

# PULLING INFORMATION IN RESPONSE TO A PUSH: USAGE OF QUERY-BASED HEALTH INFORMATION EXCHANGE IN RESPONSE TO AN EVENT ALERT. *PRELIMINARY REPORT*

Evidence from a study of three New York State Qualified Entities' (QEs) Subscription Alert and Query-based exchange services.

## HEALTH INFORMATION TECHNOLOGY SOLUTIONS TO IMPROVE CARE DELIVERY

New York State, a leader in health information exchange has charged the NY eHealth Collaborative (NYeC) as its State Designated Entity to lead and coordinate the Statewide Health Information Network for New York (SHIN-NY). A network of networks that includes 8 regional health information organizations (RHIOs) certified as Qualified Entities and a statewide connector, the SHIN-NY serves as a tool to help providers and health plans provide the best healthcare for patients and reduce unnecessary costs. Use of the SHIN-NY supports the exchange of health information to make critical patient information available at the point of care and support innovative delivery approaches that are now widespread in New York State.

In the past paper-based health care world, health care providers had difficulty accessing patient information. Today, providers have multiple options to obtain crit-

ical information about their patients. Two important approaches to information exchange that support and facilitate patient health information exchange are:

Query-based exchange as information sharing interventions: In query-based information exchange, end

users find patient information from community-wide, longitudinal patient records. The community-wide, longitudinal records are maintained by the State's Qualified Entities (QE) in accordance with strict privacy and security rules. Because end users request the information when needed, this approach is referred to as a query. Addi-

tionally, many end users access these records through a web portal.

Subscription alert services as information sharing interventions: Alert services automatically notify a health care provider when a patient has been

### TAKEAWAYS

- USAGE OF SUBSCRIPTION ALERT SERVICES AND QUERY-BASED EXCHANGE INCREASED OVER A ONE YEAR PERIOD BY 95% FOR ALERTS AND 102% FOR QUERY-BASED EXCHANGE
- HOME HEALTH/LONG TERM CARE ARE THE LARGEST RECIPIENTS OF ALERTS
- 7% OF USERS ACCESS QUERY-BASED EXCHANGE SERVICES IN RESPONSE TO AN ALERT WITHIN 7 DAYS
- QUERIES AFTER AN ALERT IS RECEIVED ARE MOST COMMON IN SPECIALTY CLINICS (17% WITHIN 24 HOURS)
- INCLUDING CCDS WITH ALERTS REDUCES QUERY USAGE

admitted to or discharged from a participating hospital or emergency department. Alerts are real-time, electronic, automatic, and delivered to providers in accordance with state and federal privacy regulations.

In New York State, all QEs offer both query-based exchange and core subscription alert services free of charge to all Participants to enhance the flow of infor-

mation between settings of care.

Query-based exchange has been in use in New York State and in other locations in the US for more than a decade and subscription alert services are growing nationwide.<sup>1</sup> Importantly, multiple evaluations have demonstrated that query-based exchange subscription and alert services reduce unnecessary utilization and reduce costs for New York State.<sup>2-7</sup>

Box 1. Comparison of information sharing interventions in New York State.

| Query-based exchange   | Subscription Alert Services   |
|--|---|
| <ul style="list-style-type: none"> <li>• Providers and staff access community-wide, longitudinal records</li> <li>• Comprehensive patient data</li> <li>• Secure</li> <li>• Service offered by Qualified Entities</li> </ul> | <ul style="list-style-type: none"> <li>• Providers and staff receive notices about patient events automatically</li> <li>• Limited patient data</li> <li>• Secure</li> <li>• Service offered by Qualified Entities</li> </ul> |

This preliminary report describes how these two approaches to information exchange work together within the State in a complementary fashion. This is the first part of a multi-phase study, with additional phases focusing on user stories and the impact of these services on health care costs and utilization.

*Note: For the purposes of this report, we excluded all records from sending facilities that were not hospitals or health systems and alerts that were not for an admission/discharge from a hospital or emergency department. Also, because more than one alert may be sent per health care encounter, we reduced all records into unique sender-recipient combinations for a single patient per day.*

**KEY FINDING #1: USAGE OF SUBSCRIPTION ALERT SERVICES AND QUERY-BASED EXCHANGE INCREASED OVER TIME**

Figure 1. Number of Alerts Sent by Three Qualified Entities in New York State.

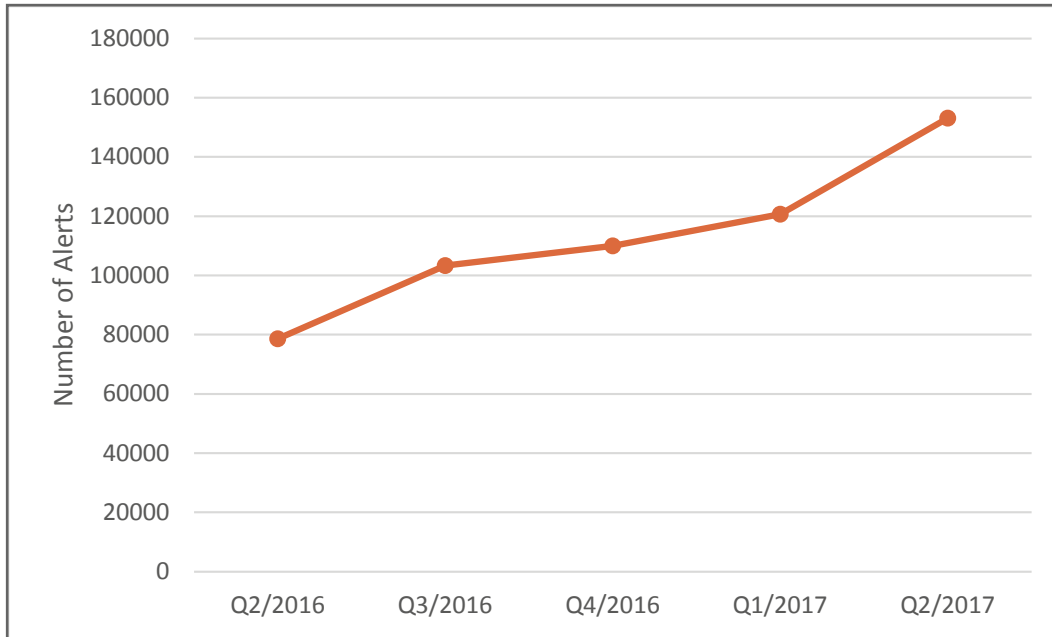
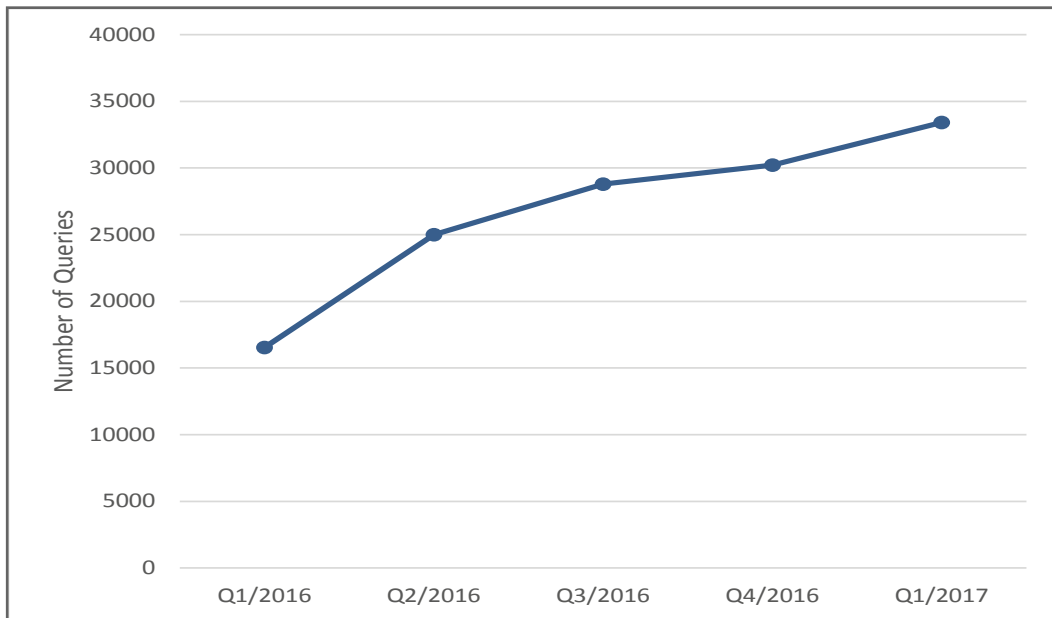


Figure 2. Number of Queries to Three Qualified Entities' Longitudinal Patient Record Systems in New York State.



