



Connect Care's Best Practice Advisory for Syphilis

What's Inside...

Infectious syphilis has risen significantly in Alberta from a rate of 3.9 per 100,000 population in 2014, to 72.2 per 100,000 in 2021 (1). As a result of this increase, nearly 200 infants were diagnosed with congenital syphilis between 2016 and 2021, including 39 stillbirths (1). In an effort to address the syphilis outbreak, Alberta Health Services (AHS) implemented a Best Practice Advisory within their clinical information system, Connect Care, to screen pregnant women presenting to emergency departments with no prior prenatal syphilis screening.

In this case study, we describe the process and planning done by AHS STI Services to create an outbreak strategy using a Best Practice Advisory. The BPA is an example of a promising practice for syphilis testing alerts that can be adapted in other parts of the country.

Insights for public health responses to congenital syphilis testing and prevention

On August 10, 2021, a Best Practice Advisory (BPA) for prenatal syphilis screening went live in Alberta's new provincial clinical information system, Connect Care. The BPA is intended to alert ordering providers of pregnant women presenting to emergency departments that have not had prenatal syphilis screening during their current pregnancy.

This case study describes Alberta's syphilis BPA in the Connect Care system as an example of a promising practice for public health practitioners. We provide an epidemiologic review of congenital syphilis and the drivers of congenital syphilis outbreaks, an overview of electronic health records, the rationale behind the implementation of Connect Care and the syphilis BPA, and the development of the BPA.



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CONGENITAL SYPHILIS

Congenital syphilis is caused by the bacterium *Treponema pallidum*. It is most commonly transmitted to a baby *in utero*, although transmission can also occur at the time of delivery (2). Transmission to the unborn child has been described as early as 9 weeks of pregnancy, but in general, the closer to term syphilis is acquired, the higher the risk of transmission to the fetus (3, 4). Primary and secondary maternal syphilis cases pose up to a 90% risk of transmission to the fetus, and adverse pregnancy outcomes are more severe in these stages (2). Early latent stages of the infection pose a 40% risk of transmission and late latent syphilis stages pose a risk of 10% (5, 6). If untreated, vertical infection can lead to miscarriage, pre-term birth, stillbirth, neonatal death, or clinical manifestations of congenital syphilis in the newborn. For more information, see the [NCCID Congenital Syphilis Disease Debrief](#) (7).

CONGENITAL SYPHILIS IN CANADA

Congenital syphilis has risen significantly in Canada in recent years, from 7 cases in 2017 to 96 cases in 2021, a rate increase from 6.2 cases per 100,000 live births to 53.8 cases per 100,000 live births (8). This increase in cases coincides with an epidemic of infectious syphilis among women aged 15-35 years (9). Between 2014 and 2018, Canada experienced a national increase of 151% in the rate of syphilis, with the most dramatic increases observed in the Prairie provinces (10). Syphilis rates more than doubled in 2021 from 11.3 cases per 100,000 population in 2017 to 30.0 cases per 100,000 population (8).

