Evidence Summary

Australian Genomics Health Alliance

International engagement

Sharing data, tools and knowledge to create a global 'learning health system' is essential if we are to effectively accelerate and sustain the integration of genomics into healthcare.

Background

Genomic sequencing is rapidly transitioning into clinical practice, and implementation into healthcare systems has been supported by substantial government investment in at least 14 countries, totalling over USD$4 billion.

These large-scale precision health initiatives are driving transformative change under real-life conditions, while simultaneously addressing barriers to implementation and gathering evidence for wider adoption.

All of these large-scale initiatives have the opportunity to transform healthcare systems by integrating genomic technologies into clinical care. With this comes the responsibility to do so efficiently and effectively.

Sharing data, tools, experience and knowledge to create a global 'learning health system' is essential if we are to effectively accelerate and sustain the integration of genomics into healthcare[1].

Project aims

The Global Alliance for Genomics and Health (GA4GH) aims to enable interoperability between alliance members, through the development of technical standards and policy frameworks that promote sharing of genomic and health-related data.

As a Driver Project of GA4GH, Australian Genomics informs the iterative development of tools and policies for data sharing, tests them under real conditions and supports the dissemination of best practice locally.

GA4GH's 5-year strategic plan, **GA4GH: Connect**[2], focuses on the development of standards for sharing of clinical-grade genomic and phenotypic data, and associated metadata.

The GA4GH toolkit provides a framework to enable secure, responsible and accountable data sharing, as well as practical specifications for genomic data formats and standards for interoperable exchange.

ga4gh.org

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Key findings

Through Australian Genomics' role as a Driver Project for GA4GH, we are helping to develop and implement many GA4GH standards, including:

- Beacon API
- Breach Response Protocol
- Crypt4GH
- Data Repository Service API
- Data Use Ontology
- GA4GH Passports
- htsget API
- Information Models for Clinical/Genomics Data Exchange
- Machine Readable Consent
- Pedigree
- Phenopackets
- refget API
- Researcher Identity and Bona Fide Status
- REWS Toolkit items
- Testbed & Interoperability Demonstration
- Variant Annotation: Data Model
- Workflow Execution Service API

In order to strengthen international collaboration between large-scale precision health initiatives, Australian Genomics and Genomics England have pioneered the formalisation of the **Genomics in Health Implementation Forum** (GHIF) as a strategic partner of the GA4GH, and co-hosted seven meetings of this group.

These meetings bring together the leadership and technical experts from more than two dozen large-scale initiatives and aim to identify potential opportunities to collaborate and share resources and expertise.

This group is currently developing a web resource (toolkit) that will facilitate sharing experience across different initiatives as well as provide point-of-contact details for each in specific areas (for example, data, ethics and security).

Figure 1. Australian Genomics involvement in GA4GH work streams

Australian Genomics and Genomics England have pioneered the formalisation of the Genomics in Health Implementation Forum as a strategic partner of the GA4GH.

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Partnership with Genomics England

Australian Genomics has an established partnership with Genomics England and a program for staff exchange.

We are currently working with Genomics England on several collaborative projects including:

Harmonisation of clinical data capture and exchange in rare disease genomics.
We have defined a common minimal clinical dataset for rare disease, compared our respective data collection tools, and mapped the dataset to FHIR, with the aim of enabling exchange of clinical/phenotypic data.

Harmonisation of gene-disease validity assessments and gene panel content.
We have compared the content of over 40 virtual gene panels between Australian Genomics and Genomics England and more than 2,000 discrepancies in gene-disease validity assessments were identified and resolved.

We have deployed a local instance of PanelApp Australia, which provides a local platform to record and resolve gene-disease validity assessments between Alliance members.

Future co-development of the platform will include connection between the two instances of PanelApp to facilitate knowledge transfer between Genomics England and Australian Genomics, as well as extending PanelApp Australia for somatic cancer panel use.

Together, we are members of the **Gene Curation Coalition**, working towards harmonizing gene-disease validity assessments internationally.

Data sharing between cohorts.
We are currently working on a project to enable the sharing of genomic and phenotypic data between two cohorts of patients with unexplained young-onset renal failure who have undergone whole genome sequencing.

This will provide the opportunity to test out GA4GH data sharing tools and frameworks and develop pathways for joint analysis across other cohorts.

panelapp.agha.umccr.org

Australian Genomics, in partnership with GA4GH and other regional and global initiatives, has an important role in strengthening an international collaborative network and creating a global learning healthcare system.

Partnership with World Economic Forum

Members of our network have also been contributing to activities of the World Economic Forum (WEF). These include:

The WEF breaking barriers to health data project

The Project explores how to set up federated systems to enable cross border access of sensitive health data: from the perspectives of consent and governance; health economics; and the technical infrastructure.

Australian Genomics is a key partner in this project, along with Genomics England, Care4Rare Canada, and Intermountain Health USA. The group has released an eight-step guide to sharing sensitive health data in a federated data consortium model[3].

Global data access for solving rare disease

Dr Ilias Goranitis, a leading health economist in Australian Genomics has co-authored a white paper for the project titled Global Data Access for Solving Rare Disease: A Health Economics Value Framework[4].

The paper identified four possible areas of benefit for global data access; the diagnostic benefit, the clinical benefit, the improvement of clinical trials, and the personal benefit.

Australian Genomics Manager, Tiffany Boughtwood, and Data Program members Oliver Hofmann, Warren Kaplan and Marie-Jo Brion are working on the governance and technical aspects of the project, to enable federated cohort analysis between Care4Rare Canada and Variant Atlas, with data drawn from our Mitochondrial Disorders and Acute Care Genomics Flagships.

WEF global futures council for biotechnology

Tiffany Boughtwood is a member of the Council, and contributing to the development of recommendations and publications to inform international policy and industry.

Conclusion

Australian Genomics, in partnership with GA4GH and other regional and global initiatives, has an important role in strengthening an international collaborative network and creating a global learning healthcare system.

References

1. Stark Z, Dolman L, Manolio TA, Ozenberger B, Hill SL, Caulfied MJ, et al. Integrating Genomics into Healthcare: A Global Responsibility. American journal of human genetics. 2019;104(1):13-20. Available at: https://pubmed.ncbi.nlm.nih.gov/30609404/

2. Global Alliance for Genomics and Health. GA4GH Connect: A 5-Year Strategic Plan. Toronto, Canada: GA4GH; 2018. Accessed April 2020. Available from www.ga4gh.org/how-we-work/strategic-roadmap/

3. Chediak L. Sharing Sensitive Health Data in a Federated Data Consortium Model An Eight-Step Guide. Geneva, Switzerland: World Economic Forum; 2020. Accessed July 2020. Available from weforum.org

4. Besley J, Chaihorsky L, Chediak L, Currie G, Goranitis I, Marshall D, et al. Global Data Access for Solving Rare Disease: A Health Economics Value Framework. Geneva, Switzerland: World Economic Forum; 2020. Accessed April 28 2020. Available from weforum.org

Acknowledgement

Australian Genomics Health Alliance is funded by NHMRC grant 1113531 and the Australian Government's Medical Research Future Fund. Published 22 October 2019. Reviewed and updated August 2020.