*Note: Unique queries for patients with alerts (2016-2017) & excluding queries for consent only.*

- The number of alerts being sent for patients with alerts is increasing over time.
- The number of queries is increasing over time.

**KEY FINDING #2: CHARACTERISTICS ASSOCIATED WITH ALERTS**

Table 1. Patient Characteristics Associated with Alerts from Three Qualified Entities in New York State.

|                       | N       | %    |
|-----------------------|---------|------|
| <b>Patient Gender</b> |         |      |
| Male                  | 249,436 | 38.9 |
| Female                | 358,384 | 55.8 |
| Other/Unknown         | 34,099  | 5.3  |
| <b>Patient Age</b>    |         |      |
| <18                   | 27,955  | 4.4  |
| 18 - 29               | 67,932  | 10.6 |
| 30 - 44               | 109,991 | 17.1 |
| 45 - 64               | 221,171 | 34.6 |
| 65+                   | 213,870 | 33.3 |

Table 2. Characteristics of Alerts from Three Qualified Entities in New York State.

|                              | N       | %    |
|------------------------------|---------|------|
| <b>Alert Timing</b>          |         |      |
| Admit                        | 229,047 | 35.7 |
| Discharge                    | 236,410 | 36.8 |
| Both                         | 176,462 | 27.5 |
| <b>Alert Setting</b>         |         |      |
| Emergency Department         | 412,712 | 64.3 |
| Inpatient                    | 179,490 | 28.0 |
| Both                         | 49,717  | 7.7  |
| <b>Alert Source Type</b>     |         |      |
| General Hospital             | 639,434 | 99.6 |
| Specialty Hospital           | 2,485   | 0.4  |
| <b>Alert Source Location</b> |         |      |
| Downstate Metropolitan       | 309,119 | 48.2 |
| Upstate Metropolitan         | 274,296 | 42.7 |
| Micropolitan                 | 50,715  | 7.9  |
| Rural                        | 7,789   | 1.2  |

Table 2. Characteristics of Alerts from Three Qualified Entities in New York State (continued).

|                      | N       | %    |
|----------------------|---------|------|
| <b>Direct to EHR</b> |         |      |
| Yes                  | 335,318 | 52.2 |
| No                   | 306,601 | 47.8 |
| <b>CCD Attached</b>  |         |      |
| Yes                  | 286,708 | 44.7 |
| No                   | 355,211 | 55.3 |

- Alerts are more likely to be sent for women than men.
- More alerts are sent for individuals between the ages of 45-64 and those that were 65 or older.
- Alerts are most commonly sent when a patient had been discharged from an emergency department than an inpatient setting.
- Most alerts come from general hospitals.
- Slightly more than half of alerts are sent directly to an EHR; the remaining half are sent via other methods including secure email or other messaging.
- Many alerts include Continuity of Care Documents (CCD).

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*“We have a client who we were able to see how much she was utilizing the emergency room. It allowed us to make a goal around that for her that we would have never known without it [alerts]. It [alerts] helped us to see the volume of visits and focus on that in our program with her.”*

*-Director of Programs, Social Service and Mental Health Organization*

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**KEY FINDING #3: LONG TERM CARE/HOME HEALTH ARE THE LARGEST RECIPIENTS OF ALERTS**

Table 3. Types of Organizations that Received Alerts from Three Qualified Entities in New York State.

|   | N       | %    |
|---|---------|------|
| <b>Receiving Organization Type</b>            |         |      |
| Primary Care Clinic <sup>1</sup>              | 103,898 | 16.2 |
| Federally Qualified Health Center             | 119,413 | 18.6 |
| Specialty/Multi-Specialty Clinic <sup>2</sup> | 49,959  | 7.8  |
| Long Term Care/Home Health                    | 178,807 | 27.9 |
| Health Home                                   | 141,894 | 22.1 |
| Behavioral Health                             | 14,932  | 2.3  |
| Payer   | 8,975   | 1.4  |
| Other <sup>3</sup>                            | 22,479  | 3.5  |
| Missing                                       | 1,562   | 0.2  |

<sup>1</sup>Primary care clinics include hospital-based clinics.

<sup>2</sup>Specialty/Multi-Specialty clinics may include primary care services offered as part of multi-specialty practices.

<sup>3</sup>"Other" includes social services, community services, and other non-clinical care settings.

- A wide variety of health care organizations received alerts.
- Home health received the largest number of alerts.
- Federally Qualified Health Centers and Primary Care Clinics (both independent and hospital-based practices) were the next most common recipients of alerts.

*“RHIO alerts have been very helpful to our organization. It also has saved us money as we pay an aide for going to a home even if someone is not there. Now we are alerted in advance and can call the aide.”*  
*-Executive Director, Home Care Organization*

**KEY FINDING #4: PROVIDERS USE QUERY-BASED EXCHANGE IN RESPONSE TO ALERTS**

Figure 3. Percent<sup>1</sup> of Alerts from Three Qualified Entities in New York State with a Query within 24 hours, 72 hours, and 7 days.

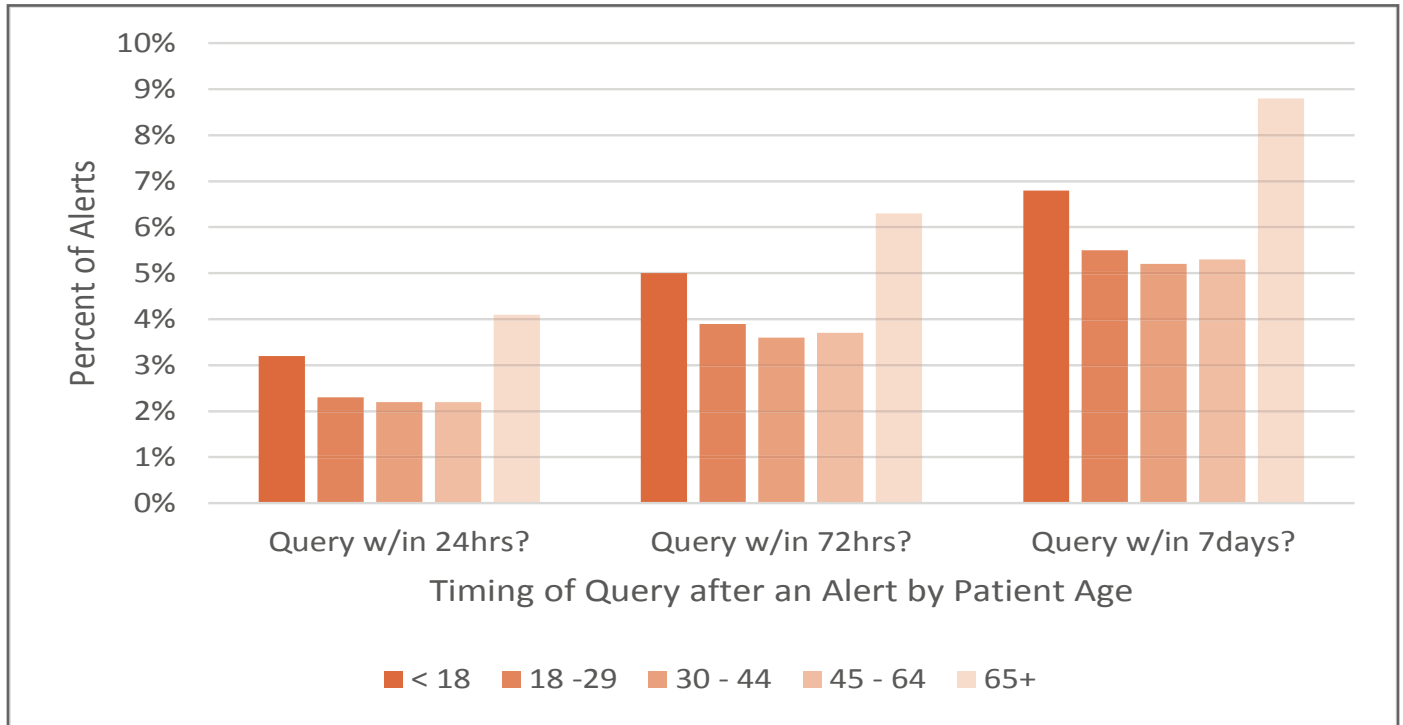


<sup>1</sup>Percentages in this figure are cumulative

- Both alerts and query-based information exchange are supported by New York State and the Federal Government.
- Within 24 hours, nearly 3% of alerts resulted in end users accessing query portals for additional patient information.
- Within 7 days, more than 6% of alerts resulted in query access.

