Centre universitaire de santé McGill
McGill University Health Centre

L'Unité d'évaluation des technologies et des modes d'intervention en santé (UETMIS) du Centre Universitaire de Santé McGill (CUSM)

Health Technology Assessment Unit (TAU) of the MUHC

July 24, 2026

Emerging Technologies in Pediatric and Oncology Care

A Rapid Environmental Scan
Report no. 109

Report prepared for the Technology Assessment Unit (TAU) of the McGill University Health Centre (MUHC)

by

Nisha Almeida, PhD

Manager and Scientific Lead, Health Technology Assessment Unit (TAU), MUHC

Mission Statement

The MUHC Health Technology Assessment Unit (TAU) advises hospital administrators and clinical teams in difficult resource allocation decisions. Using an approach based on independent, critical evaluations of the available scientific evidence and a transparent, fair decision-making process, novel and existing medical equipment, drugs and procedures used by healthcare professionals are prioritized on a continuous basis ensuring the best care for life with the best use of resources.

Declaration of Conflicts of Interest

Members of TAU's research staff and policy committee declare no conflicts of interest.

Suggested citation

Almeida N. Emerging Technologies in Pediatric and Oncology Care: A Rapid Environmental Scan. Montreal (Canada): Technology Assessment Unit (TAU) of the McGill University Health Centre (MUHC); 2026 July 24. Report no. 109. 32 pages

DISCLAIMER

KEY FINDINGS AT A GLANCE

WHAT DID WE DO?

An environmental scan of emerging technologies shaping pediatric and oncology care

EMERINGING CAPABILITY AREAS

ONCOLOGY	PEDIATRICS
1 AI FOR GENOMICS & BIOMARKER DISCOVERY	1 ROBOTICS & IMAGE-GUIDED INTERVENTIONS
2 AI-ENABLED DETECTION & DIAGNOSIS	2 GENE EDITING & PRECISION THERAPEUTICS
3 LIQUID BIOPSY	3 GENOMIC MEDICINE
4 MULTI-OMICS SEQUENCING	4 DIGITAL HEALTH & VIRTUAL CARE
5 INTEGRATED PRECISION ONCOLOGY PROGRAMS	5 INTEGRATED CARE FOR MEDICAL COMPLEXITY

4 CROSS-CUTTING THEMES

From data to insight	AI and advanced analytics are increasingly being used to interpret complex clinical, imaging and molecular data.
From diagnosis to precision	Genomics, multi-omics and molecular diagnostics are enabling increasingly individualized approaches to diagnosis and treatment.
From hospital to connected care	Digital technologies and integrated care models are extending care beyond traditional hospital settings.
From technology to learning	Leading programs increasingly connect **clinical care + data + research + evaluation** to support continuous learning and improvement.

OVERALL SIGNAL

ONCOLOGY: Oncology innovation is increasingly focused on making cancer care more precise, predictive and data-driven, from early detection through treatment selection and monitoring.

PEDIATRICS: Pediatric innovation is combining precision medicine and advanced interventions with digitally enabled, coordinated models of care that extend beyond the hospital.

ACKNOWLEDGEMENTS

The contribution of the following individuals is gratefully acknowledged:

- Dr. Alan Forster, MD, Director of Quality, Innovation and Performance, MUHC, for strategic guidance and review.
- Alessia Paparella, MISt, Librarian, Medical Library of the MUHC, for support with the literature search and source identification.

REPORT REQUESTOR

This rapid environmental scan was requested by Dr. Lucie Opatrny, President and CEO of the MUHC, to identify emerging technologies and innovative care models in pediatric and oncology care.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

LIST OF ABBREVIATIONS

Abbreviation	Definition
AI	Artificial intelligence
CADTH	Canadian Agency for Drugs and Technologies in Health
CE	*Conformité Européenne* (European Conformity), mandatory regulatory sign indicating that a product complies with European Union health, safety, and environmental protection legislation.
CDA	Canada's Drug Agency
CLIA	The Clinical Laboratory Improvement Amendments (CLIA) of 1988 are United States federal regulatory standards that govern all clinical laboratory testing performed on humans
CRISPR	Clustered regularly interspaced short palindromic repeats
CYwMC	Children and youth with medical complexity
FDA	United States Food and Drug Administration
HTA	Health technology assessment
JLA	James Lind Alliance
LDT	Laboratory-developed test
MCED	Multi-cancer early detection
MUHC	McGill University Health Centre
RAS	Robot-assisted surgery
RUO	Research use only
TAU	Technology Assessment Unit
TRL	Technology Readiness Level
WES	Whole-exome sequencing
WGS	Whole-genome sequencing
WGTS	Whole-genome and transcriptome sequencing

EXECUTIVE SUMMARY

BACKGROUND

Health care is undergoing rapid technological change, with advances in artificial intelligence, precision medicine, genomics, robotics, digital health, and other emerging technologies creating new opportunities to transform how care is delivered.

To better understand this evolving landscape, the Health Technology Assessment Unit (TAU) of the McGill University Health Centre (MUHC) conducted a rapid environmental scan of emerging technologies and innovative care models in pediatric and oncology care.

The scan was undertaken as an initial exploration of areas of technological development that may be relevant to academic health centres and health systems. It is intended to provide a pragmatic snapshot of emerging innovations and stimulate discussion, learning, and further evaluation.

OBJECTIVE

To conduct a rapid environmental scan of emerging technologies, innovative care models, and examples of their implementation in pediatric and oncology care, providing a starting point for further exploration and benchmarking.

METHODS

- We conducted an environmental scan of innovative technologies and care models in pediatric and oncology settings using a combination of targeted literature searches and existing horizon scanning reports.
- To focus the scan on emerging and high-impact innovations, we used Canada's Drug Agency (CDA) [formerly the Canadian Agency for Drugs and Technologies in Health (CADTH)] Watch Lists on precision medicine, artificial intelligence, and pediatrics as foundational sources.
    - The CDA Watch Lists were developed using a modified James Lind Alliance priority-setting approach, whereby candidate technologies and issues were identified from published literature, industry reports, and news sources with input from expert advisory groups. Final topics were selected through consensus-based processes involving diverse panels of patients and caregivers, policy and legal experts, researchers, industry representatives, and health care professionals from across Canada.
- The TAU analysis further incorporated additional technologies and exemplary centres identified through the literature to broaden the scan.

SCOPE AND LIMITATIONS OF ANALYSIS

- This environmental scan focused on two clinical priority areas: **pediatrics and oncology**.
- The scan was informed by the CDA Watch Lists, which emphasize emerging technologies relevant to the Canadian healthcare context; consequently, Canadian organizations are prominently represented in the TAU analysis.
- This environmental scan was intended to identify illustrative examples of emerging technologies rather than provide a comprehensive or systematic review. We therefore caution that findings should be interpreted as a pragmatic starting point for benchmarking.

KEY FINDINGS

Oncology

Emerging technologies/care models identified through the CDA scan and literature review include:

1. **AI for genomic and biomarker discovery**
    - AI approaches that support identification of cancer-driving variants, biomarker discovery, protein structure modelling, and precision-medicine applications.
2. **AI-enabled cancer detection and diagnosis**
    - AI applications in imaging, digital pathology, mammography and endoscopy to support cancer detection, classification, risk prediction and prognostication.
3. **Liquid biopsy and multi-cancer early detection**
    - Blood-based approaches using circulating tumour DNA and other biomarkers to support early cancer detection, molecular profiling and treatment monitoring
4. **Genomic and multi-omics-based sequencing technologies**
    - Advanced sequencing approaches, including whole-genome, transcriptomic, long-read and single-cell technologies, to characterize disease biology and identify actionable findings.
5. **Integrated precision oncology programs**
    - Models that combine molecular diagnostics, research, clinical trials and multidisciplinary care to support implementation of precision oncology.

