**Introduction to ESP Reporting for Infectious Diseases**

**Bureau of Infectious Disease and Laboratory Sciences**

**Massachusetts Department of Public Health**

# **What is ESP?**

Electronic medical record Support for Public Health (ESP) is an open-source software application used by the Massachusetts Department of Public Health (DPH) for infectious disease surveillance.[[1]](#footnote-1) ESP enables information about priority reportable conditions to flow from electronic health records (EHR) systems to DPH. The primary goals of ESP implementation are to facilitate more timely, complete, and accurate reporting to inform public health actions, and to help reduce provider reporting burden.

Our current system for disease surveillance relies primarily on clinician-submitted case reports and healthcare provider interviews, combined with laboratory reporting. There are, however, significant limitations to the current system. Manual clinical reporting using case report forms (CRFs) is burdensome to providers, particularly for high-volume infections, such as chlamydia. Interviews require active communication between clinicians and public health epidemiologists to gather complete information, such as exposure history, pregnancy status, and treatment status required for case investigation, follow-up, and case disposition. There are often delays in these types of reporting, and information is often incomplete. Laboratory reports also may not provide complete patient information (e.g., race/ethnicity, pregnancy status, risk history), are “blind” to purely empirical diagnoses, and are poor discriminators between active and resolved infection (e.g., new versus old syphilis) or acute and chronic disease. Complete, accurate, and timely data are essential for epidemiologic analysis and to inform public health action.

DPH has implemented ESP to combine the best aspects of traditional clinician-initiated and electronic laboratory reporting to obtain fast, accurate, clinically detailed, automated reporting. EHRs contain detailed data regarding medical history, presenting symptoms, laboratory tests, treatment status, and referrals to specialty providers. Through ESP, applicable EHR data fields are mapped to common terms; these terms are analyzed for reportable diseases or updates to existing cases of a reportable disease using validated case detection algorithms and are automatically transmitted to DPH. Automated extraction and mapping of data from EHRs facilitates complete and timely case reporting, enables longitudinal collection of data on diseases, and advances the analysis of health outcomes. At the same time, automated reporting of data from EHRs helps reduce provider burden associated with completion and submission of individual case reports and depending on the completeness of EHR data may obviate epidemiologic follow-up.

# **How does ESP work?**

Facilities set up a physical or cloud-based ESP server and then populate it with nightly extracts of structured data from their EHR including diagnoses, laboratory test results, prescriptions and other indicators of specific reportable conditions. ESP then applies condition identification algorithms to these data. Once a record is identified as meeting the criteria for the condition, a secure electronic message is generated containing the data elements required for public health reporting. ESP runs behind a facility’s firewall, and data are extracted and pushed to DPH.

# **How does ESP organize and manage data?**

ESP extracts and organizes EHR data into a standard format and into multiple data tables containing data such as vital signs and diagnoses. This ensures that condition definitions are being applied consistently across facilities, facilitating complete and comparable reporting. Data can be sent to a facility’s standalone or cloud-based ESP server. Validated case detection algorithms are applied by ESP to the data tables to identify certain reportable conditions, and data are assembled for reporting.

# **How are data transmitted to DPH?**

Data are sent nightly to a facility’s ESP server. Data are then automatically scanned with validated case detection algorithms to identify reportable conditions. ESP then automatically pushes data to DPH, through one of two routes, depending on the condition. The two routes are nightly automated transmission to MAVEN via secure HL7 messaging (Clinical Document Architecture), or weekly transmission of flat files via SFTP. An automated flat file transmission is currently employed for syndromic surveillance of specialized conditions such as reportable respiratory illness, and Lyme disease. Reporting via flat file transmission may be used in the future in circumstances such as outbreaks or emerging infections in which data regarding a reportable condition is urgently needed to inform public health response. In these circumstances ESP facilitates rapid identification of conditions of interest via new algorithms for case or syndromic surveillance (e.g., COVID-19).

# **How does ESP determine if a case is reportable to DPH**?

ESP uses case detection algorithms comprised of diagnoses (ICD codes), vital signs, laboratory test results, and medication prescriptions to accurately identify reportable conditions. For example, ESP classifies a record as a reportable case of HIV infection when any of the following conditions are met: a positive HIV antigen/antibody test result and a positive EIA test result; OR an HIV viral load > 200 copies/mL; or prescriptions for 3 or more concurrent antiretroviral medications at least 1 month apart. Because ESP surveys EHRs daily, new information associated with a previously reported case, such as new laboratory test results or prescriptions are appended to existing, previously reported cases.