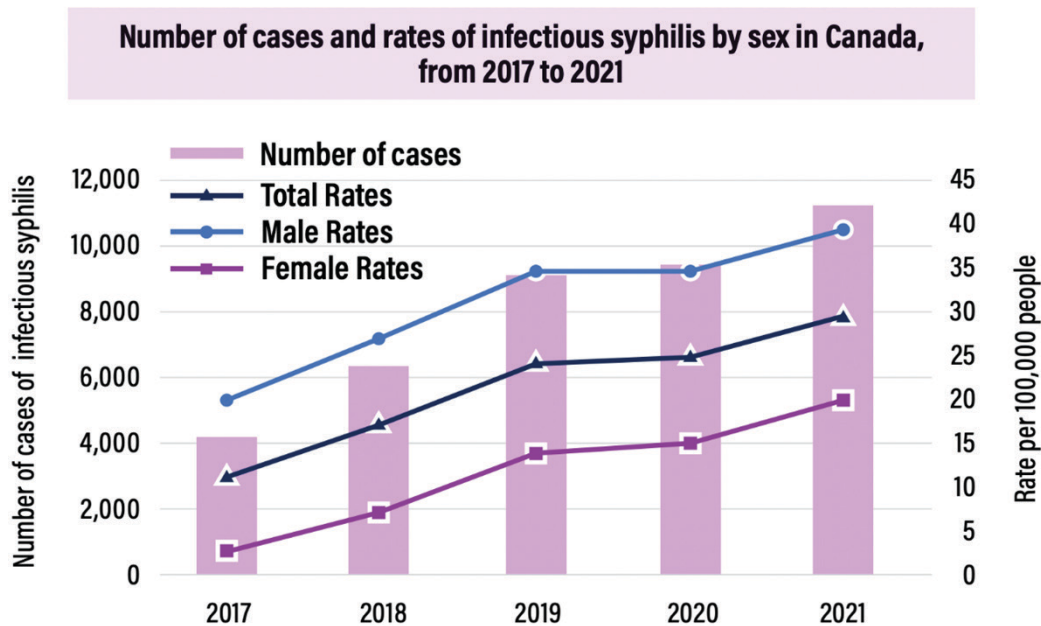
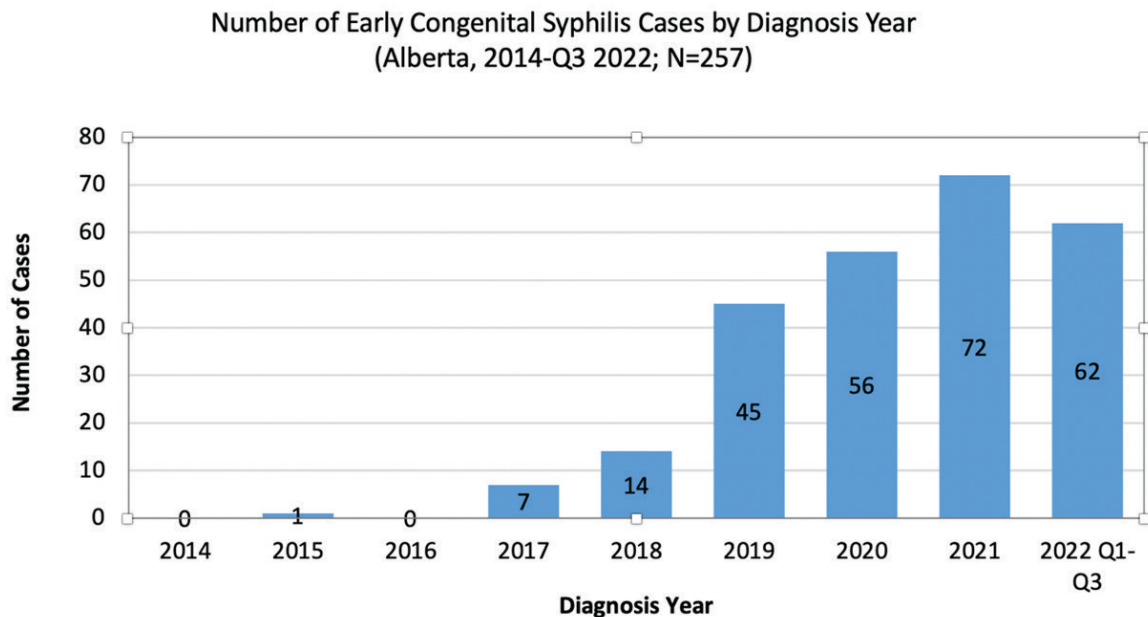


Figure 1. Congenital syphilis cases and incidence rate in Canada, 2017-2021 (8).

CONGENITAL SYPHILIS IN ALBERTA

In 2019, Alberta declared an infectious syphilis outbreak (11). Rates of infectious syphilis increased 8-fold from 3.9 per 100,000 in 2014 to 35.9 per 100,000 in 2018 (1). By 2021, 3,209 cases of infectious syphilis were reported in the province: a rate of 72.2 cases per 100,000, an incidence not reported since 1945 (1, 12). The number of infants infected with congenital syphilis has increased significantly during the outbreak. There were 194 cases of congenital syphilis diagnosed in Alberta between 2016 and 2021, with 72 cases diagnosed in babies born in 2021 (1, 13). Of the 194 infants born with congenital syphilis between 2016 and 2021, 39 were stillborn (1, 13).