Pediatrics

Emerging technologies/care models identified through the CDA scan and literature review include:

1. **Advanced pediatric robotics and image-guided interventions**

- Robotic and image-guided technologies supporting increasingly complex pediatric surgical and interventional procedures.

2. **Precision therapeutics and gene editing**
    - Emerging approaches including personalized gene editing and precision therapeutic development.
3. **Genomic medicine and precision diagnostics for children with medical complexity**
    - Whole-genome and exome sequencing, chromosomal microarray, pharmacogenomics and other genomic approaches to diagnosis and treatment.
4. **Digital health and virtual care for children with medical complexity**
    - Digital platforms supporting remote monitoring, communication, information sharing and coordination for children with complex health needs.
5. **Integrated models of care for children with medical complexity**
    - Models designed to improve coordination across hospital, home, school and community settings.

CONCLUSIONS

- Across both clinical areas, the scan illustrates a shift toward **more data-driven, personalized and digitally enabled models of care**.
- Several themes cut across pediatric and oncology innovation:
    - increasing use of AI to interpret complex clinical and biological data;
    - movement toward earlier and more precise diagnosis;
    - growing integration of genomic and molecular information into clinical care;
    - development of technologies that enable personalized treatment and monitoring;
    - greater use of digital tools to support patients, families and clinicians; and
    - increasing emphasis on integrated models of care, rather than technology in isolation.
- Importantly, emerging technologies vary substantially in their level of development. Some are already being used in clinical practice, while others remain in research, pilot or early validation stages. Emergence should therefore not be interpreted as evidence of effectiveness, readiness for adoption or value.

NEXT STEPS

- This environmental scan provides a starting point for further exploration of technologies and care models that may be relevant to academic health centres.
- Future work can build on this landscape by examining selected technologies in greater depth, including their clinical evidence, implementation requirements, organizational context, patient and provider experience, costs, and potential value.

- **The scan does not constitute recommendations for adoption, investment or implementation.** Rather, it is intended to support awareness of emerging developments and provide a foundation for continued learning and evaluation.

SOMMAIRE

Technologies émergentes en soins pédiatriques et oncologiques : un examen rapide de l'environnement

CONTEXTE

Le secteur de la santé connaît une évolution technologique rapide, les progrès de l'intelligence artificielle, de la médecine de précision, de la génomique, de la robotique, de la santé numérique et d'autres technologies émergentes créant de nouvelles possibilités de transformer la prestation des soins.

Afin de mieux comprendre ce contexte en constante évolution, l'Unité d'évaluation des technologies de la santé (UETMIS-TAU) du Centre universitaire de santé McGill (CUSM) a mené une analyse rapide de l'environnement technologique, portant sur les technologies émergentes et les modèles de soins novateurs en pédiatrie et en oncologie.

Cette analyse visait à explorer les domaines de développement technologique susceptibles de concerner les centres hospitalo-universitaires et les systèmes de santé. Elle a pour objectif de fournir un aperçu pragmatique des innovations émergentes et de stimuler la discussion, l'apprentissage et une évaluation plus approfondie.

OBJECTIF

Réaliser une analyse rapide de l'environnement des technologies émergentes, des modèles de soins innovants et d'exemples de leur mise en œuvre dans les soins pédiatriques et oncologiques, afin de fournir un point de départ pour une exploration et une analyse comparative plus approfondies.

MÉTHODES

- Nous avons réalisé une analyse de l'environnement des technologies novatrices et des modèles de soins en pédiatrie et en oncologie en combinant des recherches documentaires ciblées et des rapports de veille technologique existants.
- Afin de concentrer l'analyse sur les innovations émergentes et à fort impact, nous avons utilisé les listes de surveillance de l'Agence canadienne des médicaments (ACM) [anciennement l'Agence canadienne des médicaments et des technologies de la santé (ACMTS)] sur la médecine de précision, l'intelligence artificielle et la pédiatrie comme sources fondamentales.
- Les listes de surveillance de l'ACM ont été élaborées selon une approche de priorisation modifiée de l'Alliance James Lind, qui a permis de recenser les technologies et les enjeux potentiels à partir de publications, de rapports de l'industrie et de sources d'information, avec la contribution de groupes consultatifs d'experts. Les sujets finaux ont été sélectionnés par consensus auprès de divers panels de patients et d'aidants naturels,

d’experts en politiques et en droit, de chercheurs, de représentants de l’industrie et de professionnels de la santé de partout au Canada.

- L’analyse TAU a également intégré d’autres technologies et des centres exemplaires recensés dans la littérature afin d’élargir le champ de l’analyse.

PORTÉE ET LIMITES DE L’ANALYSE

- Cette analyse environnementale s’est concentrée sur deux domaines cliniques prioritaires : la pédiatrie et l’oncologie.
- Cette analyse s’appuie sur les listes de surveillance de l’ACM, qui mettent l’accent sur les technologies émergentes pertinentes pour le contexte canadien des soins de santé; par conséquent, les organismes canadiens sont bien représentés dans l’analyse des pratiques habituelles.
- Cette analyse environnementale visait à identifier des exemples illustratifs de technologies de pointe et de centres de référence plutôt qu’à fournir un examen exhaustif ou systématique. Nous tenons donc à préciser que les résultats doivent être interprétés comme un point de départ pragmatique pour l’analyse comparative, et non comme un inventaire exhaustif des institutions.

PRINCIPAUX RÉSULTATS

Oncologie

Les technologies et modèles de soins émergents identifiés par l'analyse ACM et la revue de la littérature comprennent :

1. **IA pour la découverte de données génomiques et de biomarqueurs**
    - Approches d'IA qui soutiennent l'identification des variants à l'origine du cancer, la découverte de biomarqueurs, la modélisation de la structure des protéines et les applications de médecine de précision.
2. **Détection et diagnostic du cancer assistés par l'IA**
    - Applications de l'IA en imagerie, pathologie numérique, mammographie et endoscopie pour faciliter la détection, la classification, la prédiction des risques et le pronostic du cancer.
3. **Biopsie liquide et dépistage précoce de plusieurs cancers**
    - Approches sanguines utilisant l'ADN tumoral circulant et d'autres biomarqueurs pour faciliter le dépistage précoce du cancer, le profilage moléculaire et le suivi du traitement.
4. **Technologies de séquençage génomique et multi-omique**
    - Des approches de séquençage avancées, notamment les technologies de séquençage du génome entier, de la transcriptomique, du séquençage à longue lecture et de l'analyse unicellulaire, pour caractériser la biologie de la maladie et identifier des résultats exploitables.

5. **Programmes d'oncologie de précision**
    - Des modèles qui combinent diagnostic moléculaire, recherche, essais cliniques et soins multidisciplinaires pour soutenir la mise en œuvre de l'oncologie de précision.

