Alternative Models for Accessing EHR Data for Surveillance

EHR systems and clinical repositories can enable your public health agency to access its health data for surveillance purposes by employing one of two different data sharing models: the "push" or "pull" model:

- In a **push model** of electronic reporting to public health, a clinical entity sends data to a public health agency in response to pre-determined criteria. This model reflects traditional public health reporting such as electronic lab and immunization reporting under the "Meaningful Use" program.
- In a **pull model** of authorized access to data in a clinical database, such as from an EHR system or clinical repository, the public health agency uses a query to request the data. The queries could be made in two ways: directly to a health care organization's EHR or to an intermediary data broker, such as a Health Information Exchange, that may then pass the query to multiple EHR systems and aggregate the results. In contrast to the push model, the pull model requires public health agencies to establish data access agreements and permissions to view or query data held in the clinical databases.

Comparing push and pull models

You can compare the push and the pull models along two dimensions: (1) the use of individual versus aggregate case reporting, and (2) the use of push versus pull data exchange. The table below presents various applications of each model for exchange, specific examples of their use, and the advantages and disadvantages of each.

Table: Comparison of Push and Pull Surveillance Models for EHR Data

	Type of Data Exchange	
Type of Case Reporting	**Push**	**Pull**
Individual *Each report received by the public health agency reflects one personally identifiable patient with a condition of public health interest.*	Type: Individual-Push Examples: Cases with certain reportable conditions, registry reporting. Pro: Includes specific demographic data for case follow up investigation. Con: Requires clinician to recognize the reporting criteria that triggers events.	Type: Individual-Pull Examples: Outbreak investigations, other case management. Pro: Allows public health agency to obtain case-specific, targeted information at time of need. Con: Potential repercussions over perceived governmental intrusion.

Type of Case Reporting	Type of Data Exchange	
	Push	**Pull**
Batched Individual *Each report received by the public health agency reflects multiple individual patients (who may or may not be personally identifiable) with a condition of public health interest.*	Type: Batched Individual-Push Example: Emergency department reporting for syndromic surveillance. Pro: Allows public health agency to obtain targeted information at time of need. Con: Requires clinician to recognize the reporting criteria that triggers events. This could happen with clinical decision support rules, but then those rules must be built and maintained, likely in collaboration with the EHR system vendor.	Type: Batched Individual-Pull Example: Some emerging chronic disease surveillance systems. Pro: Allows public health agency to obtain targeted information at time of need. Con: Can require more technological sophistication on the part of public health agency. Can be challenging to define query parameters in ways that are both specific, but broad or flexible enough to accommodate the many ways a given condition can be recorded in an EHR system.
Aggregate *Each report received by the public health agency reflects a count of anonymized individuals with a condition of public health interest.*	Type: Aggregate-Push Example: Outpatient influenza-like Illness (ILI) reporting. Pro: Anonymized data may be more feasible from a stakeholder acceptance perspective. Con: Requires clinician to correctly calculate aggregate case counts and report them, either according to a predetermined schedule or as an automated function.	Type: Aggregate-Pull Example: Some emerging chronic disease surveillance systems. Pro: Anonymized data may be more feasible from a stakeholder acceptance perspective. Con: Can require more technological sophistication on the part of the public health agency.

Understanding the individual reporting models

The following describes the four reporting models that may be used in public health surveillance, along with some considerations when employing this type of reporting.

Individual-push

Practitioners tend to consider the individual-push model the one traditionally used for public health surveillance. A clinician uses this model when they recognize a patient with a reportable condition and send a case report to the public health agency. In addition, many view this model as the one used in the manual or automatically triggered reporting of individual, patient-level events of public health significance, such as an immunization, that is sent to your agency's immunization registry.

Individual-pull

An agency might employ an individual-pull model when it wants to know more about a specific individual; for instance, in the context of urgent and targeted interventions, such as an outbreak response. Historically, agencies have rarely used this model due to both patient privacy concerns and the lack of the technological means to query an EHR system. This is beginning to change with the advent of the Retrieve Form for Data Capture (RFP) standard being developed by Integrating the Healthcare Enterprise (IHE) International.

Batched individual-push

An agency typically would use batched individual-push techniques when it needs patient-level data on a routine, predictable basis. For example, agencies often use this model for syndromic surveillance and vital records events reporting.

