Ontario Health

Carrier Screening Programs for Cystic Fibrosis, Fragile X Syndrome, Hemoglobinopathies and Thalassemia, and Spinal Muscular Atrophy: Recommendation

Final Recommendation

Ontario Health, based on guidance from the Ontario Health Technology Advisory Committee, recommends publicly funding universal (population-wide) carrier screening programs for cystic fibrosis, fragile X syndrome, hemoglobinopathies and thalassemia, and spinal muscular atrophy conditional upon a pilot study to investigate and establish the implementation pathway.

Rationale for the Recommendation

The Ontario Health Technology Advisory Committee has reviewed the findings of the health technology assessment[1] and the recommendation of a subcommittee, the Ontario Genetics Advisory Committee.

The Ontario Health Technology Advisory Committee made this recommendation after considering the clinical, economic, patient preference and values, and ethical evidence. The clinical evidence supports that carrier screening programs are effective at identifying couples* with an increased risk of having a pregnancy affected by one of the screened health conditions and that this information impacts reproductive decision-making. Examining the economic evidence, the committee noted the cost-effectiveness of carrier screening programs is uncertain due to uncertainty around important considerations in the implementation pathway and associated costs for these programs. Similarly, there is uncertainty in the total additional costs of publicly funding carrier screening programs in Ontario over the next 5 years, which were estimated to be between $128 million and $491 million for a universal carrier screening program and between $0.8 million and $3 million for a risk-based

*A couple is defined as the two people who contribute their genes to a pregnancy.

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program. However, when treatment for the screened health conditions is considered, publicly funding a universal or risk-based carrier screening program would result in a reduction of total costs or cost savings over the next 5 years. After examining the economic evidence, the committee agreed that the uncertainty in the estimated costs warrants further study of the implementation pathway to better assess the cost-effectiveness and budget impact of carrier screening programs in Ontario for the genetic conditions evaluated.

The expressed preferences and values of people interviewed who accessed genetic carrier screening services and evidence from published studies, which included the perspectives of health care providers, also informed the committee's recommendation. People value the perceived impact of carrier screening programs, including the potential medical benefits from early detection and treatment, information for reproductive decision-making, and the social benefit of awareness and preparation. There was a strong expressed preference for thorough, timely, and unbiased information to allow for informed reproductive decision-making and for screening to be done early in the reproductive journey. The ethical evidence supports that access to publicly funded carrier screening programs assists people's reproductive autonomy. The committee members also acknowledged the potential for a universal carrier screening program to overcome the variability and inequity of access inherent in Ontario's current risk-based approach to carrier screening.

In reflecting further upon the uncertainties regarding the implementation pathway for a universal screening program, the committee suggested a pilot study be undertaken to determine program attributes including patient participation rates, program structure and model of delivery, laboratory capacity for testing, opportunity for publicly funded alternatives to support reproductive decision-making, and capacity of health human resources to support program needs. Additionally, the committee suggested the pilot study: i) examine the current state of risk-based carrier screening in the province and collect data about access and uptake to inform considerations for a future universal (population-wide) carrier screening program, and ii) adopt an approach that includes geographical variation in study sites and inclusion of equity-seeking groups. There was committee consensus that the pilot study be done with guidance from the Provincial Genetics Program and Prenatal Screening Ontario.

The committee did not explicitly mention the type of carrier screening testing methods (standard vs. expanded panels) in the recommendation, recognizing that testing methods may evolve over time to incorporate newer technology and that choice may be further informed through the development of an implementation pathway. Likewise, the committee did not explicitly recommend time of screening, recognizing that, while screening done preconception offers more reproductive options and time for decision-making, carrier screening should also be available prenatally (i.e., during pregnancy) in cases where preconception screening was not done.

Decision Determinants for Carrier Screening Programs for Cystic Fibrosis, Fragile X Syndrome, Hemoglobinopathies and Thalassemia, and Spinal Muscular Atrophy

Overall Clinical Benefit

Effectiveness

How effective is the health technology/intervention likely to be (taking into account any variability)?

Carrier screening programs for cystic fibrosis (CF), fragile X syndrome (FXS), hemoglobinopathies and thalassemia, and spinal muscular atrophy (SMA) likely results in the identification of couples at increased risk of having an affected pregnancy (GRADE: Moderate). Screening likely impacts reproductive decision-making (GRADE: Moderate) and may result in lower anxiety among pregnant people, although the evidence is uncertain (GRADE: Very low).

Safety

How safe is the health technology/intervention likely to be?

Carrier screening is a simple blood test, and complications are rare for the person(s) tested. There are no known associated harms to the pregnancy of having the blood test.

Burden of Illness

What is the likely size of the burden of illness pertaining to this health technology/intervention?

The estimated carrier frequencies are approximately 1 in 35 to 40 people for CF, 1 in 150 for females and 1 in 470 for males for FXS, up to 1 in 4 people for hemoglobinopathies and thalassemia among some higher-risk populations, and 1 in 40 to 60 people for SMA.[1]

Need

How large is the need for this health technology/intervention?