**KEY FINDING #5: QUERIES AFTER ALERTS ARE RECEIVED ARE MORE COMMON FOR OLDER PATIENTS**

Figure 4. Percent<sup>1</sup> of Alerts from Three Qualified Entities in New York State with a Query within 24 hours, 72 hours, and 7 days.



<sup>1</sup>Percentages in this figure are cumulative

- Organizations are more likely to access Qualified Entities’ query-based portal services if they received an alert for patients over the age of 65 years.
- Usage of query-based portals after an alert is received was next highest for children (< 18 years old).

*“It [alerts] keeps me a step ahead of the game, because right now there is no communication between the hospital and me or the doctors and me. This really helps so that I can address them and try to build confidence with the doctors and the discharge planners. It’s increasing my communication with the health care professionals that are taking care of her so that we can all work together.”*  
 -Respiratory Therapist, Pharmacy and Home Healthcare Organization



## KEY FINDING #6: QUERIES AFTER AN ALERT IS RECEIVED ARE MOST COMMON IN SPECIALTY CLINICS

Table 4. Organizational Characteristics Associated with Utilization of Query-Based Services Following an Alert in Three Qualified Entities in New York State.

|   | Total number of alerts received (n) | Query w/in 24hrs? | Query w/in 72hrs? | Query w/in 7days? |
|---|-------------------------------------|-------------------|-------------------|-------------------|
|   |                                     | Y(%)              | Y(%) <sup>4</sup> | Y(%) <sup>4</sup> |
| <b>All alerts</b>                             | 641,919                             | 2.9               | 4.6               | 6.5               |
| <b>Receiving Organization Type</b>            |                                     |                   |                   |                   |
| Primary Care Clinic <sup>1</sup>              | 103,898                             | 1.6               | 2.6               | 3.5               |
| Federally Qualified Health Center             | 119,413                             | 3.6               | 6.0               | 8.9               |
| Specialty/Multi-Specialty Clinic <sup>2</sup> | 49,959                              | 16.5              | 25.8              | 35.7              |
| Long Term Care/Home Health                    | 178,807                             | 0.6               | 0.9               | 1.3               |
| Health Home                                   | 141,894                             | 0.8               | 1.4               | 2.1               |
| Behavioral Health                             | 14,932                              | 4.7               | 7.4               | 10.6              |
| Payer   | 8,975                               | 6.3               | 9.3               | 12.0              |
| Other <sup>3</sup>                            | 22,479                              | 3.4               | 5.8               | 8.0               |
| Missing                                       | 1,562                               | 0.4               | 0.5               | 0.5               |

<sup>1</sup>Primary care clinics include hospital-based clinics.

<sup>2</sup>Specialty/Multi-Specialty clinics may include primary care services offered as part of multi-specialty practices.

<sup>3</sup>“Other” includes social services, community services, and other non-clinical care settings.

<sup>4</sup>Percentages are cumulative

- Specialty and Multi-Specialty Clinics queried for additional information in response to 1 out of every 7 alerts within 24 hours.
- Payers are also more likely to use query-based portals within 24 hours than other types of providers.
- Organizations that received a larger number of alerts tended to have fewer queries in response to the alerts.

**KEY FINDING #7: INCLUDING CCDS WITH ALERTS REDUCES QUERY USAGE**

Table 5. Characteristics Associated with Utilization of Query-Based Services Following an Alert in Three Qualified Entities in New York State.

|                              | Total number of alerts received (n) | Query w/in 24hrs? | Query w/in 72hrs? | Query w/in 7days? |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------|
|                              |                                     | Y(%)              | Y(%) <sup>1</sup> | Y(%) <sup>1</sup> |
| <b>All Alerts</b>            | 641,919                             | 2.9               | 4.6               | 6.5               |
| <b>Alert Timing</b>          |                                     |                   |                   |                   |
| Admit                        | 229,047                             | 2.8               | 4.9               | 7.3               |
| Discharge                    | 236,410                             | 3.1               | 4.7               | 6.2               |
| Both                         | 176,462                             | 2.6               | 4.2               | 5.9               |
| <b>Alert Setting</b>         |                                     |                   |                   |                   |
| Emergency Department         | 412,712                             | 2.5               | 4.1               | 5.9               |
| Inpatient                    | 179,490                             | 3.6               | 5.4               | 7.3               |
| Both                         | 49,717                              | 3.9               | 6.3               | 9.2               |
| <b>Alert Source Location</b> |                                     |                   |                   |                   |
| Metropolitan-Upstate         | 274,296                             | 3.1               | 4.9               | 7.2               |
| Metropolitan-Downstate       | 309,119                             | 2.7               | 4.3               | 5.9               |
| Micropolitan                 | 50,715                              | 2.6               | 4.4               | 6.4               |
| Rural                        | 7,789                               | 3.4               | 5.3               | 8.4               |
| <b>Direct to EHR</b>         |                                     |                   |                   |                   |
| Yes                          | 306,601                             | 2.3               | 3.7               | 5.0               |
| No                           | 335,318                             | 3.4               | 5.5               | 7.9               |
| <b>CCD Attached</b>          |                                     |                   |                   |                   |
| Yes                          | 286,708                             | 2.4               | 3.9               | 5.3               |
| No                           | 355,211                             | 3.2               | 5.2               | 7.5               |

<sup>1</sup>Percentages in this figure are cumulative

- Alerts sent after an individual had been discharged were most likely to result in an organization accessing QE query-based portal services within 24 hours.
- Alerts that were sent after a patient had been admitted were more likely to result in queries within 72 hours or 7 days.
- Alerts that were sent when a patient had been to both the ED and inpatient setting in the same day were most likely to result in an organization accessing QE query-based portal services for all time intervals.
- Alerts that were sent with a Continuity of Care Document (CCD) attached were less likely to result in an organization accessing QE query-based portal services.

## TAKEAWAY POINTS FOR POLICY MAKERS

- Health care organizations have unprecedented access to patient information.
- Alerts and query-based exchange technologies serve many different types of organizations.
- Alerts can prompt end users to seek additional information from query-based portals.
- Federally Qualified Health Centers are key users of health information exchange technologies.
- Health homes are a key recipient of alert services.

## IMPLICATIONS FOR PROVIDERS

- End users access query-based portals in response to alerts.
- Alerts associated with inpatient admissions are more likely to prompt the need for additional information.
- Including CCDs (which have additional information beyond the alert content) decreases the need to access the query portal.

## REFERENCES

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6. Vest, J. R., Kaushal, R., Silver, M. D., Hentel, K., & Kern, L. M. (2014). Health information exchange and the frequency of repeat medical imaging. *American Journal of Managed Care*, 20(11 Spec 17), eSP16-eSP24.
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APPENDIX

Appendix A. Buffalo Report

KEY FINDING #1: USAGE OF SUBSCRIPTION ALERT SERVICES AND QUERY-BASED EXCHANGE INCREASED OVER TIME

Figure 1. Number of Alerts Sent by HEALTHeLINK.