Currently, the following conditions are reported to DPH via ESP:

* Anaplasmosis
* Babesiosis
* Chlamydia
* COVID-19
* Gonorrhea
* Hepatitis A
* Hepatitis B
* Hepatitis C
* HIV
* Lyme disease (in process)
* Syphilis
* Tuberculosis
* Influenza-like illness (syndromic)
* COVID-like illness (syndromic)
* Respiratory virus-like illness (syndromic)

Future implementation of additional conditions is planned and DPH will notify facilities of implementation of reporting for additional conditions via ESP.

# **What data are reported to DPH?**

ESP gathers data from structured EHR fields including personal, demographic, clinical, epidemiologic, and laboratory information pertinent to the condition, consistent with the regulatory requirements of [*105 CMR 300: Reportable diseases, surveillance, and isolation and quarantine requirements*](https://www.mass.gov/regulations/105-CMR-30000-reportable-diseases-surveillance-and-isolation-and-quarantine-requirements)*.* Data transmitted to DPH includes patient information including name, address, date of birth, insurance, housing status; demographic information (e.g., gender, race/ethnicity); provider information (e.g., name, facility, NPI), clinical information (e.g., symptoms, diagnoses); test orders and results; associated health conditions; exposure/risk history; and prescription orders.

Access by the Department of Public Health to hospital, clinic, and laboratory records is specifically authorized under Massachusetts law (see MGL C. 111 § 5; 105 CMR 300.000). Access to medical records by the Department for the purpose of disease investigation and intervention is allowed under federal Health Insurance Portability and Accountability Act (HIPAA) regulations (45 CFR 164.512b). Those regulations permit a covered entity to disclose protected health information to a public health authority (without the written authorizations of the individual or the opportunity for the individual to agree or object) when it is to be used for the purpose of preventing or controlling disease, injury, or disability. Access includes, but is not limited to, the conduct of public health surveillance, public health investigations, and public health interventions.

To obtain robust understanding of factors contributing to incidence or epidemiological trends, DPH may need personal, demographic, clinical, epidemiologic, or laboratory information in addition to data routinely reported to DPH via ESP, clinical case reporting, and/or laboratory reporting. DPH may employ ESP to efficiently and rapidly gather and report such disease surveillance data, *ad hoc*. For example, data regarding antibiotic prescribing practices may facilitate understanding of antibiotic resistance among reportable infections. In such circumstances, DPH will notify facilities of implementation of supplemental reporting. This typically requires little to no extra work for facilities since the necessary raw data are typically already in ESP.

# **How does implementing ESP help fulfill my facility’s public health reporting obligations?**

For facilities providing information on reportable conditions through ESP, DPH will continue to adapt the mechanisms used to obtain data necessary for the investigation, monitoring, control, and prevention of diseases dangerous to the public health. ESP considerably reduces the daily burden of infectious disease reporting for participating facilities, particularly for initial reporting of relatively high-volume infections such as latent tuberculosis infection (LTBI) and chlamydia, and longitudinal reporting of chronic infections such as HIV and hepatitis C virus. ESP-specific reporting processes vary by condition, but in many instances reporting via ESP eliminates the obligation for clinicians to complete and submit to DPH a case report form (CRF). While ESP reduces provider burden associated with submission of initial reports and individual case reports, depending on the completeness of EHR data epidemiologic follow-up may be required to obtain necessary information. Additionally, information on cases and the circumstances surrounding their incidence that is not routinely contained in structured fields in electronic medical records may be necessary and may require state and local health departments to request supplementary data from clinicians to inform public health actions. Additional information regarding ESP-specific reporting processes may be found in: [Overview of DPH Reporting Requirements and ESP Reporting Sufficiency for LTBI, Suspect/Confirmed Active TB, Chlamydia, Syphilis, Gonorrhea, Hepatitis A, and HIV condition](https://www.mass.gov/doc/overview-of-dph-reporting-requirements-of-esp-reporting-sufficiency/download).