Carrier screening is currently publicly funded for people at increased risk for CF, hemoglobinopathies and thalassemia, FXS, or SMA, but testing is inconsistent across Ontario.

Patient Preferences and Privacy

Patient Preferences and Values

Do patients and their partners have specific preferences, values, or needs related to the health condition, health technology/intervention, or life impact that are relevant to this assessment?

Participants value the perceived potential positive impact of carrier screening programs such as medical benefits from early detection and treatment, information for reproductive decision-making, and the social benefit of awareness and preparation. There was a strong preference expressed for thorough, timely, unbiased information to allow for informed reproductive decision-making.

Autonomy, Privacy, Confidentiality, and/or Other Relevant Ethical Principles as Applicable

Are there concerns regarding accepted ethical or legal standards related to patient autonomy, privacy, confidentiality, or other ethical principles that are relevant to this assessment?

Carrier screening can support reproductive autonomy, but there are ethical challenges with autonomous and informed decision-making, well-being, and privacy. Carrier screening can impact prospective parents, family members, and future children. Additional ethical considerations related to public health aims of disease prevention and cost-effectiveness raise concerns about ableism, transparency, equity, and stewardship. There may be several opportunities to avoid or mitigate these ethical challenges. Attention to procedural values can support ethical deliberations about the implementation of carrier screening.

Equity and Patient Care

Equity of Access or Outcomes

Are there disadvantaged populations or populations in need whose access to care or health outcomes might be improved or worsened that are relevant to this assessment?

Currently in Ontario, the decision to use carrier screening is based on a person's risk factors, which may lead to variation in access to screening. Carrier screening is typically performed during pregnancy in Ontario; however, preconception carrier screening would allow for the most reproductive options for people and the most time to make reproductive decisions. Organized and consistent implementation of carrier screening would support equitable access to testing.

Patient Care

Are there challenges in the coordination of care for patients or other system-level aspects of patient care (e.g., timeliness of care, care setting) that might be improved or worsened that are relevant to this assessment?

The decision to participate in carrier screening should be made by the person to be tested and based on appropriate information and pre-test genetic counselling. Appropriate post-test genetic counselling for identified carriers or couples at increased risk of having an affected pregnancy should be provided to help people make informed reproductive decisions as well as to provide support. In some instances, carriers may be at risk of developing associated conditions in the future, which may

require care and treatment. Positive carrier screening results may also lead to cascade testing of family members.

Cost-Effectiveness

Economic Evaluation

How efficient is the health technology/intervention likely to be?

Short-term cost-effectiveness analyses (CEAs) for preconception or prenatal carrier screening programs for the given conditions identified more pregnancies or couples at risk and more reproductive choice options (compared with no screening). The CEAs found similar effectiveness of compared carrier screening strategies with respect to the number of affected births and number of at-risk pregnancies detected, and higher costs with universal carrier screening options. Universal screening with standard panels was preferred when we compared all strategies together (incremental cost-effectiveness ratios [ICERs] vs. no screening: $367,731 per affected birth averted, $29,106 per at-risk pregnancy detected [preconception carrier screening], $431,807 per affected birth averted, $29,759 per at-risk pregnancy detected [prenatal carrier screening]). Lifetime cost–utility analyses suggested small differences in quality-adjusted life-years between the compared strategies and cost savings with preconception or prenatal carrier screening programs compared with no screening.

Feasibility of Adoption Into Health System

Economic Feasibility

How economically feasible is the health technology/intervention?

Based on the short-term analyses, publicly funding preconception carrier screening programs over the next 5 years would require between $1.3 million and $2.7 million for risk-based screening or between $208 million and $491 million for universal screening. Similarly, publicly funding prenatal carrier screening programs over the next 5 years would require between $0.8 million and $1.7 million for risk-based screening or between $128 million and $305 million for universal screening. Accounting for treatment costs of the screened health conditions resulted in a decrease in the budget impact of universally provided carrier screening programs (e.g., preconception universal carrier screening program with standard and expanded panels would result in additional 5-year costs of $170 million and $487 million, respectively) or cost savings for risk-based programs (e.g., preconception risk-based carrier screening programs would result in total 5-year savings of about $4 million and $2.6 million with standard and expanded panels, respectively).

Organizational Feasibility

How organizationally feasible is it to implement the health technology/intervention?

Uncertainties exist with important program components that impact access, care, program resource needs, and costs of a carrier screening program implementation pathway. Because of this, the implementation of a universal carrier screening program in Ontario would benefit from an initial feasibility study to reduce these uncertainties.

Reference

(1) Ontario Health. Carrier screening programs for cystic fibrosis, fragile x syndrome, hemoglobinopathies and thalassemia, and spinal muscular atrophy: a health technology assessment. Ont Health Technol Assess Ser [Internet]. 2023 Aug;23(4):1–398. Available from: https://www.hqontario.ca/evidence-to-improve-care/health-technology-assessment/reviews-and-recommendations/carrier-screening-programs-for-cystic-fibrosis-fragile-x-syndrome-hemoglobinopathies-and-thalassemia-and-spinal-muscular-atrophy

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