OF PHYSICIANS AND SURGEONS OF CANADA

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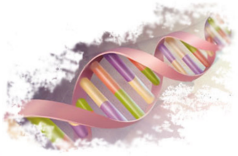
Clinical sequencing pilot study:
400 children from 3 provinces

Analysis and Interpretation



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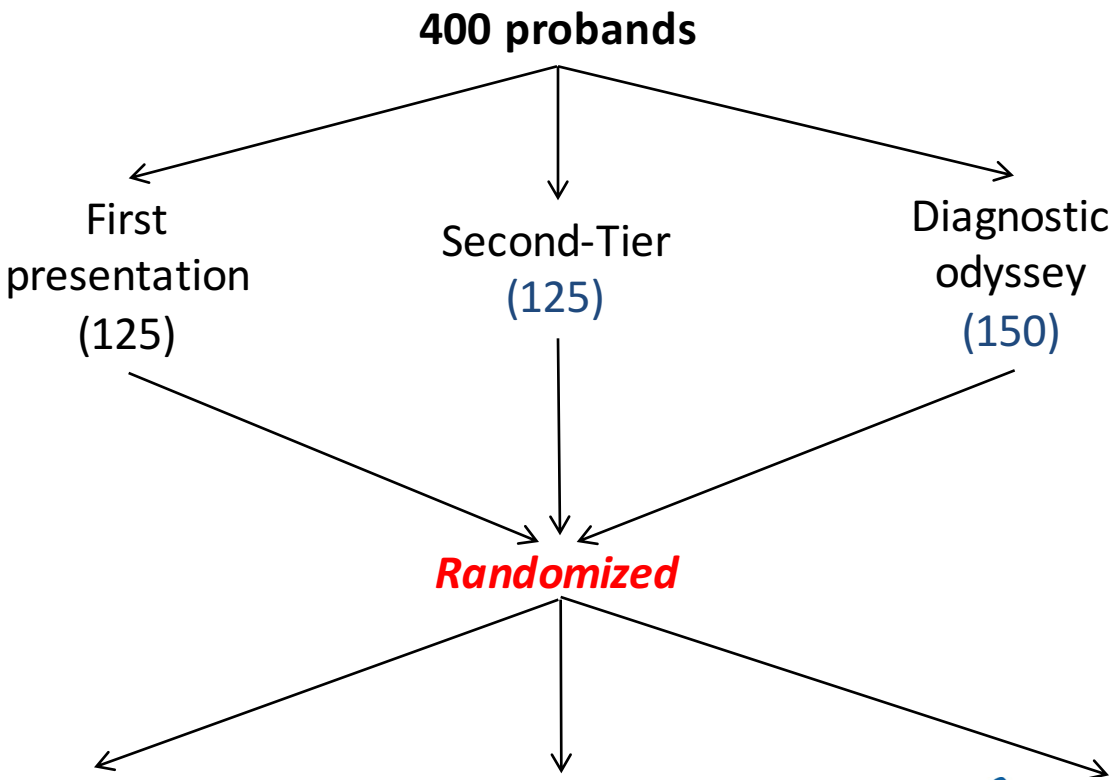
C4R activity 2a



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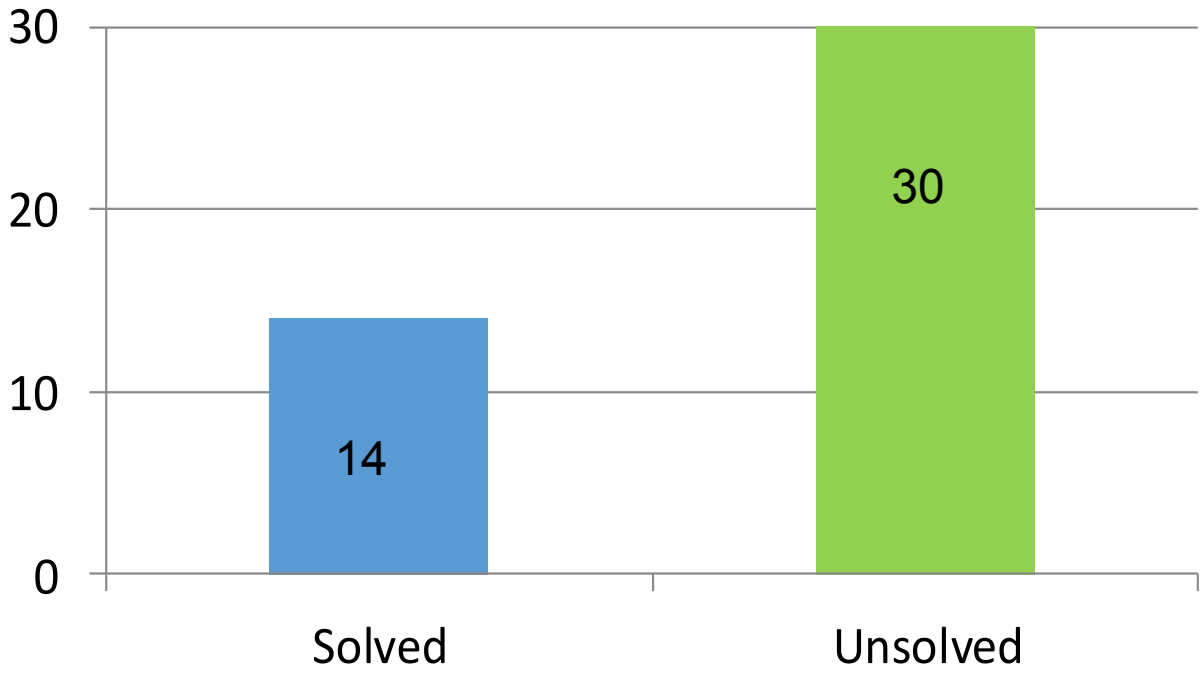
C4R activity 2a: Clinome