Prenatal screening tests for syphilis were implemented in Alberta in the 1950s (14), and Alberta Health implemented updated prenatal screening guidelines for syphilis and other infectious diseases in 2018 (15). These guidelines include routine screening of all pregnant women at the first prenatal visit and at delivery, in addition to re-screening throughout pregnancy for women with ongoing risk of acquiring syphilis (14, 15). Women at increased risk of syphilis are defined as those with a new sexual partner, two or more partners in the preceding year, sexual contact with syphilis-infected person(s), or a previous STI. Risk for syphilis is associated with colonial and structural factors and often entwined with substance use, incarceration, exchanging sex for goods or money, and street-involved youth (16). Despite the updated screening guidelines, rates of congenital syphilis have continued to climb since 2016 (9).



Generated from Interactive Health Data Application, December 5, 2022

Figure 2. Quarterly congenital syphilis case counts in Alberta, 2014-2021 (1, 13).

DRIVERS OF CONGENITAL SYPHILIS

There are a number of factors driving the outbreak of infectious syphilis and congenital syphilis case numbers in Alberta.

Prenatal care and timing of treatment

Congenital syphilis can usually be prevented if the mother receives adequate treatment of a penicillin based regime at least 4 weeks prior to delivery (17). [For detailed information pertaining to the treatment of infants born to mothers with reactive treponemal tests during pregnancy, please refer to the Canadian Paediatric Society's article "Congenital syphilis: No longer just of historical interest" (18).] Unfortunately, women who are at a higher risk of acquiring syphilis may also be less likely to receive standard prenatal care (9, 19, 20).

A 2022 study found that nearly two-thirds of Alberta women infected with infectious syphilis had not received prenatal screening in the first trimester and nearly one-third of those infected with infectious syphilis did not receive treatment at least 4 weeks before delivery (20). Using the Alberta Health Services (AHS) Communicable Disease & Outbreak Management (CDOM) database and the Alberta Vital Statistics Registry, the study examined the proportion of women infected with syphilis between the ages of 15-50 years who received syphilis prenatal care and treatment between March 13, 2016 and December 31, 2019, as well as congenital syphilis births and outcomes in Alberta between 2017 and 2019 (20). Of 182 pregnant women infected with syphilis, 83.0% (151/182) of women were screened for syphilis at some point during their pregnancies and 92.9% (169/182) were screened at delivery. However, only 39% (71/182) of pregnant women received their first syphilis screening during the first trimester (20).

An additional 25.3% (46/182) received their first screening in the 2nd trimester, 18.7% (34/182) during the 3rd trimester, and 15.4% (28/182) received their first syphilis screening at delivery (20). The odds of congenital syphilis increased the later in pregnancy that treatment was initiated (20). While 68.7% (125/182) of syphilis-infected pregnant women received treatment at least 4 weeks before delivery, just 24.2% (44/182) received it during the 1st trimester (20). Another 25.8% (47/182) received treatment during the 2nd trimester, 28.0% (51/182) during the 3rd trimester, and 14.3% (26/182) at delivery (20). Delayed screening resulting in delayed treatment have contributed to the increase in congenital syphilis in Alberta (20).

Maternal risk factors

As noted, risk for syphilis is associated with colonial and structural factors. Recent studies have identified correlations between substance use and the prevalence of syphilis and congenital syphilis (21, 22, 23). However, the prevalence of substance use as a risk factor for congenital syphilis varies across provinces and territories (9). In Winnipeg, Manitoba, intravenous substance use was reported in 50% of mothers birthing neonates with congenital syphilis in 2018, 40.9% in 2019, and 10.0% in 2020 (24). In Alberta, substance use, homelessness, and insecure housing were associated with the majority of the 40 congenital syphilis cases identified in 2019 (9).