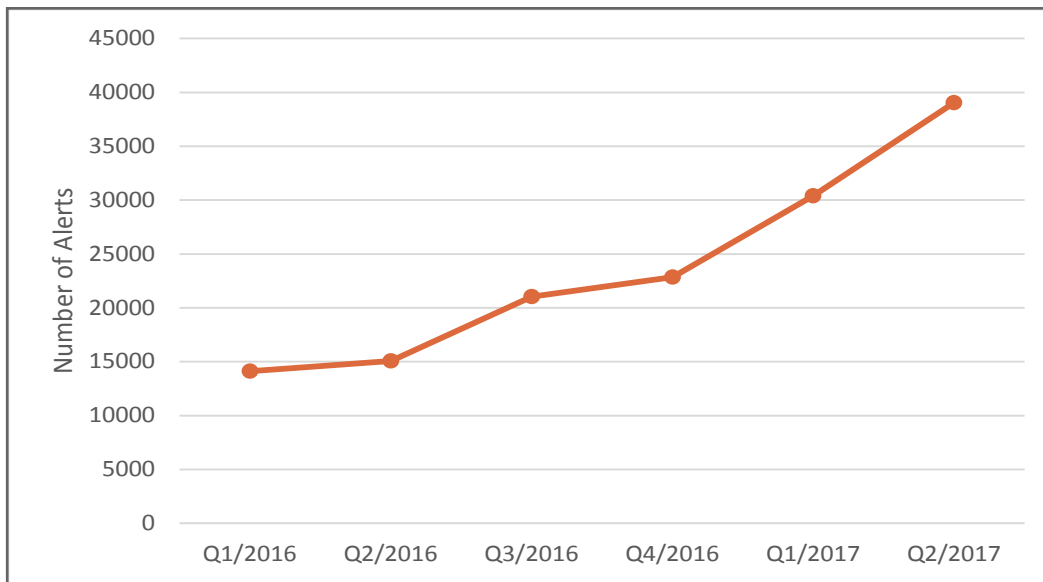
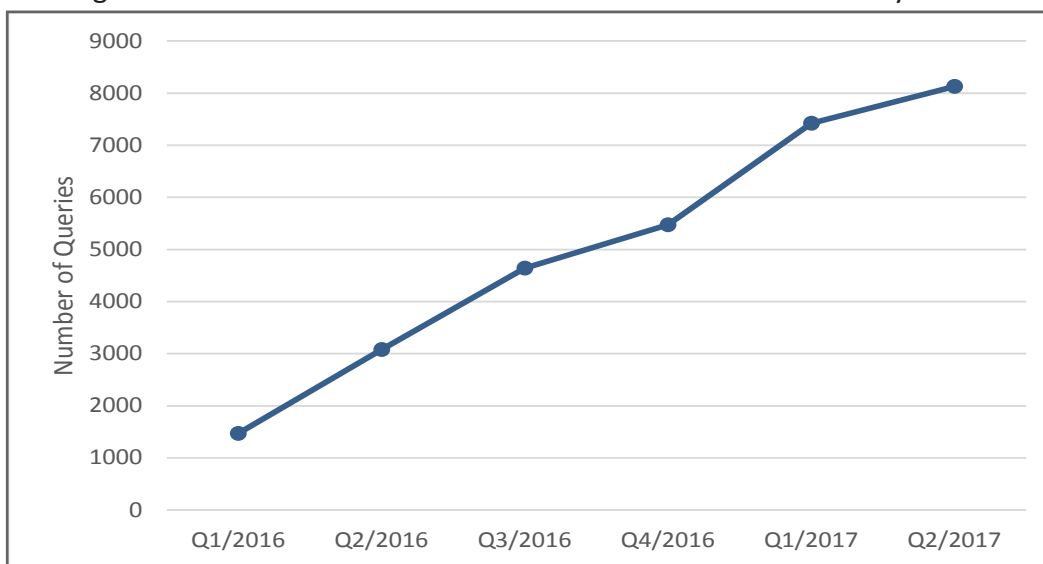


Figure 2. Number of Queries to HEALTHeLINK’s Patient Record System.



Note: Unique queries for patients with alerts (2015-2017) & excluding queries for consent only.

- The number of alerts being sent for patients is increasing over time.
- The number of queries is increasing over time.

## KEY FINDING #2: CHARACTERISTICS ASSOCIATED WITH ALERTS

Table 1. Patient Characteristics Associated with Alerts from HEALTHeLINK.

|                       | N      | %    |
|-----------------------|--------|------|
| <b>Patient Gender</b> |        |      |
| Male                  | 54,868 | 38.5 |
| Female                | 79,206 | 55.6 |
| Other/Unknown         | 8,385  | 5.9  |
| <b>Patient Age</b>    |        |      |
| < 18                  | 5,692  | 4.0  |
| 18 - 29               | 19,795 | 13.9 |
| 30 - 44               | 31,836 | 22.4 |
| 45 - 64               | 51,539 | 36.1 |
| 65+                   | 33,597 | 23.6 |

Table 2. Patient Characteristics Associated with Alerts from HEALTHeLINK.

|                              | N       | %    |
|------------------------------|---------|------|
| <b>Alert Timing</b>          |         |      |
| Admit                        | 38,730  | 27.2 |
| Discharge                    | 53,781  | 37.8 |
| Both                         | 49,948  | 35.1 |
| <b>Alert Setting</b>         |         |      |
| Emergency Department         | 113,879 | 79.9 |
| Inpatient                    | 27,575  | 19.4 |
| Both                         | 1,005   | 0.7  |
| <b>Alert Source Type</b>     |         |      |
| General Hospital             | 141,539 | 99.3 |
| Specialty Hospital           | 920     | 0.7  |
| <b>Alert Source Location</b> |         |      |
| Metropolitan                 | 106,227 | 74.6 |
| Micropolitan                 | 33,046  | 23.2 |
| Rural                        | 3,136   | 2.2  |
| <b>Direct to EHR</b>         |         |      |
| Yes                          | 5,578   | 3.9  |
| No                           | 136,881 | 96.1 |

- Alerts are more likely to be sent for women than men.
- Alerts are sent most frequently for individuals that were 45-64 years old.
- Alerts are more likely to be sent when a patient had been discharged from an emergency department or an inpatient setting.
- Alerts are sent most frequently when a patient has been seen in the Emergency Department.
- Alerts are not commonly sent directly to the end users' electronic health record systems (other methods of delivery include secure email or other messaging).

**KEY FINDING #3: HEALTH HOME ORGANIZATIONS ARE THE LARGEST RECIPIENTS OF ALERTS**

Table 3. Types of Organizations that Received Alerts from HEALTHeLINK.

|   | N      | %    |
|---|--------|------|
| <b>Receiving Organization Type</b>            |        |      |
| Primary Care Clinic <sup>1</sup>              | 46,335 | 32.5 |
| Federally Qualified Health Center             | 9,501  | 6.7  |
| Specialty/Multi-Specialty Clinic <sup>2</sup> | 30,242 | 21.2 |
| Long Term Care/Home Health                    | 1,053  | 0.7  |
| Health Home                                   | 47,271 | 33.2 |
| Behavioral Health                             | 5,004  | 3.2  |
| Payer   | 620    | 0.4  |
| Other <sup>3</sup>                            | 2,433  | 1.7  |

<sup>1</sup>Primary care clinics include hospital-based clinics.

<sup>2</sup>Specialty/Multi-Specialty clinics may include primary care services offered as part of multi-specialty practices.

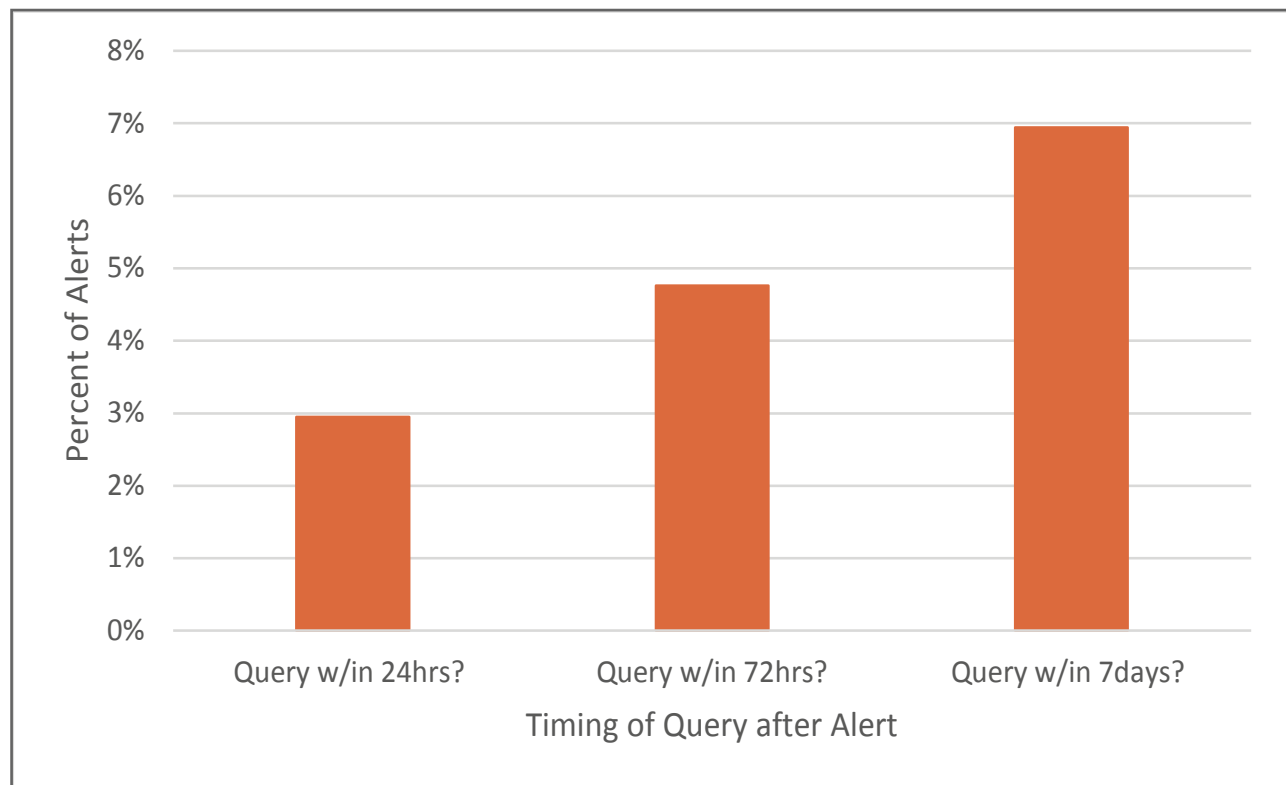
<sup>3</sup>“Other” includes social services, community services, and other non-clinical care settings.

