ONTARIO HIV TREATMENT NETWORK

Cost-effectiveness of rapid point-of-care testing (POCT) programs for HIV

Questions

- What evidence exists regarding the cost-effectiveness of rapid point-of-care testing (POCT) programs for HIV?
- How is the cost-effectiveness of these programs determined?

Key Take-Home Messages

- Studies suggest that rapid HIV tests can be cost-effective in high-income settings under various scenarios (1-5).
- Criteria to examine the cost-effectiveness of rapid tests for HIV include cost per test conducted and cost per reactive test (4, 6), cost per quality adjusted life year (QALY)[1] gained (5, 7-11), and an incremental cost-effectiveness ratio (ICER or $/QALY)[2] (1, 12-14) which compares cost and outcomes of an HIV testing initiative, relative to the next most effective initiative (12).
- Select studies used modelling and compared different scenarios to estimate the future cost-effectiveness of HIV rapid testing (1, 13, 15).

The Issue and Why it's Important

At the end of 2016, the Public Health Agency of Canada estimated that 14% of individuals living with HIV in Canada were undiagnosed (16). In order to identify those living with HIV who are currently undiagnosed, increased testing is critical (1). New point-of-care tests have become available in recent years which can rapidly test for HIV in less than 20 minutes using an oral swab or a fingerstick blood sample (17). However, this can lead to increased costs due to additional testing and due to the increased number of years on treatment among individuals diagnosed earlier (13).

The purpose of this rapid response is to examine what evidence exists regarding the cost-effectiveness of rapid point-of-care testing programs for HIV in high-income countries and to determine how the cost-effectiveness of these programs is calculated.

References

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[1] A quality-adjusted life year (QALY) is an outcome measure that considers both the quality and the quantity of life lived. The QALY is based on the number of years of life added by the intervention (21).
[2] When evaluating several programs in a cost-effectiveness analysis, the incremental cost-effectiveness ratio (ICER) can be expressed in terms of cost per QALY gained ($/QALY) (21).

What We Found

HIV testing in health care settings

One systematic review on cost-effectiveness of HIV screening in high-income countries found that certain healthcare settings, such as sexually transmitted infection clinics or emergency departments, may play an important role in HIV screening (i.e. offering HIV testing) (2). For example, a 2017 UK study conducted a health economic modelling analysis to estimate the cost-effectiveness of HIV testing in primary care (1). Authors based their model on a randomised-controlled trial conducted in Hackney, London, an area with a high prevalence of HIV. The study assessed the cost-effectiveness of the trial by fitting model diagnosis rates to the trial data, using trial testing costs and projected future treatment costs. The trial was predicted to be cost-effective in the medium term (i.e. between 13 years and 18 years) in the modelled scenarios (two of which used cost data from Canada) (1).

Another systematic review aimed to identify the types of HIV testing services provided and their associated costs for different approaches across different settings, populations, and contexts (6). This review identified the cost per case enrolled and cost per case detected for HIV testing studies (6). One study included in this systematic review was conducted in an urban emergency department in Denver, Colorado (6, 18). Over 16 months, "nontargeted rapid HIV screening" (intervention) and "diagnostic rapid HIV testing" (control) were alternated in four-month time blocks, and the study aimed to compare the costs of these two rapid testing approaches (18). The intervention phase offered voluntary and free opt-out rapid HIV testing while in the control phase the patients were identified as being at risk for HIV infection by their treating physicians and were offered opt-in rapid HIV testing. It is important to note that in both approaches the testing was performed by obtaining a blood sample, which was sent to the hospital's laboratory for rapid HIV testing. The average costs per HIV diagnosis were USD 9,932 and USD 7,839 for the intervention and control phases respectively. Authors concluded that the "diagnostic rapid HIV testing" was more economically efficient per newly-diagnosed patient than the "nontargeted rapid HIV screening" because the latter identified only 11 additional infections in the emergency department at a high incremental cost of USD 10,693 per additional infection (18).

Similarly, a 2011 study conducted among participants from inner-city Baltimore examined a rapid oral-fluid HIV testing program in an emergency department with the goal of estimating the cost effectiveness of three different staffing models: indigenous [internal] medical staff only, exogenous [external] staff only, or exogenous staff plus medical staff (a hybrid) (19). Costs were calculated per patient tested, per confirmed HIV-positive patient detected, and per patient linked to care. Of the different three staffing models, the indigenous staffing model had the highest cost per patient test (USD 109) but

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had the lowest cost (USD 4,937) per patient linked to care (19).

A systematic review of economic evaluations of HIV testing approaches in high-income countries included five studies, all conducted in the U.S. (5). The review concluded that all five studies reported outcomes as cost per quality adjusted life years and found that rapid HIV testing approaches were cost-effective in various scenarios (5, 7-11). Furthermore, a commentary on use of point-of-care technologies in Canada noted that in the U.S., point-of-care testing programs are found to be cost effective because of their potential for early detections, establishment of rapid linkages to care, and potential role in control of HIV transmission which, over time, outweigh initial set-up costs (3, 20).