Women experiencing incarceration are at extremely high risk of contracting sexually transmitted and blood-borne infections (STBBIs) (25). The syphilis prevalence rate for women in three Alberta correctional facilities was 5.4% between 2012 and 2015 (26). Of 374 pregnant women identified with infectious syphilis in Alberta between 2017-2020, 8.6% were diagnosed or treated in a correctional facility (27). International studies show that pregnant

women in correctional facilities are more likely to transmit syphilis to a fetus, and more likely to experience severe negative birth outcomes (28, 29). Improved prenatal care and treatment for pregnant incarcerated women, particularly those serving short sentences, is considered essential to reduce maternal transmission of syphilis and congenital syphilis (29).

EHR AND CONNECT CARE IN ALBERTA

AHS provides healthcare throughout the province including at hospitals, addiction and mental health facilities, continuing care facilities, cancer centres, community ambulatory care centres, and at wholly owned subsidiaries such as Alberta Precision Laboratories, Carewest, and Capital Care Group (30). As of March 31, 2020, there were 850 AHS facilities (30). Additionally, AHS is involved in 41 equity partnerships with family physicians, called primary care networks, serving approximately 85% of the population, or over 3.8 million Albertans (31).

Until 2019, Alberta Health Services relied on over 1,300 separate health information systems, some of which were still based on paper records, and many of which were not linked (32, 33, 34). This resulted in duplicated tests, medical errors, administrative inefficiency, and healthcare providers and healthcare providers not having a complete picture of a patient's health history (32, 33, 34). In an effort to address this challenge, Alberta undertook a fundamental transformation to integrate, share, and coordinate health information across the continuum of care through the launch of Connect Care in 2019.

Connect Care (CC) is supported by a "common clinical information system" (CIS) that is centered around the consolidated "one patient, one record" approach (35). CC uses a platform that provides a single access point for health information for

Alberta Health Services and its partners (33). Health professionals can search, measure, and correlate information for data-supported best practices. The implementation for CC has been planned in nine waves, with the intention of integrating CC at all AHS clinics, hospitals, pharmacies, and medical labs across the province by 2024 (36).

Prior to each wave, AHS staff and physicians are trained in CC processes, must pass proficiency tests, conduct dry runs for the launch, and perform cutover work moving patient information from old CIS into the new CIS (37, 38, 32).

CC serves as a Health Information Aggregator through the use of a centralized clinical data repository, Chronicles, to manage and store patient information (35). While AHS providers can access patient information directly from the CC CIS, most patient information and health care interactions still exist in primary care Electronic Medical Records (EMRs) outside of AHS, many of which are independently operated and are not designed to easily collect and exchange data across the digital health ecosystem. The Community Information Integration (CII) initiative allows data from community EMRs to be transferred to a newer central portal (Netcare Provider Portal). Of 1,900 community-based clinics in the province, 59 have been connected to the CII as of May 2019 (35). Non-AHS clinicians can also use the CC Provider Portal offering read-only access to patient charts, aggregated EMR data in Netcare's clinical repository, data from the Chronicles clinical repository, communications with CC users, and an eReferral service connected with AHS providers (35).

BEST PRACTICE ADVISORY

Rationale

All notifiable STIs are reported to STI Services - a provincial program in Alberta responsible for ensuring notifiable STIs are treated according to provincial STI guidelines. For syphilis, new cases are assigned to STI Partner Notification Nurses (PNNs) that are located throughout the province and who ensure that clients and their sexual contacts receive adequate treatment, as well as complete follow-up serology, if required. The work of PNNs is supported by a Medical Director who is available for clinical consultation and reviews/stages all new cases, or a Clinical Development Nurse that provides treatment and follow-up recommendations for cases and sexual partners. Additionally, STI Services ensures access to long-acting penicillin G benzathine (Bicillin L-A) injections for syphilis treatment and provides consultation on syphilis and other STIs for community health care providers.

To identify and close gaps in care, AHS STI Services reviewed maternal and congenital syphilis cases in the province. As noted above, delayed detection of the infection contributed to inadequate treatment in mothers - two risk factors for congenital syphilis (20, 27). However, many (136/182; 74.7%) pregnant women with infectious syphilis had a healthcare touchpoint during their first trimester, but only 39.0% were screened for syphilis (20). STI Services identified Emergency Departments (EDs) as potential locations for earlier identification of maternal syphilis cases and designed an intervention to ensure pregnant women who did not have a primary care provider received testing when and where they encountered the medical system. This intervention took advantage of the province's recent launch of CC to create a Best Practice Advisory (BPA) syphilis screening alert for ED ordering providers.