Pédiatrie

Les technologies et modèles de soins émergents identifiés par l'analyse ACM et la revue de la littérature comprennent :

1. **Robotique pédiatrique avancée et interventions guidées par l'image**
    - Des technologies robotiques et de guidage par imagerie permettant de réaliser des interventions chirurgicales et interventionnelles pédiatriques de plus en plus complexes.
2. **Thérapies de précision et édition génique**
    - Approches émergentes, notamment l'édition génique personnalisée et le développement de thérapies de précision.
3. **Médecine génomique et diagnostics de précision pour les enfants présentant des problèmes de santé complexes**
    - Séquençage du génome entier et de l'exome, analyse chromosomique par microréseau, pharmacogénomique et autres approches génomiques pour le diagnostic et le traitement.
4. **Santé numérique et soins virtuels pour les enfants présentant des problèmes de santé complexes**
    - Plateformes numériques permettant la surveillance à distance, la communication, le partage d'informations et la coordination pour les enfants ayant des besoins de santé complexes.
5. **Modèles de soins intégrés pour les enfants présentant des problèmes de santé complexes**
    - Des modèles conçus pour améliorer la coordination entre les milieux hospitaliers, domestiques, scolaires et communautaires.

CONCLUSIONS

- Dans les deux domaines cliniques, l'analyse met en évidence **une évolution vers des modèles de soins plus axés sur les données, personnalisés et numérisés**.
- Plusieurs thèmes transversaux caractérisent l'innovation en pédiatrie et en oncologie :
    - utilisation croissante de l'IA pour interpréter des données cliniques et biologiques complexes ;
    - évolution vers des diagnostics plus précoces et plus précis ;
    - intégration croissante des informations génomiques et moléculaires dans les soins cliniques ;

  - développement de technologies permettant un traitement et un suivi personnalisés ;
  - utilisation accrue d'outils numériques pour accompagner les patients, leurs familles et les cliniciens ; et
  - importance accrue accordée aux modèles de soins intégrés, plutôt qu'à la technologie de manière isolée.

- Il est important de noter que le niveau de développement des technologies émergentes varie considérablement. Certaines sont déjà utilisées en pratique clinique, tandis que d'autres restent au stade de la recherche, des projets pilotes ou des premières phases de validation. L'émergence ne doit donc pas être interprétée comme une preuve d'efficacité, de maturité pour l'adoption ou de valeur.

PROCHAINES ÉTAPES

- Cette analyse environnementale constitue un point de départ pour une exploration plus approfondie des technologies et des modèles de soins susceptibles d'être pertinents pour les centres hospitalo-universitaires. Les travaux futurs pourront s'appuyer sur ce panorama en examinant plus en détail certaines technologies, notamment leurs données cliniques, leurs exigences de mise en œuvre, leur contexte organisationnel, l'expérience des patients et des professionnels de santé, leurs coûts et leur valeur potentielle.
- **Cette analyse ne constitue pas une recommandation d'adoption, d'investissement ou de mise en œuvre**. Elle vise plutôt à sensibiliser aux développements émergents et à jeter les bases d'un apprentissage et d'une évaluation continus.

Emerging Technologies in Pediatric and Oncology Care: A Rapid Environmental Scan

1. BACKGROUND

Health systems are increasingly expected to adopt technologies that can improve clinical outcomes, patient experience, access, operational performance, and research competitiveness. In pediatric and oncology care, innovation is occurring across the full care pathway: earlier diagnosis through molecular and imaging technologies; individualized treatment through genomics and gene editing; less invasive surgery through robotics; digital support for complex care; and new models that better connect hospital, home, and community services.

To better understand this evolving landscape, the Health Technology Assessment Unit (TAU) of the McGill University Health Centre (MUHC) conducted a rapid environmental scan of emerging technologies and innovative care models in pediatric and oncology care.

The scan was undertaken as an initial exploration of areas of technological development that may be relevant to academic health centres and health systems. It is intended to provide a pragmatic snapshot of emerging innovations and stimulate discussion, learning, and further evaluation.

2. OBJECTIVE

The objective of this report was to determine which emerging technologies and innovative care models are shaping pediatric and oncology care, and to document some examples of their implementation.

3. METHODS

3.1 Design and scope of environmental scan

TAU conducted a rapid environmental scan rather than a systematic review. Given the need for timely prioritization, the scan focused on two clinical priority areas: oncology and pediatrics. The unit of analysis was a technology-centre record: a single identified technology, research program, or care model associated with a named organization.

3.2 Foundational horizon-scanning sources

3.2.1 Canada's Drug Agency (CDA) Watch Lists

CDA Watch Lists on precision medicine, pediatrics, and artificial intelligence were used as foundational sources.[1-3] These reports used a modified James Lind Alliance priority-setting approach comprising: the development of preliminary lists of emerging technologies and issues through searches of published literature, news, and industry reports, with input from expert advisory groups; final topic selection through consensus-based workshops or panels that brought together diverse perspectives, including patients and caregivers, health professionals, researchers, policy and legal experts, and industry representatives from across Canada.

The CDA Watch Lists defined new or emerging technologies as those not yet available or widely adopted in Canada. The Watch Lists provided illustrative examples and did not rank items by importance, potential impact, or timing. For AI, broad technology categories were emphasized because of the rapid pace of development.

3.2.2 Key references

The following reference served as a foundational source to identify broad AI-enabled technologies in oncology: Tiwari A, Mishra S, Kuo TR. Current AI technologies in cancer diagnostics and treatment. Mol Cancer. 2025 Jun 2;24(1):159.[4]

3.3 Supplementary search and data extraction

Targeted literature and institutional website searches were used to broaden the scan and identify additional technologies, programs, and centres. The Medline search strategy is shown in Appendix A. Information was extracted into a structured workbook with the following fields: clinical domain; technology or care-model domain; domain description; technology or care-model name; description; centre where used or piloted; maturity; primary regulatory classification; regulatory status; and key reference or source.

3.4 Capability domains

Individual records were consolidated into broad capability domains to support strategic interpretation. The domains represent institutional capabilities rather than mutually exclusive technology classes; some innovations could reasonably fit more than one domain.

3.5 Maturity and regulatory status

Technology Readiness Levels (TRLs) were interpreted using the following broad categories: TRL 1-3, early research; TRL 4-6, prototype or pilot evaluation; TRL 7-8, late-stage validation; and TRL 9, routine or operational implementation (Appendix B). For care models and research platforms that do not fit a device-oriented TRL scale, maturity was described using the implementation status reported in the source materials. Regulatory status was recorded as reported, including FDA or CE authorization, laboratory-developed test status, research-use-only status, clinical trial status, or non-medical-device classification.

3.6 Scope and limitations

- This was a rapid, targeted scan and not a systematic or exhaustive review of technologies or centres.
- Canadian organizations are prominently represented because CDA Watch Lists were foundational sources and emphasize innovations relevant to the Canadian health system.
- Frequency in the source set may reflect publication visibility, source selection, and availability of public information rather than comparative institutional performance.
- Maturity and regulatory status were based on source descriptions and were not independently verified with regulators, manufacturers, or institutions. Regulatory status and adoption may change rapidly, particularly for AI, genomic tests, and emerging therapeutics.

4. RESULTS

4.1 Overview of identified records

We identified 41 technology-centre records: 23 related to oncology, including AI applications, and 18 related to pediatrics. The portfolio spanned foundational research tools, clinical research platforms, regulated medical devices and diagnostics, laboratory-developed tests, and mature care models. Detailed records are shown in Appendix C.