- Health Homes received the largest number of alerts.
- Primary Care Clinics and Specialty/Multi-Specialty Clinics were the next most common recipients of alerts.



**KEY FINDING #4: PROVIDERS USE QUERY-BASED EXCHANGE IN RESPONSE TO ALERTS**

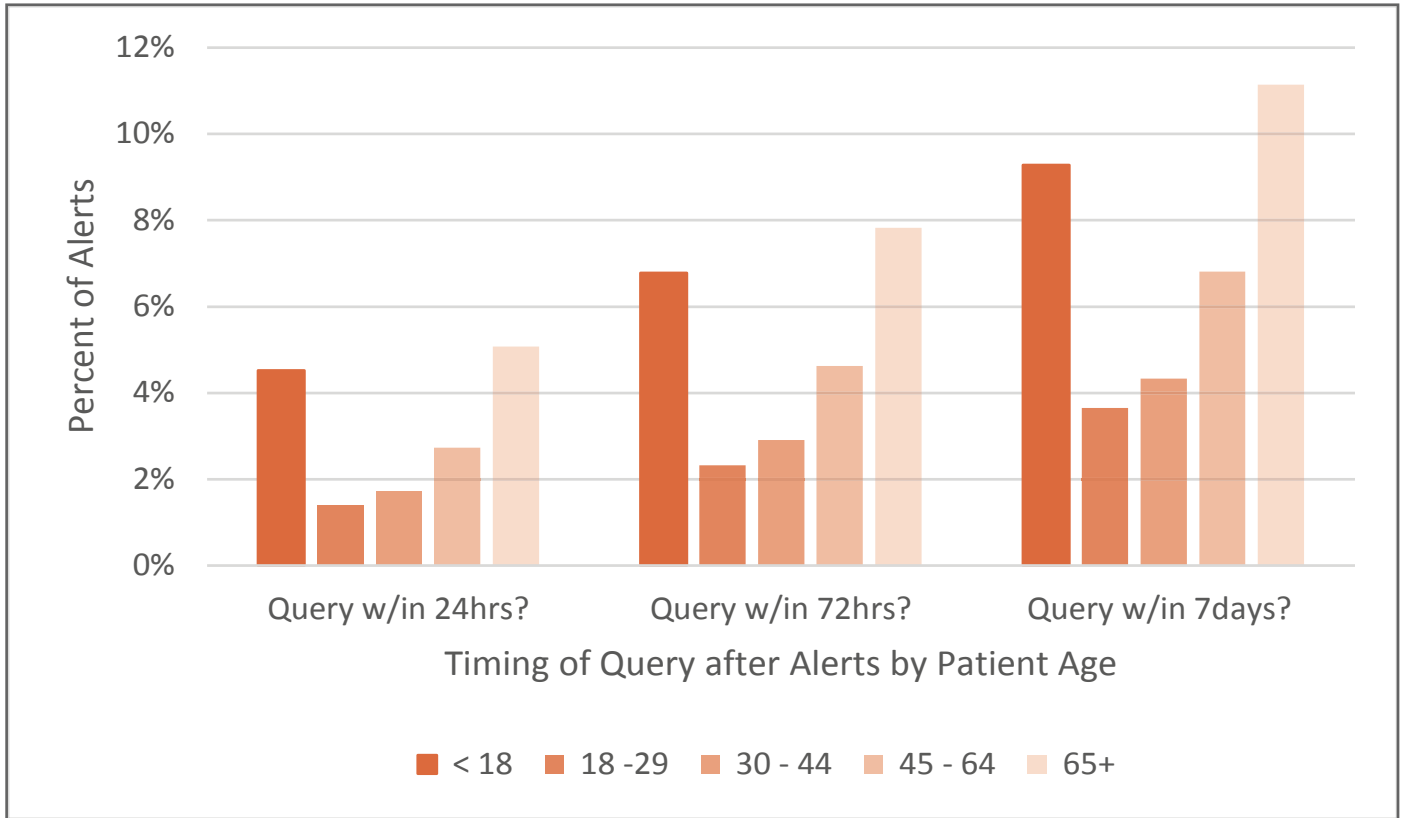
Figure 3. Percent of Alerts from HEALTHeLINK with a Query within 24 hours, 72 hours, and 7 days.



- Both alerts and query-based information exchange are supported by New York State and the Federal Government.
- Within 24 hours, about 3% of alerts resulted in end users accessing query portals for additional patient information.
- Within 7 days, approximately 7% of alerts resulted in query access.

**KEY FINDING #5: QUERIES AFTER ALERTS ARE RECEIVED ARE MORE COMMON FOR OLDER AND YOUNGER PATIENTS**

Figure 4. Percent of Alerts from HEALTHeLINK with a Query within 24 hours, 72 hours, and 7 days by Patient Age.



- Organizations are most likely to access Qualified Entities’ query-based portal services if they received an alert for younger (<18) and older patients (65+).

## KEY FINDING #6: QUERIES AFTER AN ALERT IS RECEIVED ARE MOST COMMON IN LONG TERM CARE/HOME HEALTH AND PAYER ORGANIZATIONS

Table 4. Organizational Characteristics Associated with Utilization of Query-Based Services Following an Alert from HEALTHeLINK.

|   | Total number of alerts received (n) | Query w/in 24hrs? | Query w/in 72hrs? | Query w/in 7days? |
|---|-------------------------------------|-------------------|-------------------|-------------------|
|   |                                     | Y                 | Y                 | Y                 |
| <b>All Alerts</b>                             | 142,459                             | 3.0               | 4.8               | 6.9               |
| <b>Receiving Organization Type</b>            |                                     |                   |                   |                   |
| Primary Care Clinic <sup>1</sup>              | 46,335                              | 0.3               | 0.4               | 0.6               |
| Federally Qualified Health Center             | 9,501                               | 1.6               | 3.0               | 5.2               |
| Specialty/Multi-Specialty Clinic <sup>2</sup> | 19,183                              | 7.0               | 10.9              | 15.6              |
| Long Term Care/Home Health                    | 1,053                               | 25.5              | 40.7              | 56.8              |
| Health Home                                   | 47,271                              | 2.4               | 4.2               | 6.3               |
| Behavioral Health                             | 4,840                               | 3.3               | 5.2               | 7.8               |
| Payer   | 620                                 | 36.6              | 52.7              | 73.2              |
| Other <sup>3</sup>                            | 2,433                               | 0.0               | 0.0               | 0.0               |

<sup>1</sup>Primary care clinics include hospital-based clinics.

<sup>2</sup>Specialty/Multi-Specialty clinics may include primary care services offered as part of multi-specialty practices.

<sup>3</sup>"Other" includes social services, community services, and other non-clinical care settings.

- While Long Term Care/Home Health and Payer agencies did not receive a large number of alerts, both were highly likely to access query-based portal services for the alerts they did receive.
- Specialty or Multi-specialty clinics were the next group most likely to use query-based portals.

**KEY FINDING #7: QUERIES WITHIN 24 HOURS ARE MOST COMMON WHEN A PATIENT HAD BEEN DISCHARGED OR WAS SEEN IN BOTH AN ED AND INPATIENT SETTING**

Table 5. Characteristics Associated with Utilization of Query-Based Services Following an Alert from HEALTHeLINK.

|                      | Total number of alerts received (n) | Query w/in 24hrs? | Query w/in 72hrs? | Query w/in 7days? |
|----------------------|-------------------------------------|-------------------|-------------------|-------------------|
|                      |                                     | Y(%)              | Y(%)              | Y(%)              |
| <b>All Alerts</b>    | 142,459                             | 3.0               | 4.8               | 6.9               |
| <b>Alert Timing</b>  |                                     |                   |                   |                   |
| Admit                | 38,730                              | 3.3               | 5.7               | 8.9               |
| Discharge            | 53,781                              | 3.1               | 4.9               | 6.8               |
| Both                 | 49,948                              | 2.5               | 3.9               | 5.6               |
| <b>Alert Setting</b> |                                     |                   |                   |                   |
| Emergency Department | 113,879                             | 2.9               | 4.7               | 6.9               |
| Inpatient            | 27,575                              | 3.4               | 5.1               | 7.0               |
| Both                 | 1,005                               | 3.5               | 6.0               | 9.0               |
| <b>Direct to EHR</b> |                                     |                   |                   |                   |
| Yes                  | 5,578                               | 1.8               | 3.1               | 4.4               |
| No                   | 136,881                             | 3.0               | 4.8               | 7.0               |

- Alerts sent after an individual had been admitted from an emergency department or inpatient setting were most likely to result in an organization accessing QE query-based portal services within 24 hours.
- Alerts that were sent when a patient had been to both the ED and inpatient setting in the same day were most likely to result in an organization accessing QE query-based portal services across all times.
- Alerts that were sent direct to an EHR were less likely to result in a query across all times.