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C4R activity 2a: Clinome

CATEGORY 1: Initial presentation

> 3 genes on differential

2/5 (40%)

CATEGORY 2: Second-tier testing

Follow-up appointment, first investigations normal

6/15 (40%)

CATEGORY 3: Diagnostic odyssey

No diagnosis following standard-of-care

6/24 (20%)

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Diagnostic translation

Tools and Guidelines

OPEN ACCESS

ORIGINAL ARTICLE

The clinical application of genome-wide sequencing for monogenic diseases in Canada: Position Statement of the Canadian College of Medical Geneticists

Kym Boycott,[1] Taila Hartley,[1] Shelin Adam,[2] Francois Bernier,[3] Karen Chong,[4,5] Bridget A Fernandez,[6] Jan M Friedman,[2] Michael T Geraghty,[1] Stacey Hume,[7] Bartha M Knoppers,[8] Anne-Marie Laberge,[9] Jacek Majewski,[10] Roberto Mendoza-Londono,[4] M Stephen Meyn,[4,11] Jacques L Michaud,[9] Tanya N Nelson,[12] Julie Richer,[1] Bekim Sadikovic,[13] David L Skidmore,[14] Tracy Stockley,[15] Sherry Taylor,[7] Clara van Karnebeek,[2] Ma'n H Zawati,[8] Julie Lauzon,[3] Christine M Armour,[1] on behalf of the Canadian College of Medical Geneticists

Journal of Medical Genetics 2015

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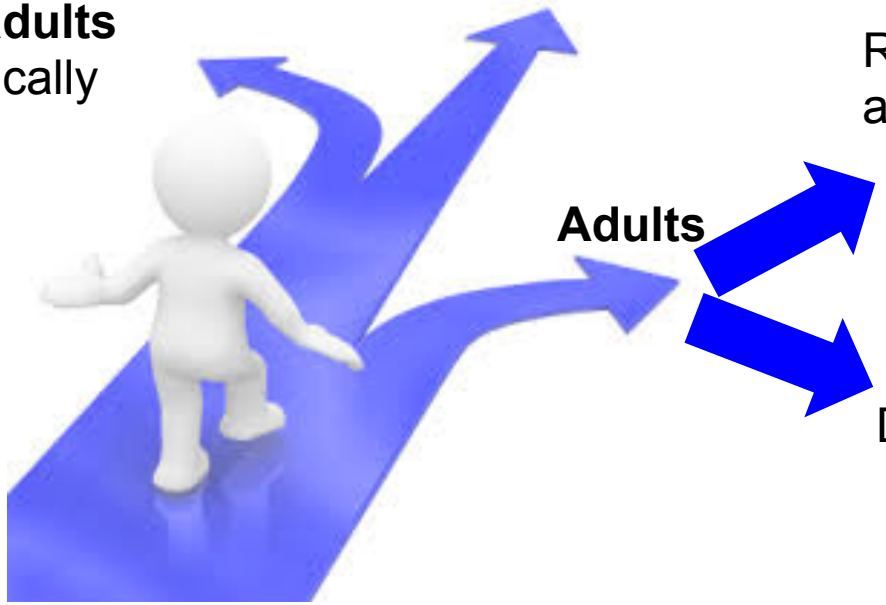
Canadian Guidelines: Primary indication is the focus