A review of the reported maturity information suggested that 70% (29 records) of the identified technologies were late-stage maturity (≥TRL 7):

- 21 records (51%) were operational or TRL 9
- eight were in late-stage validation or TRL 7-8
- seven were prototype or pilot-stage (TRL 4-6)
- two were described as early or experimental (TRL 1-3)
- three were programs without an applicable maturity level (Figure 1).

These categories are descriptive and reflect the source information rather than independent technical assessment.

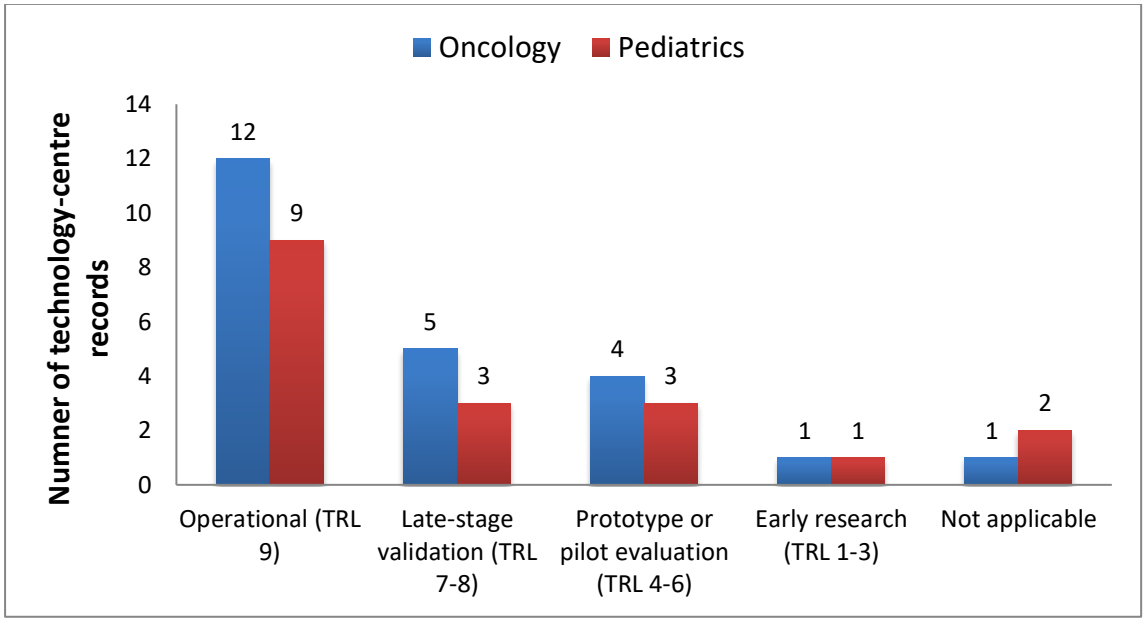

Figure 1. Technology maturity profile of the 41 identified technologies in oncology and pediatrics

4.2 Oncology technology landscape

4.2.1 Emerging technologies

The oncology scan identified five broad capability domains, described in detail in Table 1.

The identified oncology technologies focus on enabling more precise, data-driven cancer care across the full pathway, with an emphasis on harnessing AI for precision medicine.

Key areas include AI-supported genomics and biomarker discovery,[4-6] AI-enabled imaging and cancer detection,[4] liquid biopsy for early detection and molecular profiling,[7-9] and advanced genomic and multi-omics sequencing.[10] These technologies are complemented by digital decision-support tools and integrated precision oncology programs that help translate complex molecular findings into clinical trials, personalized treatment decisions, and coordinated care.

Table 1. Oncology capability domains and representative innovations

Capability domain	Strategic purpose	Illustrative examples
AI for genomics and biomarker discovery	Use of AI to identify cancer-driving variants, model protein structure, discover biomarkers, and match patients to precision-medicine trials.	AlphaFold; PMATCH
AI-enabled cancer detection, diagnosis, and prognostication	AI applied to mammography, radiology, digital pathology, and endoscopy to support detection, classification, risk prediction, prognosis, or recurrence assessment.	Clairity Breast; Prov-GigaPath; Owkin models; CHIEF; Endoscreener; REDMOD
Liquid biopsy and multi-cancer early detection	Analysis of circulating tumour DNA or other blood-based biomarkers to detect cancer, characterize actionable mutations, guide treatment, or support monitoring.	Galleri; CancerSEEK; FoundationOne Liquid CDx; Guardant360 CDx
Genomic and multi-omics sequencing	Whole-genome, exome, transcriptome, long-read, and single-cell multi-omics technologies used to characterize disease biology and generate clinically actionable findings.	Tapestri; ultrarapid nanopore sequencing; Oxford Nanopore PromethION
Digital precision oncology and clinical decision support	Digital tools that support trial matching, access to genetic information, education, consent, interpretation, and navigation of precision-medicine pathways.	PMATCH; Genetics Adviser
Integrated precision oncology programs	Organizational programs that combine advanced diagnostics, research, clinical trials, and multidisciplinary implementation to translate molecular findings into care.	PanCuRx; BrightSeq

4.3 Pediatric technology landscape

4.3.1 Emerging technologies

The pediatric scan identified a wider mix of emerging and mature clinical or organizational tools, categorized into 5 capability domains described in Table 2.

The identified pediatric technologies span advanced robotic interventions,[11,12] precision medicine,[13-17] digital care,[18] and service redesign.[19] They include robotic and image-guided systems for complex surgery, gene-editing and personalized therapeutic approaches, and genomic testing to diagnose rare conditions, guide treatment, and characterize pediatric cancers.

These innovations are complemented by digital tools that support remote monitoring, caregiver engagement, and information sharing, as well as integrated care models designed to improve coordination across hospital, home, school, and community settings for children with medical complexity.

Table 2. Pediatric capability domains and representative innovations

Capability domain	Strategic purpose	Illustrative examples
Advanced pediatric robotics and image-guided interventions	Robotic and minimally invasive systems that improve precision in complex pediatric surgery and enable novel neurosurgical or reconstructive procedures.	Renishaw neuromate; da Vinci Surgical System; magnetically controlled micro-robots
Precision therapeutics and gene editing	Development or delivery of highly individualized therapies based on a child's molecular or genetic profile.	Personalized CRISPR therapy; Casgevy; precision robotic drug-discovery platform
Genomic medicine and precision diagnostics	Genomic and molecular testing to diagnose rare disease, guide treatment, identify medication response, and characterize pediatric cancers.	WGS; WES; CMA; pharmacogenomics; BabySeq; BrightSeq; PediSeq
Digital health and virtual care for medical complexity	Technologies that support remote monitoring, caregiver engagement, virtual follow-up, and information exchange across hospital, home, school, and community.	DigiComp Kids; EnrichMyCare; Genetics Adviser
Integrated care models for children with medical complexity	Coordinated, multidisciplinary models that address fragmented care and support shared plans, transitions, family partnership, and hub-and-spoke delivery.	Complex Care for Kids Ontario; Connected Care; dedicated complex-care centres

5. CONCLUSIONS

- Across both clinical areas, the scan illustrates a shift toward **more data-driven, personalized and digitally enabled models of care**.
- Several themes cut across pediatric and oncology innovation:
    - increasing use of AI to interpret complex clinical and biological data;
    - movement toward earlier and more precise diagnosis;
    - growing integration of genomic and molecular information into clinical care;
    - development of technologies that enable personalized treatment and monitoring;
    - greater use of digital tools to support patients, families and clinicians; and
    - increasing emphasis on integrated models of care, rather than technology in isolation.
- Importantly, emerging technologies vary substantially in their level of development. Some are already being used in clinical practice, while others remain in research, pilot or early validation stages. Emergence should therefore not be interpreted as evidence of effectiveness, readiness for adoption or value.