There are over one hundred BPAs currently within CC and all users are required to complete training about implementing BPAs and the importance of adhering to the advisories (39).

Implementation

STI Services approached CC's Emergency and Emergency Medical Services (EMS) Area Council to increase awareness about the syphilis outbreak and to gain support for EDs' role in the prevention of congenital syphilis as opportunistic testing sites (39). A syphilis BPA was proposed as an outbreak mitigation strategy and emergency physicians were informed that the provincial STI program would take responsibility for follow-up of positive test results and treatment if required. By August 10, 2021, the syphilis BPA went live for EDs that had launched CC (39). The BPA displays for patients that meet the following criteria:

1. Answer "yes" to "currently pregnant" in an ED assessment

OR

Have a laboratory-confirmed positive pregnancy test in the past 5 calendar days performed at a healthcare provider's office

2. Have no record of receiving a syphilis enzyme immunoassay (EIA) during current pregnancy.

The alert continues to display in CC until acted upon by the ordering provider. Choosing "Order" automatically leads to a requisition form for a prenatal syphilis enzyme immunoassay (EIA) test.

If physicians choose not to order a test, they must select one of the following reasons: "Patient will see MD for testing", "Refuses" (patient refuses testing), or "Opts out" (patient declines testing). All positive EIA tests results are reportable to STI Services (39).

STI test results and emergency room visits appear in a patient's Netcare profile allowing family doctors to view health-related data from emergency room visits. All notifiable STI lab results and treatment records are maintained in the (CDOM) database which is only viewable by the AHS STI Services team at the time of writing (39).

Testing

EIA tests are sensitive for syphilis, however, may lack specificity (40). In Alberta, confirmatory testing for all positive syphilis EIA is performed with TPPA (Treponema pallidum particle agglutination; 39, 41, 42). EIA testing may be repeated in 4 weeks for patients with non-reactive EIA test results depending on recent syphilis exposure, clinical evidence of infection, or suspicion of infection (39).

Non-treponemal tests (e.g., rapid plasma reagin (RPR) tests) indicate disease activity through the detection of nonspecific antibodies hosting cardiolipin antigens as a response to treponemal infection (43). While a four-fold decline in non-treponemal antibodies is defined as an appropriate response to treatment, some patients lack a complete seroreversion and have persistent non-treponemal antibody titres (43). RPR test results may be non-reactive in cases of early primary, late latent syphilis, or tertiary syphilis (40). Serologic interpretation of syphilis test results is complex and depends on the test results (including treponemal and non-treponemal test results), as well as the patient's previous history of syphilis and treatment history, thus, should be done in consultation with an STI specialist.

Further information pertaining to syphilis test results and interpretation in Alberta can be found at the Public Health Laboratory (Provlab) and Alberta Health Services "Interpretation of Syphilis Serology" (44).