Another study provides an analysis of the cost per HIV test conducted in four HIV testing pilot study sites in the UK (15). The study estimated the cost variations based on different staff pay levels, test uptake rates, and rates of HIV positivity (15). Authors compared HIV testing in two acute general medical admission units (which used laboratory serology tests) and two general practices (which used point-of-care tests) (15). Findings suggested that testing may be more cost-efficient in acute medical admissions units than in general practices because of a shorter offer time, higher patient uptake, higher HIV positivity, and lower diagnostic test costs (15). One study in the U.S. compared the cost-effectiveness of HIV screening in three settings: sexually transmitted infection clinics, routine screening in hospital emergency departments, and diagnoses made in inpatient settings (14). The study ran a model for 10,000 index patients for each setting in order to examine alternative scenarios (14). To measure cost-effectiveness, the study calculated the incremental cost-effectiveness ratio for each scenario. The study found that diagnosing persons in emergency department settings was cost-saving compared with diagnosing persons in inpatient facilities, and that diagnosing in sexually transmitted infection clinics was also cost-saving when compared with both emergency department settings and inpatient facilities (14).

HIV testing among targeted populations

A 2018 systematic review found that repeated HIV testing is an important tool for prevention among high-risk groups such as people who inject drugs and men who have sex with men (2). For example, a study in Portugal found both one-time routine rapid HIV testing and annual testing to be cost-effective among men who have sex with men and people who inject drugs (21). The study used a threshold of EUR 30,000 per quality adjusted life year when determining whether a given intervention is cost-effective. This threshold is inspired by the UK's National Institute for Health and Clinical Excellence (NICE) guidelines (21, 22). Canadian proposed thresholds range between CAD 20,000–100,000 per quality

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adjusted life year gained depending on other factors such as patient characteristics and the availability of other treatment options (5, 23).

A 2019 study among men who have sex with men in the Netherlands examined four scenarios using an economic model to calculate costs, quality adjusted life years, and incremental cost-effectiveness ratios from 2018–2027 (13). The study concluded that increased HIV testing could prevent considerable numbers of new HIV infections among men who have sex with men, but may be cost-effective only if targeted at high-risk individuals, such as those with many partners (13).

A 2016 study in the U.S. assessed the cost-effectiveness of HIV testing of men who have sex with men and people who inject drugs at three- and six-month intervals using fourth-generation tests and rapid tests (12). Cost-effectiveness was examined by calculating the incremental cost-effectiveness ratio. The study found that testing men who have sex with men as frequently as every three months was very cost effective under almost all scenarios evaluated. Testing people who inject drugs semi-annually could be cost effective using a laboratory-based test but not with a rapid point-of-care test (12).

A 2017 study performed an economic evaluation of HIV testing for men who have sex with men in community-based settings and compared them across six European cities where all but one city used rapid blood testing (4). The study performed an economic analysis following international recommendations for economic evaluations in HIV (4, 24). Final outcomes included the cost per HIV test and the cost per reactive HIV test and found that the benefits were obtained at an acceptable cost, in comparison to median costs found in prior literature (4, 6).

HIV testing among the general population

A four-month pilot in the UK offering rapid HIV point-of-care testing to the general population found it to be acceptable, feasible, effective, and low cost (25). Costs calculated included the cost per patient (GBP 2), and the cost per case of HIV identified (GBP 1,083) (25). Similarly, a study examining rapid HIV testing at Walgreens pharmacies in the U.S. found that retail pharmacies may be an effective venue for those who have never been tested for HIV to access HIV testing, with calculated costs including mean cost per person tested (USD 41.79), and the mean cost per reactive result (USD 5,057) (26).

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Factors That May Impact Local Applicability

The studies identified in this rapid response were conducted across different populations in various high-income countries with different healthcare structures and financing models, and therefore their analyses may not be generalizable to the Canadian context. Furthermore, the availability and cost of the rapid HIV point-of-care tests used in the studies may vary across countries and settings.

What We Did

We searched Medline using a combination of text terms HIV and testing and (point-of-care or POC*) and (cost-effective* or cost-benefit analysis). Google searches with various combinations of these terms were also conducted. Searches were conducted on March 24, 2020, and results limited to articles published in the English language since 2010. Reference lists of identified articles were also searched. Only those articles examining cost effectiveness of HIV point-of-care testing in high-income settings were included. The search yielded 254 references from which 26 were included.

Rapid Response: Evidence into Action

The OHTN Rapid Response Service offers quick access to research evidence to help inform decision making, service delivery and advocacy. In response to a question from the field, the Rapid Response Team reviews the scientific and grey literature, consults with experts, and prepares a review summarizing the current evidence and its implications for policy and practice.

Suggested Citation
Rapid Response Service. Cost-effectiveness of rapid point-of-care testing (POCT) programs for HIV. Toronto, ON: Ontario HIV Treatment Network; April 2020.

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