6. NEXT STEPS

- This environmental scan provides a starting point for further exploration of technologies and care models that may be relevant to academic health centres.
- Future work can build on this landscape by examining selected technologies in greater depth, including their clinical evidence, implementation requirements, organizational context, patient and provider experience, costs, and potential value.
- **The scan does not constitute recommendations for adoption, investment or implementation.** Rather, it is intended to support awareness of emerging developments and provide a foundation for continued learning and evaluation.

APPENDICES

APPENDIX A MEDLINE SEARCH STRATEGY

Database(s): **Ovid MEDLINE(R) and Epub Ahead of Print and In-Process, In-Data-Review & Other Non-Indexed Citations and Daily** 1946 to May 28, 2026
Search Strategy:

#	Searches	Results
1	Oncology Service, Hospital/ or exp Medical Oncology/	35708
2	(oncolog* or cancer*).tw,kf.	2840425
3	1 or 2	2845913
4	exp Artificial Intelligence/ or exp Electronics/ or exp Biotechnology/	421901
5	((emerg* or new or innovat*) adj3 (technolog* or trend*)).tw,kf.	115616
6	4 or 5	529976
7	3 and 6	51141
8	exp Precision Medicine/	40247
9	(preci* adj3 medicin*).tw,kf.	40753
10	8 or 9	70371
11	7 and 10	2429
12	limit 11 to yr="2024-current"	1179
13	exp Specialties, Surgical/ or exp Surgical Oncology/ or exp Surgical Procedures, Operative/	3987503
14	su.fs.	2461500
15	surg*.tw,kf.	2790265
16	13 or 14 or 15	5777308
17	7 and 16	11409
18	limit 17 to yr="2024-current"	2849
19	exp Child/ or exp Infant/ or Adolescent/ or exp Pediatrics/ or Adolescent Medicine/	4309804
20	(perinatolog* or newborn* or new-born* or neonat* or neo-nat* or infan* or child* or adolesc* or paediatr* or pediatr* or baby* or babies* or toddler* or kid or kids or boy* or girl* or juvenile* or teen* or youth* or pubescen* or prepubesc* or preadolesc* or preteen* or tween*).tw,kf,hw,jw.	5588395
21	(pediatr* or paediatr* or neonat*).jw.	744977
22	19 or 20 or 21	5588395
23	18 and 22	90
24	11 and 22	67
25	23 or 24	153
26	limit 25 to yr="2024-current" [pediatric oncology and precision medicine or surgery]	114

APPENDIX B TECHNOLOGY READINESS LEVELS (TRLS)

Table B-1. Technology Readiness Levels

Maturity	Interpretation used in this report
TRL 1-3	Early research or proof of concept
TRL 4-6	Prototype, development, or pilot evaluation
TRL 7-8	Late-stage validation or demonstration in relevant settings
TRL 9	Operational or routinely implemented technology
Mature care model	Established care delivery model; TRL may not be applicable
Not specified	Source did not provide enough information for categorization

APPENDIX C DETAILED TECHNOLOGY-CENTRE RECORDS

Table C-1. Oncology-related technology-centre records

Domain	Technology/care model	Description	Centre(s)	Maturity	Regulatory classification	Regulatory status	Key reference
AI for Genomics and Biomarker Discovery	DeepSomatic (Google + UCSC)	Open-source artificial intelligence model designed to accurately detect cancer-causing mutations in a tumor's genetic sequence. It helps researchers and clinicians pinpoint the specific genetic variants driving cancer, making it a powerful tool for advancing precision oncology and personalized medicine.	UC Santa Cruz	TRL 7-8	Computational Structural Biology Tool	Because it is foundational software, it does not hold a formal medical device classification (such as an FDA or Health Canada approval). DeepSomatic is distributed freely on GitHub for genomic research. It functions as an analytical algorithm rather than a regulated, commercial medical device. When used for clinical decision-making or patient treatment, the regulatory burden falls entirely on the individual medical facilities.	Park J, Cook DE, Chang PC, et al. Accurate somatic small variant discovery for multiple sequencing technologies with DeepSomatic. Nat Biotechnol. 2025 Oct 16. doi: 10.1038/s41587-025-02839-x. Epub ahead of print. PMID: 41102444.
AI for Genomics and Biomarker Discovery	DeepSomatic (Google + UCSC)		Children's Mercy Hospital (Kansas City, USA)	TRL 7-8	Computational Structural Biology Tool	Same as above	
AI for Genomics and Biomarker Discovery	AlphaFold (Google DeepMind)	Breakthrough AI system developed by Google DeepMind that predicts the 3D shapes of proteins from their amino acid sequences (2024 Nobel Prize Chemistry)	Memorial Sloan Kettering	TRL 9	Computational Structural Biology Tool	Research and computational biology tool, not a medical device.	Tiwari A, Mishra S, Kuo TR. Current AI technologies in cancer diagnostics and treatment. Mol Cancer. 2025 Jun 2;24(1):159. doi: 10.1186/s12943-025-02369-9. PMID: 40457408; PMCID: PMC12128506.
AI for Genomics and Biomarker Discovery	AlphaFold (Google DeepMind)		Princess Margaret Cancer Centre	TRL 9	Computational Structural Biology Tool	Research and computational biology tool, not a medical device (open access software).	Schapira M, Halabelian L, Arrowsmith CH, Harding RJ. Big data and benchmarking initiatives to bridge the gap from AlphaFold to drug design. Nat Chem Biol. 2024 Aug;20(8):937-940. doi: 10.1038/s41589-024-01570-z. PMID: 38459278.
AI for Genomics and Biomarker Discovery	PMATCH	Machine learning to match patients with precision medicine trials in near real-time.	Princess Margaret Cancer Centre	TRL 5-6	Clinical Trial Allocation Software	Not medical device requiring regulatory approval	https://www.pmatch.ca/
AI-enabled cancer detection and diagnosis – Medical Imaging (Radiomics)	Radiomics-based Early Detection	Clairity Breast is an FDA-authorized AI platform designed to predict a woman's five-year risk of developing breast cancer using only standard screening mammograms	Beth Israel Deaconess Medical Center	TRL 9	Software as a Medical Device (SaMD)	FDA-approved	https://clairity.com/healthcare-providers/
AI-enabled cancer detection and diagnosis – Medical Imaging (Radiomics)	Prov-GigaPath to analyze gigapixel pathology images	AI-powered foundation model designed for digital pathology. Developed collaboratively by Microsoft, Providence, and the University of Washington	Providence Health	TRL 4-5	Pathology Foundation Model	Research Use Only (RUO)	Tiwari A, Mishra S, Kuo TR. Current AI technologies in cancer diagnostics and treatment. Mol Cancer. 2025 Jun 2;24(1):159. doi: 10.1186/s12943-025-02369-9. PMID: 40457408; PMCID: PMC12128506.