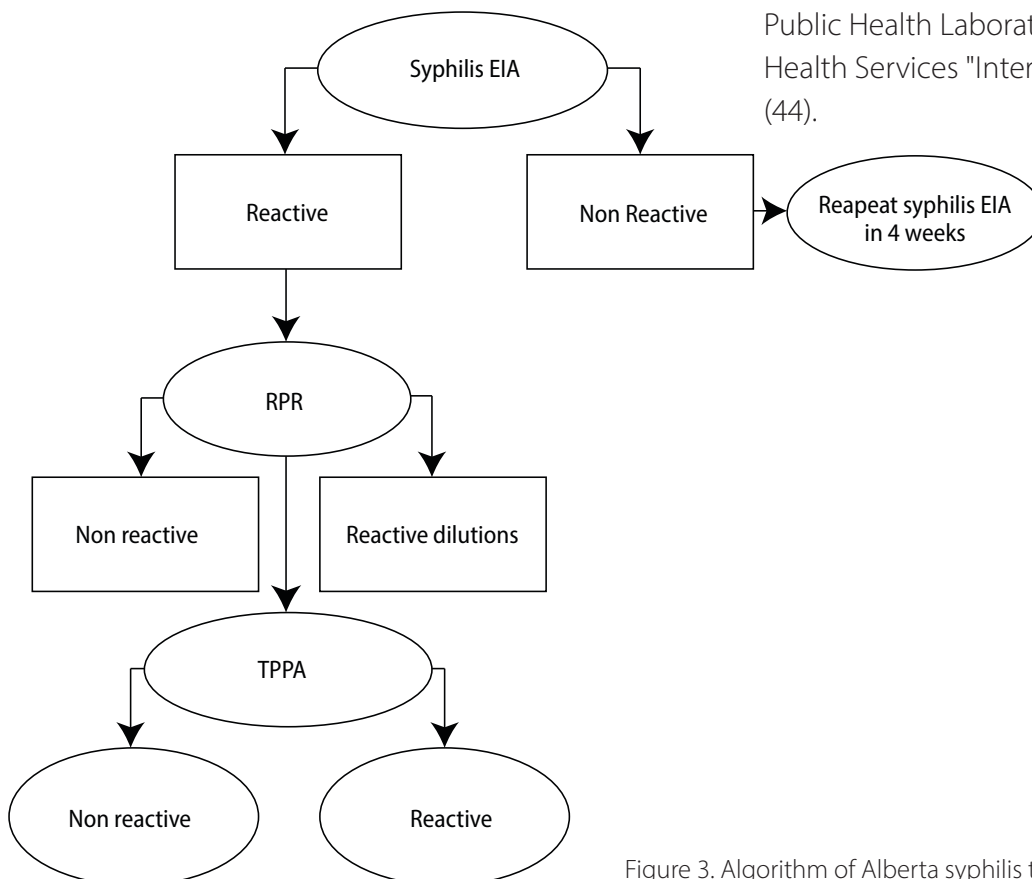


Figure 3. Algorithm of Alberta syphilis testing (41).

Follow-up

When positive results are received from the emergency departments, new cases are immediately assigned to a PNN so that clients can be reached, and treatment can be arranged for patients and their sexual partners (39). PNNs work in collaboration with many community providers and non-governmental organizations to support clients in receiving timely care (39). For pregnant women with reactive syphilis serology, the STI Medical Director prepares a letter containing information about the serology, treatment, and recommended follow-up for both mother and baby at the time of delivery (39, 45). The letter is sent to all healthcare providers involved in the care of the pregnant women and the infants including primary care, obstetricians, and Pediatric Infectious Disease specialists.

NEXT STEPS

CC is being implemented in a series of launches, with the next launch planned for early May 2023. (36).

Education to increase awareness of prenatal syphilis screening and the BPA in EDs was expected to begin in the fall of 2022 (39).

Future work is needed to evaluate the effectiveness of the syphilis BPA on reducing congenital syphilis and infectious syphilis across the province. Future analyses could also examine the demographic characteristics of pregnant women screened as a result of the syphilis BPA and better understand the barriers they face to accessing primary care. Additional feedback from ED physicians would be valuable regarding the use of the BPA and barriers to care.

CONCLUSION

As one of the most ambitious healthcare projects in the country, CC serves as a leading example for other jurisdictions looking to transform public health practice using a connected clinical information system (46). The syphilis BPA within CC assists with conducting screening and diagnostic testing for pregnant women presenting to an emergency room without a history of adequate prenatal screening. Through mitigating delayed screening and initiation of treatment among maternal syphilis cases, the syphilis BPA serves as a promising practice for public health practitioners in controlling congenital and infectious syphilis outbreaks.

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Points to take away...

- There are a number of factors driving the outbreaks of infectious syphilis and congenital syphilis in Canada, especially delayed detection in prenatal care
- A multi-disciplinary team determined that emergency departments are critical sites to identify pregnant women for syphilis screening
- Centered around the “one patient, one record” approach, a Best Practice Advisory was built into electronic records to alert providers
- Connect Care serves as an example of a promising practice for public health practitioners

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