# **What other capabilities does ESP have?**

ESP is a highly configurable software application, which can be tailored to strengthen infectious disease surveillance and, at the same time, provide tools to support advancement of population health objectives, and to assist facilities to strengthen the quality of care.

In 2023, DPH will enhance ESP capabilities by configuring ESP for aggregate, de-identified reporting and population-level analysis of data not typically available through routine reporting mechanisms. Such data include social determinants of health (e.g., housed status), associated health conditions, and preventive services (e.g., recommended screenings), and which are critical to understanding the impact and trajectory of infectious conditions of public health importance, and for advancing health equity. DPH’s *Infectious Disease Aggregation and Data Visualization Platform* (ID-ADVP) will include a web-based, interactive tool for data visualization. DPH and facilities will be able to review, analyze, map, and trend near-real-time infectious disease surveillance data, providing insights into population-level risks and continuity of care. Facilities will be able to use the analytic functions of ID-ADVP for quality improvement within their catchment areas and patient populations, while minimizing analytic burden.

DPH has also configured ESP to help to advance and monitor the uptake of HIV PrEP. Implementation of a PrEP algorithm in a facility’s ESP server enables ESP to generate a report of all patients who meet a prespecified probability of acquiring HIV infection in the coming year, and who may therefore benefit from PrEP (i.e., a “line list”). The user interface associated with the ESP PrEP module allows recording of the disposition of efforts to engage and prescribe PrEP. This tool gives clinicians, PrEP navigators, and other staff an additional tool to identify and engage patients who could most benefit from PrEP, and means to monitor the success of interdisciplinary care teams in promoting and supporting PrEP. At the same time, the ESP PrEP module enables production of aggregate, de-identified reports, that describe PrEP uptake, providing DPH with information essential to informing public health efforts to advance PrEP in Massachusetts. DPH is currently considering configuration of ESP to produce similar reports to assist facilities to identify patients with HIV or HCV infection and who have not been linked to treatment, or who may be at risk for or have disengaged from treatment.

# **How does ESP complement other reporting mechanisms?**

DPH uses multiple reporting mechanisms to facilitate complete, timely, and accurate data for surveillance and monitoring of reportable infectious conditions in Massachusetts. There is not currently a single mechanism that enables efficient, accurate, and timely reporting of all data elements necessary for public health surveillance and epidemiologic analyses of over 90 reportable conditions. Electronic laboratory reporting, electronic case reporting, clinical case reporting, immunization registry reporting, epidemiologic interviews, and targeted medical record reviews will continue to be needed and used.

# **How is implementation of ESP accomplished?**

The general steps for implementation include:

1. Build the ESP server and install ESP on the server
2. Create data extract and load on to the ESP server
3. Initiate daily data loading
4. Map data for case detection
5. Initiate processing of ESP data for case detection
6. Clinical and message validation of cases
7. Implement reporting via secure transfer to DPH

DPH, in collaboration with our ESP vendors, Commonwealth Informatics, Inc. and Harvard Pilgrim Health Care Institute, will provide guidance and technical support in all phases of installation, implementation, and maintenance.

Each facility should identify an interdisciplinary team to support and facilitate ESP implementation. While each facility is organized differently, implementation requires expertise and administrative authority in the following areas:

* Regulatory/public health reporting
* Information technology
* Clinical applications
* Informatics/analytics
* Clinical quality management
* Program quality improvement (e.g., for patient navigation, PrEP program implementation)
* Clinical management of infectious disease (as relevant to validating data for the conditions reportable through ESP is recommended)

DPH strongly recommends that each facility identifies at least one individual who will coordinate communication and activities across the team and serve as a primary point of contact for DPH.

Technical information including specifications and requirements, detection algorithms, and an implementation toolkit is available at <https://www.esphealth.org/resources>. For additional information and questions about how to get started implementing ESP, please contact BIDLS/DPH at BIDLS.OHCP@mass.gov.

1. The ESP surveillance platform was developed and implemented by the DPH in collaboration with the Department of Population Medicine, Harvard Pilgrim Health Care Institute, and clinical partners. ESP software is open source and is compatible with different electronic health record systems. Information about ESP, including code and technical specifications is available at [http://esphealth.org](http://esphealth.org/). [↑](#footnote-ref-1)