Domain	Technology/care model	Description	Centre(s)	Maturity	Regulatory classification	Regulatory status	Key reference
AI-enabled cancer detection and diagnosis – Medical Imaging (Radiomics)	Owkin models (MSIntuit CRC; RlapsRisk BC)	Owkin uses AI to analyze medical images (like tissue slides, CT scans, and ultrasounds), combining them with clinical data to predict patient outcomes and identify biomarkers. Their technology diagnoses, screens, and helps doctors predict relapse and survival	Gustave Roussy	TRL 9	I-powered Digital Pathology Software	CE-approved; not FDA-approved	https://www.owkin.com/blogs-case-studies/owkin-ai-model-predicting-survival-of-cancer-patients-from-radiology-and-clinical-data-is-published-in-the-european-journal-of-cancer
AI-enabled cancer detection and diagnosis – Medical Imaging (Radiomics)	Endoscreener	Computer-assisted detection of colorectal polyps during colonoscopies	Beth Israel Deaconess Medical Center	TRL 9	Computer-Aided Detection (CADe) Software	CE-approved and FDA-approved (510k)	
AI-enabled cancer detection and diagnosis – Medical Imaging (Radiomics)	Radiomics-based Early Detection Model (REDMOD)	Analyzes standard CT scans to detect subvisual tissue texture changes linked to pancreatic cancer (pancreatic ductal adenocarcinoma)	Mayo Clinic	TRL 5-6	Clinical Research AI Model	Research Use Only (RUO)	
Liquid Biopsy for Informing Cancer Treatments	Galleri Test (GRAIL Inc.)	The Galleri test is a multi-cancer early detection (MCED) blood test developed by healthcare company GRAIL, Inc..It is designed to detect more than 50 types of cancer before symptoms appear by analyzing circulating tumor DNA (ctDNA) fragments shed into the bloodstream	Dana-Farber Cancer Institute	TRL 9	Laboratory Developed Test (LDT)	Not FDA-approved. Filed for Premarket Approval (PMA)	
Liquid Biopsy for Informing Cancer Treatments	Galleri Test (GRAIL Inc.)		Mayo Clinic	TRL 9	Laboratory Developed Test (LDT)	Not FDA-approved. Filed for Premarket Approval (PMA)	
Liquid Biopsy for Informing Cancer Treatments	Galleri Test (GRAIL Inc.)		Princess Margaret Cancer Centre	TRL 9	Laboratory Developed Test (LDT)	Not FDA-approved. Filed for Premarket Approval (PMA)	Giridhar K, et al. Safety and Performance Results From PATHFINDER 2 (PF2), a Registrational Study of a Multi-Cancer Early Detection (MCED) Test in an Intended-Use Population [presentation]. American Society of Clinical Oncology (ASCO) Annual Meeting; 2026 May 29-June 2
Liquid Biopsy for Informing Cancer Treatments	CancerSEEK	CancerSEEK is an experimental blood test developed by researchers at Johns Hopkins University that simultaneously screens for eight different types of common cancers by analyzing circulating tumor DNA (ctDNA) and protein biomarkers in the blood	John Hopkins	Experimental	Laboratory Developed Test (LDT) / Companion Diagnostic (CDx)	FDA Approved as CDx for specific indicators (e.g., PIK3CA breast mutations). Broader multi-cancer early detection (MCED) variants are still processed via CLIA/CAP labs.	Tiwari A, Mishra S, Kuo TR. Current AI technologies in cancer diagnostics and treatment. Mol Cancer. 2025 Jun 2;24(1):159. doi: 10.1186/s12943-025-02369-9. PMID: 40457408; PMCID: PMC12128506.
Liquid Biopsy for Informing Cancer Treatments	FoundationOne Liquid CDx	Blood test (liquid biopsy) that analyzes the DNA in blood to detect cancer-related genetic mutations	Memorial Sloan Kettering	TRL 9	In Vitro Diagnostic (IVD) / Companion Diagnostic (CDx)	FDA-approved; not Health Canada-approved	Yaeger R, Martini JF, Pasquina L, et al. Clinical Validity of FoundationOne Liquid CDx for Detection of BRAFV600E in Colorectal Cancer. Cancer Res Commun. 2025 Sep 1;5(9):1566-1573. doi:

Domain	Technology/care model	Description	Centre(s)	Maturity	Regulatory classification	Regulatory status	Key reference
							10.1158/2767-9764.CRC-25-0002. PMID: 40832988; PMCID: PMC12417970.
Liquid Biopsy for Informing Cancer Treatments	FoundationOne Liquid CDx		Princess Margaret Cancer Centre	TRL 9	In Vitro Diagnostic (IVD) / Companion Diagnostic (CDx)	FDA-approved; not Health Canada-approved	
Liquid Biopsy for Informing Cancer Treatments	Guardant360 CDx	Blood test (liquid biopsy) used to analyze tumor DNA in patients with advanced cancer	MD Anderson Cancer Center	TRL 9	In Vitro Diagnostic (IVD) / Companion Diagnostic (CDx)	FDA-approved	Imai M, Nakamura Y, Yoshino T. Transforming cancer screening: the potential of multi-cancer early detection (MCED) technologies. Int J Clin Oncol. 2025 Feb;30(2):180-193. doi: 10.1007/s10147-025-02694-5. Epub 2025 Jan 12. PMID: 39799530; PMCID: PMC11785667.
Genomic and Multi-Omics-based Sequencing Technologies (WGS/WES/Transcriptome)	Tapestri® Platform	First and only high-throughput single-cell multi-omics sequencing system that simultaneously measures DNA and proteins from the exact same single cell	Memorial Sloan Kettering	TRL 8-9	Single-Cell Multi-omics Instrument	Research Use Only (RUO)	
Genomic and Multi-Omics-based Sequencing Technologies (WGS/WES/Transcriptome)	PanCuRx: Whole genome and transcriptome sequencing	PanCuRx (a translational research program in pancreatic cancer) to reduce time to deliver clinically actionable results from whole genome and transcriptome sequencing (WGTS)	Princess Margaret Cancer Centre	TRL 7	Clinical Trial Assays (CTA) / Laboratory Developed Tests (LDTs)	Not FDA or Health Canada Cleared. Actively operating as validated clinical trial protocols inside CAP/CLIA frameworks.	https://oicr.on.ca/programs/pancreatic-cancer-translational-research-initiative-pancurx/
Genomic and Multi-Omics-based Sequencing Technologies (WGS/WES/Transcriptome)	Nanopore genome sequencing (Oxford Nanopore Technologies PromethION platform)	A high-throughput, benchtop sequencing platform designed to sequence long strands of DNA and RNA in real-time. It is built for massive, population-scale genomics and complex transcriptomic studies	Mayo Clinic	TRL 9	Research Use Only (RUO) / Sequencing Instrument	Research Use Only (RUO)	Lin B, Hui J, Mao H. Nanopore Technology and Its Applications in Gene Sequencing. Biosensors (Basel). 2021 Jun 30;11(7):214. doi: 10.3390/bios11070214. PMID: 34208844; PMCID: PMC8301755.
Genomic and Multi-Omics-based Sequencing Technologies (WGS/WES/Transcriptome)	Genome-wide Sequencing Ontario	A clinical collaboration for rare disease diagnostics (GSO) is a partnership between The Hospital for Sick Children (SickKids) and CHEO	Hospital for Sick Children (SickKids) and CHEO	NA		NA	https://gsontario.ca/what-is-gso/
Digital Tools to Access Genetic Information and Navigate Oncology/Pediatric Care	Genetics Adviser: patient engagement tool for pre-test education, consent and post-test support		CHEO	TRL 8-9	Non-Regulated Digital Health Tool	Not medical device requiring regulatory approval	https://www.geneticsadviser.com/