Appendix B. New York City Report

**KEY FINDING #1: USAGE OF SUBSCRIPTION ALERT SERVICES AND QUERY-BASED EXCHANGE INCREASED OVER TIME**

Figure 1. Number of Events with an Alert Sent by Healthix.

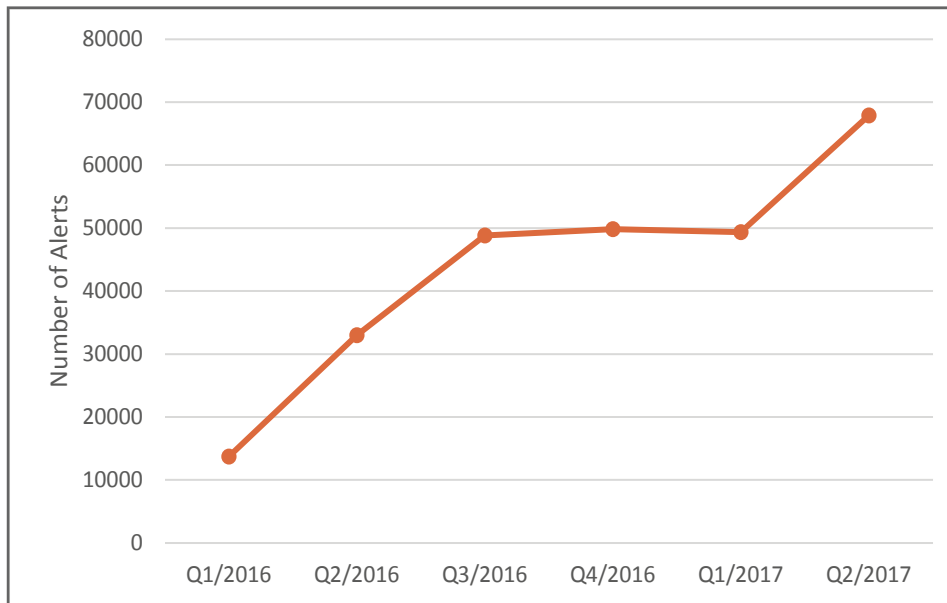
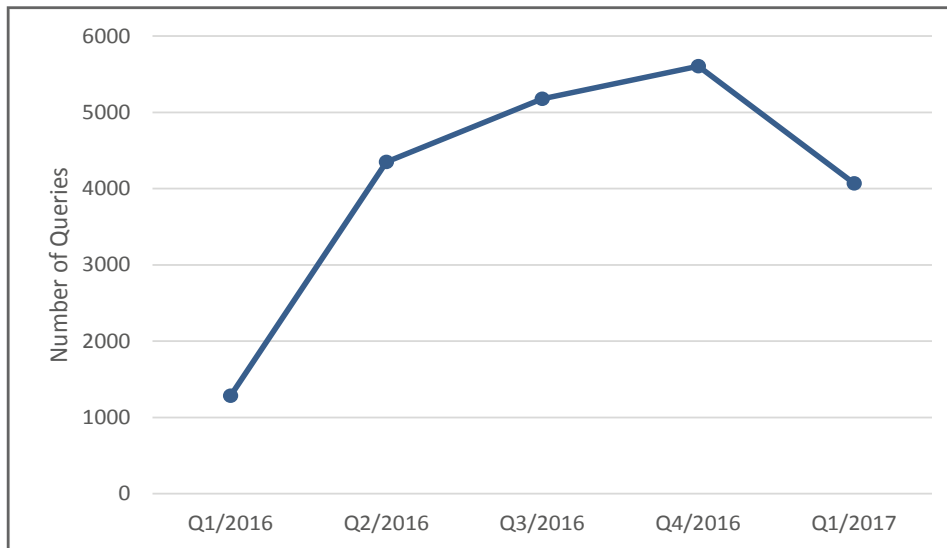


Figure 2. Number of Queries to Healthix’s Patient Record System.



Note: Unique queries for patients with alerts (2015-2017) & excluding queries for consent only.

- The number of alerts being sent for patients with alerts is increasing over time.
- The number of queries is generally increasing over time, however query usage decreases with the inclusion of CCDs (see Table 5).

## KEY FINDING #2: CHARACTERISTICS ASSOCIATED WITH ALERTS

Table 1. Patient Characteristics Associated with Alerts from Healthix.

|                       | N       | %    |
|-----------------------|---------|------|
| <b>Patient Gender</b> |         |      |
| Male                  | 125,449 | 40.6 |
| Female                | 166,086 | 53.7 |
| Other/Unknown         | 17,584  | 5.7  |
| <b>Patient Age</b>    |         |      |
| < 18                  | 14,135  | 4.6  |
| 18 - 29               | 30,517  | 9.9  |
| 30 - 44               | 45,020  | 14.5 |
| 45 - 64               | 104,102 | 33.7 |
| 65+                   | 115,345 | 37.3 |

Table 2. Patient Characteristics Associated with Alerts from Healthix.

|                              | N       | %     |
|------------------------------|---------|-------|
| <b>Alert Timing</b>          |         |       |
| Admit                        | 126,335 | 40.9  |
| Discharge                    | 125,690 | 40.6  |
| Both                         | 57,094  | 18.5  |
| <b>Alert Setting</b>         |         |       |
| Emergency Department         | 161,232 | 52.2  |
| Inpatient                    | 105,379 | 34.1  |
| Both                         | 42,508  | 13.7  |
| <b>Alert Source Type</b>     |         |       |
| General Hospital             | 307,554 | 99.5  |
| Specialty Hospital           | 1,565   | 0.5   |
| <b>Alert Source Location</b> |         |       |
| Downstate Metropolitan       | 309,119 | 100.0 |
| <b>Direct to EHR</b>         |         |       |
| Yes                          | 286,708 | 92.8  |
| No                           | 22,411  | 7.2   |
| <b>CCD Attached</b>          |         |       |
| Yes                          | 286,708 | 92.8  |
| No                           | 22,411  | 7.2   |

- Alerts are more likely to be sent for women than men.
- More alerts are sent for individuals that were 65 or older.
- Alerts are about equally likely to be sent when a patient had been admitted or discharged from an emergency department or an inpatient setting.
- A majority of alerts are sent directly to the end users' electronic health record systems (other methods of delivery include secure email or other messaging) with a Continuity of Care Document (CCD) attached.

## KEY FINDING #3: LONG TERM CARE/HOME HEALTH ORGANIZATIONS ARE THE LARGEST RECIPIENTS OF ALERTS

Table 3. Types of Organizations that Received Alerts from Healthix.

|   | N       | %    |
|---|---------|------|
| <b>Receiving Organization Type</b>            |         |      |
| Primary Care Clinic <sup>1</sup>              | 48,817  | 15.8 |
| Federally Qualified Health Center             | 47,138  | 15.3 |
| Specialty/Multi-Specialty Clinic <sup>2</sup> | 19,183  | 6.2  |
| Long Term Care/Home Health                    | 102,082 | 33.0 |
| Health Home                                   | 80,338  | 26.0 |
| Behavioral Health                             | 1,644   | 0.5  |
| Payer   | 8,355   | 2.7  |

<sup>1</sup>Primary care clinics include hospital-based clinics.