Batched individual-pull

Public health more often associates batched individual-pull approaches with conditions reported as a result of partnerships between clinical entities and public health rather than on mandatory reporting requirements. Public health has been increasingly implementing this model to support chronic disease surveillance with public health agencies sending queries to clinical entities, and in turn, those entities returning the resulting data sets of case-level data.

Batched reports, including those pushed by clinical entities and pulled by public health agencies, may or may not include data elements that permit the identification of specific individuals.

Considerations when using individual reporting models

When using one of the four models described above with more than one health care organization and EHR system, it is important to acknowledge that there will likely be multiple records on the same individual. The number of duplicates you are likely to find depends on the nature of the health care organizations (i.e., the mix of primary and specialty care, in-patient and ambulatory, etc.), the population being surveilled, etc. The key question is whether having duplicate records —likely to be

a small percentage of the total for any given condition/data element of interest—matters for your purposes. The value of knowing case counts must be weighed against the potentially significant costs of building or acquiring a robust record deduplication engine. If you are primarily monitoring trends over time, and the number of duplicate records is likely to remain fairly constant over time, then you can have a higher tolerance of duplicate records.

Understanding the aggregate reporting models

The following describes the two aggregate reporting models that may be used in public health surveillance along with some benefits of using reports with aggregated counts.

Aggregate-push
In the aggregate-push model, a clinical entity tallies cases over a specified time frame and sends a report of the total number of cases to the public health agency at a pre-determined interval. Each report might include multiple aggregated case counts, such as counts by specified age ranges. Outpatient clinics often use this model for surveillance for influenza-like illness (ILI).

Aggregate-pull
Public health agencies have increasingly begun implementing aggregate-pull models to support chronic disease surveillance. As with other approaches that use a pull approach, the public health agency sends queries to clinical entities—either directly or through an intermediary information broker or a portal—which then return resulting data sets—again, either directly to public health or through the intermediary. However, with the aggregate-pull model, the clinical entities provide aggregated case counts in response to these queries.

Considerations when using the aggregated reporting models
Aggregated counts can be more feasible to implement from a stakeholder and public acceptance perspective, especially if the public health intervention informed by these reports do not require individual case follow-up.

Model triggers and system responsibilities

Each model relies on an action to trigger, or initiate, the data sharing process, the EHR and public health surveillance systems to perform certain tasks, or responsibilities to enable successful data sharing. The table below describes these triggers and system responsibilities for push and pull models are described below.

Model	Trigger	EHR System Responsibilities	Public Health Surveillance System Responsibilities
Push	Clinician asserts diagnosis and "clicks" trigger in the EHR system, *or* EHR system determines that a patient meets criteria that triggers sending the data.	After trigger occurs, the system must gather the data, package it appropriately and transmit to receiver.	Upon receipt of data, the system must parse the data package, apply business rules and integrate the data into the surveillance system.
Pull	Public health surveillance system sends a request for new data, which may or may not include the data values that will identify a person as a case.	After trigger occurs, the system must find the cases to include, gather the data, package it appropriately and transmit it to public health.	Upon receipt of data, the system must parse the data package, apply business rules and integrate the data into the surveillance system.

Choosing the optimal model

Determining which model to employ for your public health surveillance project deserves careful study by your planning team. You must consider the costs, system sustainability and scalability. You must also determine if the model allows you to build strategic, potentially valuable collaborations that go beyond the immediate needs of your surveillance program. Finally, you must consider the ramifications of the model you chose on anticipated future needs and technologies.

Although selecting the model is no trivial task, take care to avoid letting "the perfect be the enemy of the good." **The optimal model is one that provides for *flexibility, acceptability, scalability, affordability[1] and sustainability.*** You may not get all the data you want, but if you consider those five factors when selecting the model, you have great potential to deliver real and sustained value to the community and your partners.

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[1] To increase affordability, you can leverage existing data exchange models and transport protocols where possible. If your agency has an established program with the same data trading partners, using the same model may be more acceptable and less expensive to establish.

The following tools provide more information on selecting the right model for your surveillance program:

- Introduction section: *Federated Query Models for Accessing EHR Data*
- Introduction section: *Lessons Learned: How Broad and How Collaborative?*
- Forming Partnerships section: *Identifying Actors and Roles* and *Defining System Roles and Responsibilities*
- Understanding Clinical Data and Workflows section: All tools