Table C-2. Pediatric-related technology-centre records

Domain	Technology/care model	Description	Centre(s)	Maturity	Regulatory classification	Regulatory status	Key reference
Advanced Pediatric Robotics and Image-Guided Intervention	Renishaw neuromate® stereotactic robot da Vinci Surgical System	First pediatric robotic surgery program in Canada, heavily utilized for pediatric urology and complex reconstructive surgeries. First paediatric patient in Ontario to receive a robot-assisted stereoelectroencephalography (SEEG): a computer-controlled, image-guided robotic system designed specifically for stereotactic neurosurgery	Children's Hospital at London Health Sciences Centre (Ontario)	TRL 9	Medical device; First developed in 1998, it is now in its second generation (Gen II)	FDA-approved	Bütter A, Merritt N, Dave S. Establishing a pediatric robotic surgery program in Canada. J Robot Surg. 2017 Jun;11(2):207-210. doi: 10.1007/s11701-016-0646-0. Epub 2016 Oct 26. PMID: 27785727.
Advanced Pediatric Robotics and Image-Guided Intervention	da Vinci Surgical System	Used for cardiac surgery, pediatric surgery, pediatric gynecology, pediatric urology	Children's Hospital Los Angeles	TRL 9		FDA-approved	
Advanced Pediatric Robotics and Image-Guided Intervention: Micro-robots in neurosurgery	Magnetically controlled micro-robots	Researchers at SickKids and the University of Toronto are developing magnetically controlled micro-robots that could enable highly precise, minimally invasive brain surgery, potentially reducing the need for invasive procedures and improving outcomes for pediatric and adult patients.	Hospital for Sick Children (SickKids)	TRL 3-4		Not FDA-approved	
Precision Therapeutics and Gene Editing: Precision robotics for drug discovery	The advanced drug testing system screens multiple potential therapies simultaneously in beating heart cells.	A precision robotic platform developed by SickKids and the University of Toronto combines a miniature robot equipped with a specialized Z-shaped micropipette and 3D imaging technology to precisely inject and analyze molecules in dynamically moving cardiomyocytes, allowing simultaneous screening of multiple therapeutic candidates.	Hospital for Sick Children (SickKids)	TRL 4		Not medical device requiring regulatory approval	Wenkun Dou et al., Robotic manipulation of cardiomyocytes to identify gap junction modifiers for arrhythmogenic cardiomyopathy.Sci. Robot.9, eadm8233(2024). DOI:10.1126/scirobotics.adm8233
Telemedicine in Pediatric Care, particularly for Children and Youth with Medical Complexity	DigiComp Kids	Hospital-to-home monitoring system for Children with Medical Complexity	McMaster Children's Hospital	TRL 5-6		Not medical device requiring regulatory approval	Bird M, Carter N, Lim A, Kazmie N, et al. A Novel Hospital-to-Home System for Children With Medical Complexities: Usability Testing Study. JMIR Form Res. 2022 Aug 12;6(8): e34572. doi: 10.2196/34572. PMID: 35969456; PMCID: PMC9419046.
Telemedicine in Pediatric Care, particularly for Children and Youth with Medical Complexity	EnrichMyCare (UK)	AI-driven personal health and care monitoring platform designed for children and young people with disabilities, autism, ADHD, epilepsy, and other complex conditions.	UK National Health Service (NHS) trusts	TRL 7–8		Not considered medical device. Data privacy compliant across multiple international jurisdictions, including the UK, Canada, Australia	
Precision Therapeutics and Gene Editing	CRISPR to treat congenital and rare genetic diseases	Developed personalized treatment for a rare metabolic disease (CPS1 deficiency); CHOP and Penn researchers are actively launching an expanded trial to transition the platform into late-stage verification by targeting five additional patients across seven distinct urea cycle disorder genes	Children's Hospital of Philadelphia (CHOP)	TRL 6		Expedited authorization	Musunuru K, Grandinette SA, Wang X, et al. Patient-Specific In Vivo Gene Editing to Treat a Rare Genetic Disease. N Engl J Med. 2025 Jun 12;392(22):2235-2243. doi: 10.1056/NEJMoa2504747. Epub 2025 May 15. PMID: 40373211; PMCID: PMC12713542.

Domain	Technology/care model	Description	Centre(s)	Maturity	Regulatory classification	Regulatory status	Key reference
Precision Therapeutics and Gene Editing	Casgevy, the historic CRISPR gene-editing treatment for severe sickle cell disease and beta-thalassemia.		Boston Children's Hospital	TRL 9		FDA-approved	
Genomic medicine and precision diagnostics for Children and Youth with Medical Complexity	Whole exome sequencing (WES); Whole genome sequencing (WGS);	WES: For diagnosing rare or undiagnosed genetic disease WSG: Most comprehensive test available, providing a broader view of the genome to detect complex structural changes, intronic mutations, and regulatory regions;	Hospital for Sick Children (SickKids)	TRL 9		CLIA-validated LDT; FDA approval not required	Ungar W, Wu V, Marshall C. A microcosting and cost consequence analysis from a randomized controlled trial comparing genome sequencing with exome sequencing for genetic diagnosis Genetics in Medicine, 2025; 28
Genomic medicine and precision diagnostics for Children and Youth with Medical Complexity	Pharmacogenomic (PGx) testing	Tool that looks at a patient's genes to uncover why a medication may or may not be working. When used in the right context, it helps clinicians choose the right drug, at the right dose, for each child	Hospital for Sick Children (SickKids)	TRL 9	Laboratory Developed Test (LDT)	CLIA-validated LDT; FDA approval not required	Pan A, Scodellaro S, Khan T, Ushcatz I, et al. Pharmacogenetic profiling via genome sequencing in children with medical complexity. Pediatr Res. 2023 Mar;93(4):905-910. doi: 10.1038/s41390-022-02313-3. Epub 2022 Sep 27. PMID: 36167815; PMCID: PMC10033400.
Genomic medicine and precision diagnostics for Children and Youth with Medical Complexity	Chromosomal microarray analysis (CMA); Whole exome sequencing (WES); Whole genome sequencing (WGS); Pharmacogenomics		St. Jude Children's Research Hospital (Memphis, USA)	TRL 9			Yang W, Wu G, Broeckel U, et al. Comparison of genome sequencing and clinical genotyping for pharmacogenes. Clin Pharmacol Ther. 2016 Oct;100(4):380-8. doi: 10.1002/cpt.411. Epub 2016 Aug 18. PMID: 27311679; PMCID: PMC5684873.
Genomic medicine and precision diagnostics for Children and Youth with Medical Complexity	Chromosomal microarray analysis (CMA); Whole exome sequencing (WES); Whole genomse sequencing (WGS); Pharmacogenomics	The BabySeq project is a groundbreaking randomized clinical trial designed to measure the medical, behavioral, and economic impacts of integrating genomic sequencing into routine newborn care. It compares traditional newborn blood screening with whole-genome sequencing to expand the scope of detectable genetic risks. The BabySeq project revealed that 11% of healthy-appearing infants carried unanticipated genetic risks for childhood-onset conditions	Boston Children's Hospital / Brigham and Women's Hospital	TRL 7		Clinical trial	Holm IA, Agrawal PB, Ceyhan-Birsoy O, et al. The BabySeq project: implementing genomic sequencing in newborns. BMC Pediatr. 2018 Jul 9;18(1):225. doi: 10.1186/s12887-018-1200-1. PMID: 29986673; PMCID: PMC6038274.
Genomic medicine and precision diagnostics for Children and Youth with Medical Complexity	Whole exome sequencing (WES); Liquid biopsy	The BrightSeq initiative—short for Boston Research in Innovative Genomics for Hematologic and Tumor Sequencing—is a precision medicine collaboration launched to design, validate, and implement genomic assays tailored specifically to rare pediatric cancers	Boston Children's Hospital / Dana-Farber Cancer Institute	TRL 9		CLIA-validated LDT; FDA approval not required	
Genomic medicine and precision diagnostics for Children and Youth with Medical Complexity	Pediatric Genetic Sequencing (PediSeq) Project	The Pediatric Genetic Sequencing (PediSeq) Project is an NIH-regulated repository at the Children's Hospital of Philadelphia (CHOP) that maps genetic data from diverse pediatric cohorts. It provides researchers with deep	Children's Hospital of Philadelphia (CHOP)	TRL 8		Not considered medical device	