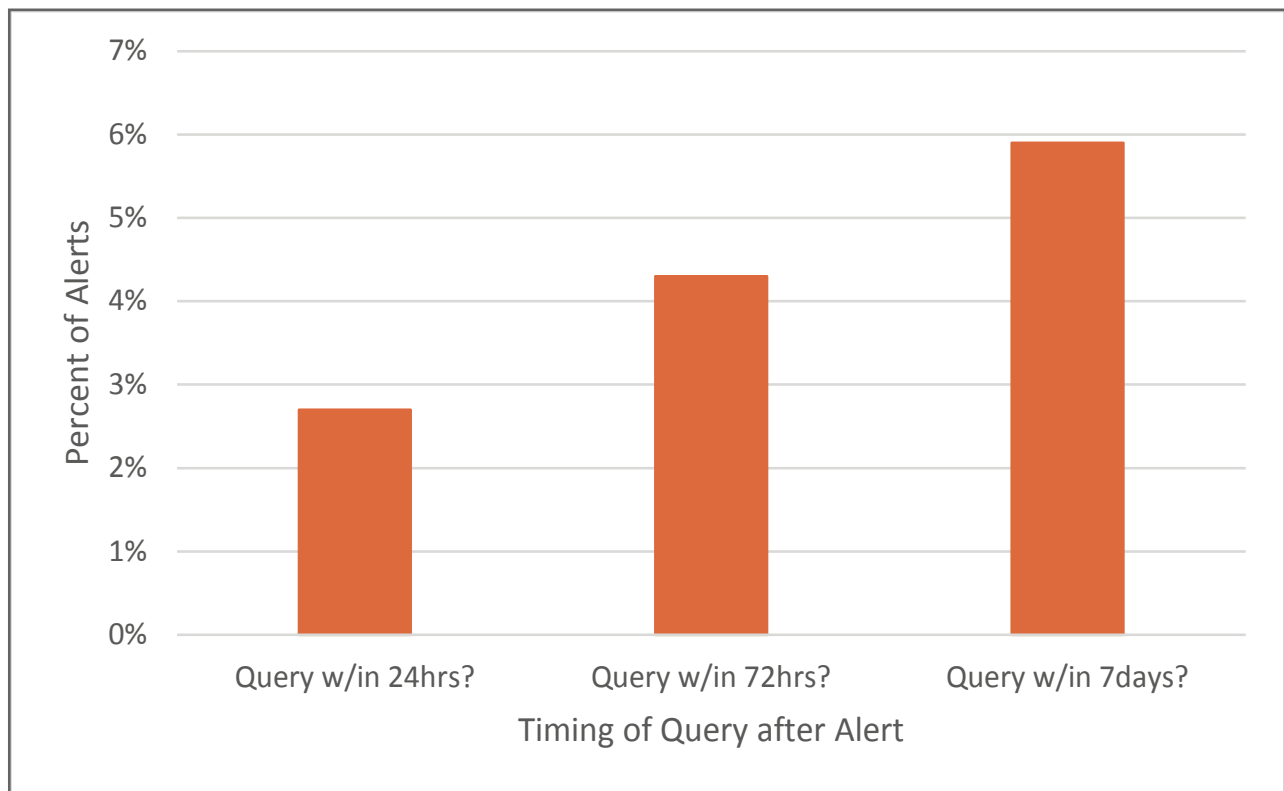
<sup>2</sup>Specialty/Multi-Specialty clinics may include primary care services offered as part of multi-specialty practices.

- Long Term Care/Home Health organizations received the largest number of alerts.
- Health Homes, Primary Care Clinics, and Federally Qualified Health Centers were the next most common recipients of alerts.



**KEY FINDING #4: PROVIDERS USE QUERY-BASED EXCHANGE IN RESPONSE TO ALERTS**

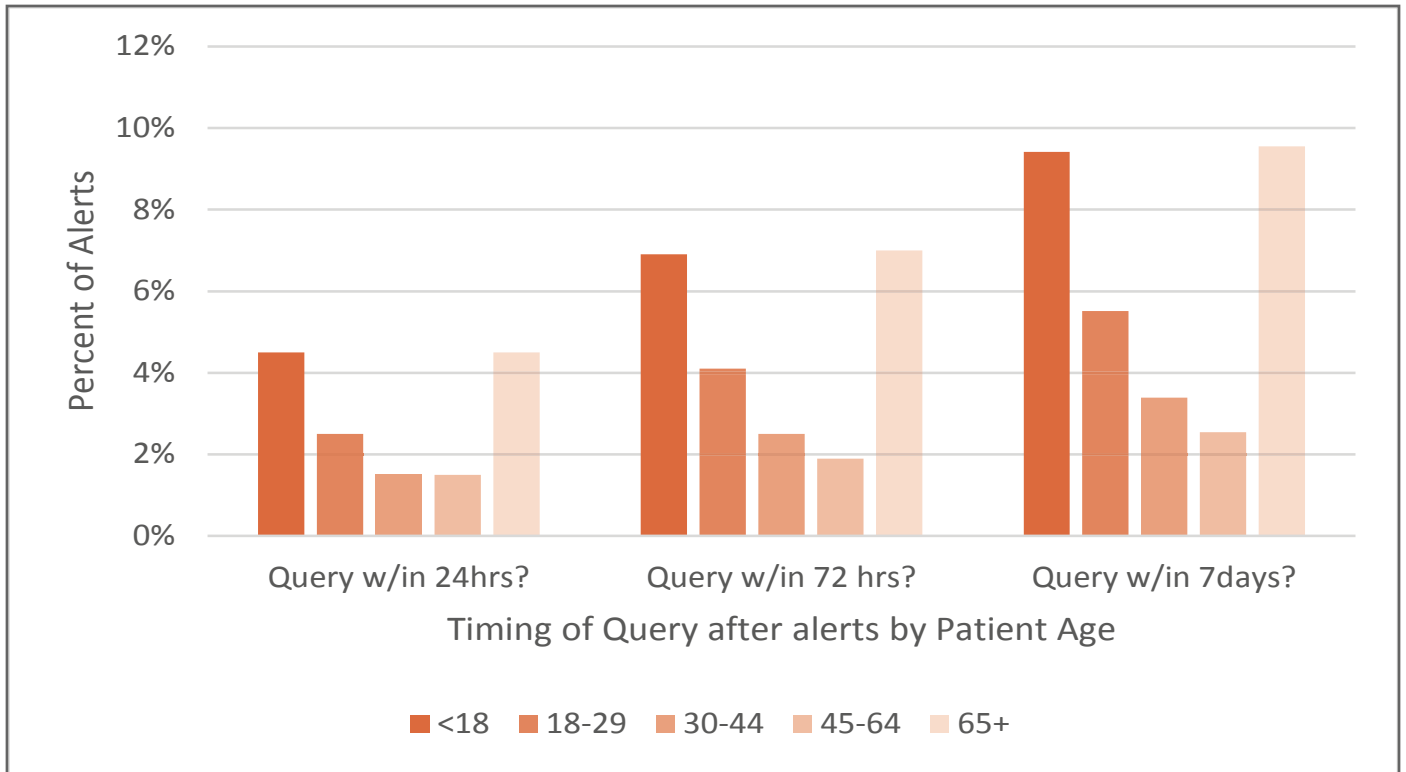
Figure 3. Percent of Alerts from Healthix with a Query within 24 hours, 72 hours, and 7 days.



- Both alerts and query-based information exchange are supported by New York State and the Federal Government.
- Within 24 hours, a little less than 3% of alerts resulted in end users accessing query portals for additional patient information.
- Within 7 days, about 6% of alerts resulted in query access.

**KEY FINDING #5: QUERIES AFTER ALERTS ARE RECEIVED ARE LESS COMMON FOR OLDER AND YOUNGER PATIENTS**

Figure 4. Percent of Alerts from HEALTHelINK with a Query Within 24 hours, 72 hours, and 7 days by Patient Age.



- Organizations are most likely to access Qualified Entities’ query-based portal services if they received an alert for younger (<18) and older patients (65+).

## KEY FINDING #6: QUERIES AFTER AN ALERT IS RECEIVED ARE MOST COMMON IN SPECIALTY AND MULTI-SPECIALTY CLINICS

Table 4. Organizational Characteristics Associated with Utilization of Query-Based Services Following an Alert from Healthix.

|   | Total number of alerts received (n) | Query w/in 24hrs? | Query w/in 72hrs? | Query w/in 7days? |
|---|-------------------------------------|-------------------|-------------------|-------------------|
|   |                                     | Y                 | Y                 | Y                 |
| <b>All Alerts</b>                             | 309,119                             | 2.7               | 4.3               | 5.9               |
| <b>Receiving Organization Type</b>            |                                     |                   |                   |                   |
| Primary Care Clinic <sup>1</sup>              | 48,817                              | 2.5               | 4.0               | 5.2               |
| Federally Qualified Health Center             | 47,138                              | 1.3               | 2.3               | 3.3               |
| Specialty/Multi-Specialty Clinic <sup>2</sup> | 19,183                              | 31.8              | 50.0              | 68.3              |
| Long Term Care/Home Health                    | 102,082                             | 0.2               | 0.3               | 0.3               |
| Health Home                                   | 80,338                              | 0.0               | 0.0               | 0.0               |
| Behavioral Health                             | 1,644                               | 1.0               | 1.3               | 3.8               |
| Payer   | 8,355                               | 4.1               | 6.1               | 7.5               |
| Other <sup>3</sup>                            | 1,562                               | 0.4               | 0.5               | 0.5               |

<sup>1</sup>Primary care clinics include hospital-based clinics.

<sup>2</sup>Specialty/Multi-Specialty clinics may include primary care services offered as part of multi-specialty practices.