Approach to Incidental Findings

Children
Report medically actionable.
Adult onset only if prevents harm in them or other family members

Incapable adults
Report medically actionable



Adults

Report medically actionable or incidental

Do not report medically actionable or incidental

Boycott et al., JMG 2015

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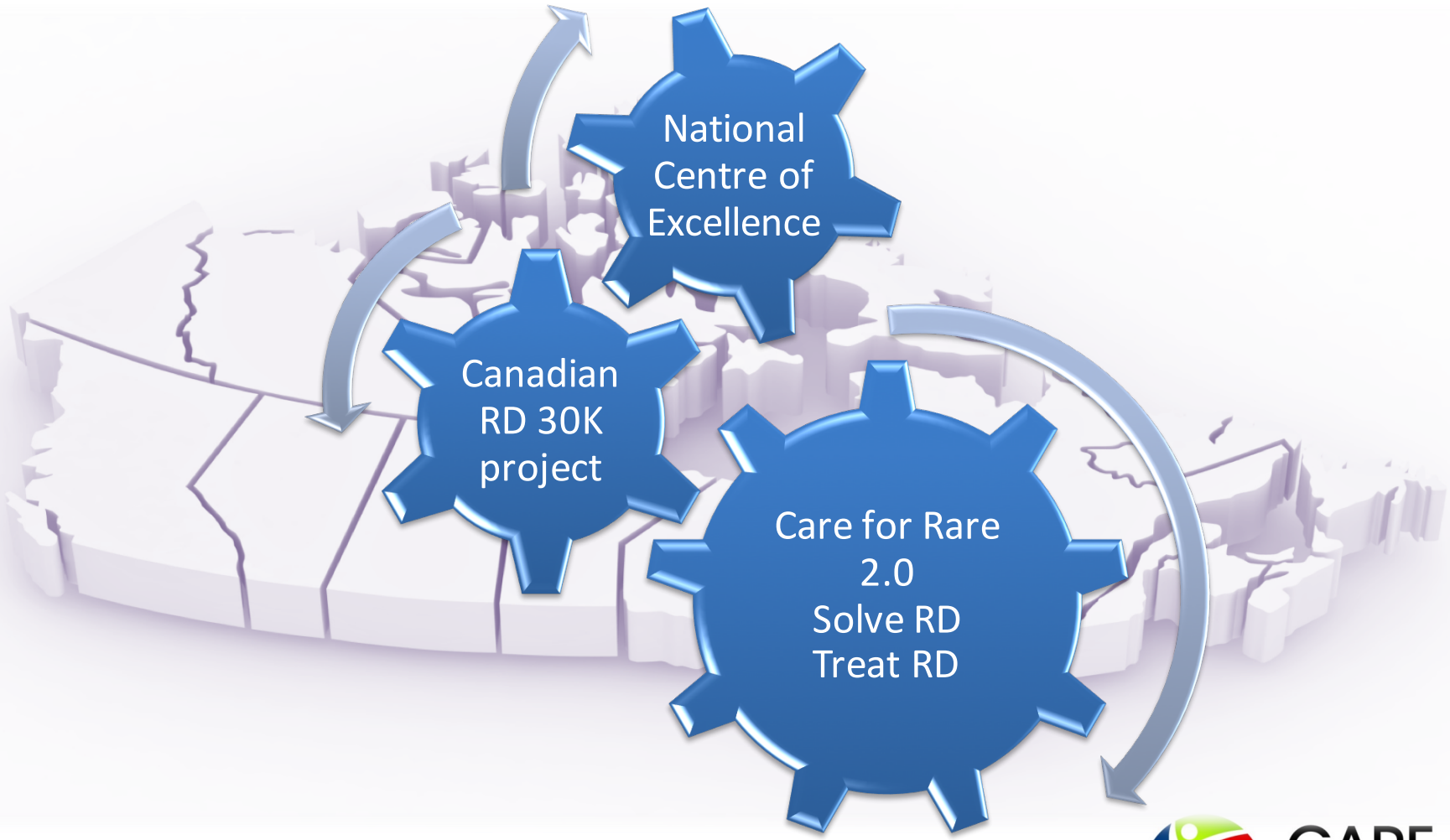
Care for Rare Next Steps



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GenomeCanada

CIHR IRSC
Canadian Institutes of Health Research
Instituts de recherche en santé du Canada

CHEO Research Institute
Institut de recherche

Alberta Children's Hospital Research Institute

OntarioGenomicsInstitute
The Future is in Our Genes.

GenomeQuébec

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