Domain	Technology/care model	Description	Centre(s)	Maturity	Regulatory classification	Regulatory status	Key reference
		molecular insights into the genetic drivers of rare congenital diseases, autism, and complex neurodevelopmental disorders.					
Integrated Models of Care for Children and Youth with Medical Complexity	Complex Care for Kids Ontario (CCKO) – hub-and-spoke RCT-validated program (JAMA Pediatrics 2023);	Provides integrated, individualized care for children and youth with medical complexity through a hub-and-spoke model linking tertiary pediatric centres and community clinics, with care coordinated by key workers across health, social, and community services	Provincial Council for Maternal and Child Health (PCMCH), Ontario	Not specified			
Integrated Models of Care for Children and Youth with Medical Complexity	LIFEspan Service	Provides a coordinated transition program for youth with cerebral palsy or acquired brain injury, preparing adolescents for the move to adult care and offering a single access point to specialized rehabilitation services after age 18.	Holland Bloorview Kids Rehabilitation Hospital + UHN-Toronto Rehab	Not specified			
Integrated Models of Care for Children and Youth with Medical Complexity	Connected Care (SickKids hospital-to-home transition with caregiver education + virtual visits);	Supports transitions from hospital to home or community care through family education, collaborative care planning with providers, and follow-up virtual visits after discharge to address ongoing needs and provide additional support.	Hospital for Sick Children (SickKids)	TRL 9		Not medical device requiring regulatory approval	
Integrated Models of Care for Children and Youth with Medical Complexity	CHEO Complex Care Centre (new building 2028); BC Children's Hospital Centre for Health Complexity (new building 2028)	CHEO and BC Children's Hospital are developing dedicated centres for children and youth with complex health needs, expected to open by 2028, that will co-locate multidisciplinary services and provide family supports to improve access, care coordination, and the quality of interdisciplinary care.	CHEO	TRL 9		Not medical device requiring regulatory approval	

REFERENCES

1. Basharat S, Smith A, Darvesh N, Rader T. 2023 Watch List: Top 10 Precision Medicine Technologies and Issues. *Canadian Journal of Health Technologies.* 2023. Available from: https://www.cda-amc.ca/sites/default/files/Tech_Trends/2023/ER0013_-_2023_Watch_List_Final.pdf.
2. Canada's Drug Agency. 2024 Watch List: Top 10 Technologies and Issues Related to Caring for Children and Youth With Medical Complexity. *Canadian Agency for Drugs and Technologies in Health.* 2024. Available from: https://www.cda-amc.ca/sites/default/files/attachments/2024-03/2024-watch-list-report.pdf.
3. Canada's Drug Agency. 2025 Watch List: Artificial Intelligence in Health Care: Health Technologies. *Canadian Agency for Drugs and Technologies in Health.* 2025. Available from: https://www.cda-amc.ca/sites/default/files/Tech_Trends/2025/ER0015%3D2025_Watch_List.pdf.
4. Tiwari A, Mishra S, Kuo T-R. Current AI technologies in cancer diagnostics and treatment. *Molecular Cancer.* 2025/06/02 2025;24(1):159.
5. Park J, Cook DE, Chang P-C, et al. Accurate somatic small variant discovery for multiple sequencing technologies with DeepSomatic. *Nature Biotechnology.* 2025/10/16 2025.
6. Schapira M, Halabelian L, Arrowsmith CH, Harding RJ. Big data and benchmarking initiatives to bridge the gap from AlphaFold to drug design. *Nature Chemical Biology.* 2024/08/01 2024;20(8):937-940.
7. Giridhar K, McDonnell CH, Kurbegov D, et al. Safety and performance results from PATHFINDER 2, a registrational study of a multi-cancer early detection (MCED) test in an intended-use population. *Journal of Clinical Oncology.* 2026/06/10 2026;44(17_suppl):LBA10509-LBA10509.
8. Yaeger R, Martini JF, Pasquina L, et al. Clinical Validity of FoundationOne Liquid CDx for Detection of BRAFV600E in Colorectal Cancer. *Cancer Res Commun.* Sep 1 2025;5(9):1566-1573.
9. Imai M, Nakamura Y, Yoshino T. Transforming cancer screening: the potential of multi-cancer early detection (MCED) technologies. *Int J Clin Oncol.* Feb 2025;30(2):180-193.
10. Lin B, Hui J, Mao H. Nanopore Technology and Its Applications in Gene Sequencing. *Biosensors (Basel).* Jun 30 2021;11(7).
11. Bütter A, Merritt N, Dave S. Establishing a pediatric robotic surgery program in Canada. *J Robot Surg.* Jun 2017;11(2):207-210.
12. Dou W, Shan G, Zhao Q, et al. Robotic manipulation of cardiomyocytes to identify gap junction modifiers for arrhythmogenic cardiomyopathy. *Sci Robot.* Oct 23 2024;9(95):eadm8233.
13. Musunuru K, Grandinette SA, Wang X, et al. Patient-Specific In Vivo Gene Editing to Treat a Rare Genetic Disease. *N Engl J Med.* Jun 12 2025;392(22):2235-2243.
14. Ungar WJ, Wu V, Marshall CR, et al. A microcosting and cost consequence analysis from a randomized controlled trial comparing genome sequencing with exome sequencing for genetic diagnosis. *Genet Med.* Feb 2026;28(2):101561.
15. Holm IA, Agrawal PB, Ceyhan-Birsoy O, et al. The BabySeq project: implementing genomic sequencing in newborns. *BMC Pediatr.* Jul 9 2018;18(1):225.
16. Pan A, Scodellaro S, Khan T, et al. Pharmacogenetic profiling via genome sequencing in children with medical complexity. *Pediatr Res.* Mar 2023;93(4):905-910.
17. Yang W, Wu G, Broeckel U, et al. Comparison of genome sequencing and clinical genotyping for pharmacogenes. *Clin Pharmacol Ther.* Oct 2016;100(4):380-388.
18. Bird M, Carter N, Lim A, et al. A Novel Hospital-to-Home System for Children With Medical Complexities: Usability Testing Study. *JMIR Form Res.* Aug 12 2022;6(8):e34572.

19. Cohen E, Quartarone S, Orkin J, et al. Effectiveness of Structured Care Coordination for Children With Medical Complexity: The Complex Care for Kids Ontario (CCKO) Randomized Clinical Trial. *JAMA Pediatr.* May 1 2023;177(5):461-471.