- Specialty and Multi-specialty clinics are more likely to use query-based portals than other types of providers.
- Organizations classified as others are the next group most likely to use query-based portals, followed by payers, and then primary care clinics.

**KEY FINDING #7: QUERIES WITHIN 24 HOURS ARE MOST COMMON WHEN A PATIENT HAD BEEN DISCHARGED OR WAS SEEN IN BOTH AN ED AND INPATIENT SETTING**

Table 5. Characteristics Associated with Utilization of Query-Based Services Following an Alert from Healthix.

|                      | Total number of alerts received (n) | Query w/in 24hrs? | Query w/in 72hrs? | Query w/in 7days? |
|----------------------|-------------------------------------|-------------------|-------------------|-------------------|
|                      |                                     | Y(%)              | Y(%)              | Y(%)              |
| <b>All Alerts</b>    | 309,119                             | 2.7               | 4.3               | 5.9               |
| <b>Alert Timing</b>  |                                     |                   |                   |                   |
| Admit                | 126,335                             | 2.7               | 4.6               | 6.7               |
| Discharge            | 118,830                             | 2.9               | 4.4               | 5.5               |
| Both                 | 57,094                              | 2.4               | 3.7               | 5.1               |
| <b>Alert Setting</b> |                                     |                   |                   |                   |
| Emergency Department | 161,232                             | 1.9               | 3.1               | 4.2               |
| Inpatient            | 105,379                             | 3.6               | 5.4               | 7.2               |
| Both                 | 42,508                              | 3.9               | 6.4               | 9.1               |
| <b>Direct to EHR</b> |                                     |                   |                   |                   |
| Yes                  | 286,708                             | 2.4               | 3.9               | 5.3               |
| No                   | 22,411                              | 6.6               | 10.5              | 13.6              |
| <b>CCD Attached</b>  |                                     |                   |                   |                   |
| Yes                  | 286,708                             | 2.4               | 3.9               | 5.3               |
| No                   | 22,411                              | 6.6               | 10.5              | 13.6              |

- Alerts sent after an individual had been discharged from an emergency department or inpatient setting were most likely to result in an organization accessing QE query-based portal services within 24 hours.
- Alerts that were sent when a patient had been to both the ED and inpatient setting in the same day were most likely to result in an organization accessing QE query-based portal services across all times.
- Alerts that were sent direct to an EHR with a CCD attached were less likely to result in a query across all times.

Appendix C. Rochester Report

KEY FINDING #1: USAGE OF SUBSCRIPTION ALERT SERVICES AND QUERY-BASED EXCHANGE INCREASED OVER TIME

Figure 1. Number of Alerts Sent by Rochester RHIO.

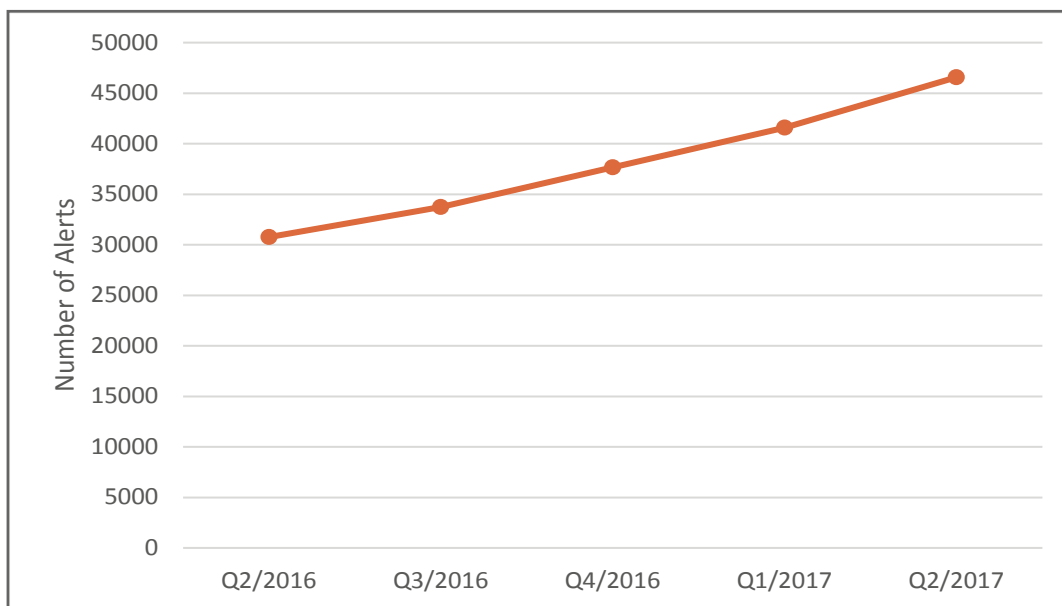
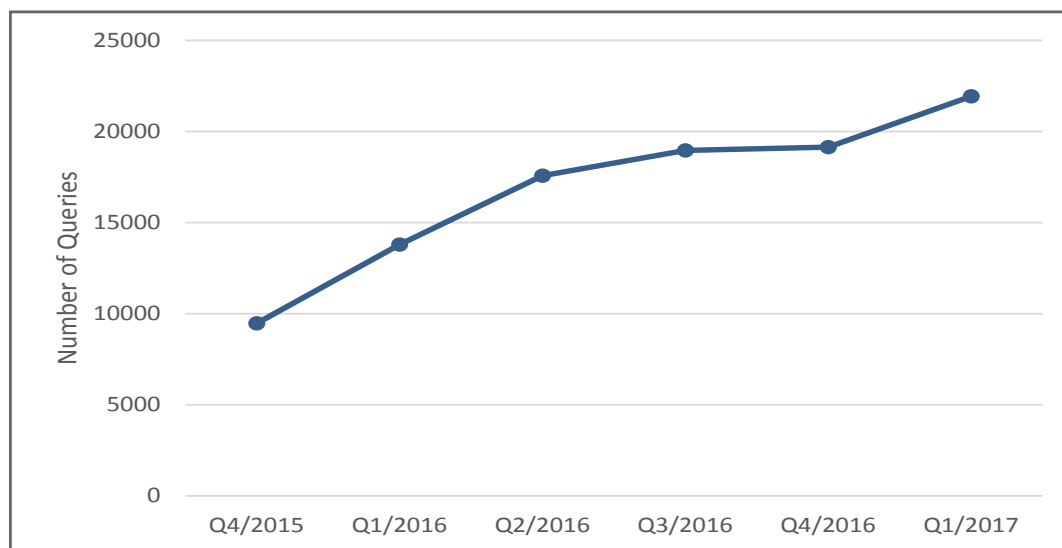


Figure 2. Number of Queries to Rochester RHIO’s Patient Record System.



Note: Unique queries for patients with alerts (2015-2017) & excluding queries for consent only.

- The number of alerts being sent for patients with alerts is increasing over time.
- The number of queries is increasing over time.

**KEY FINDING #2: CHARACTERISTICS ASSOCIATED WITH ALERTS**

Table 1. Patient Characteristics Associated with Alerts from Rochester RHIO.

|                       | N       | %    |
|-----------------------|---------|------|
| <b>Patient Gender</b> |         |      |
| Male                  | 69,119  | 36.3 |
| Female                | 113,092 | 59.4 |
| Other/Unknown         | 8,130   | 4.3  |
| <b>Patient Age</b>    |         |      |
| < 18                  | 8,128   | 4.3  |
| 18 - 29               | 17,620  | 9.3  |
| 30 - 44               | 33,135  | 17.4 |
| 45 - 64               | 66,530  | 34.9 |
| 65+                   | 64,928  | 34.1 |

Table 2. Patient Characteristics Associated with Alerts from Rochester RHIO.

|                              | N       | %     |
|------------------------------|---------|-------|
| <b>Alert Timing</b>          |         |       |
| Admit                        | 63,982  | 33.6  |
| Discharge                    | 56,939  | 29.9  |
| Both                         | 69,402  | 36.5  |
| <b>Alert Setting</b>         |         |       |
| Emergency Department         | 137,601 | 72.3  |
| Inpatient                    | 46,536  | 24.4  |
| Both                         | 6,204   | 3.3   |
| <b>Alert Source Type</b>     |         |       |
| General Hospital             | 190,341 | 100.0 |
| Specialty Hospital           | 0       | 0.0   |
| <b>Alert Source Location</b> |         |       |
| Upstate Metropolitan         | 168,019 | 88.3  |
| Micropolitan                 | 17,669  | 9.3   |
| Rural                        | 4,653   | 2.4   |
| <b>Direct to EHR</b>         |         |       |
| Yes                          | 14,135  | 7.5   |
| No                           | 176,026 | 92.5  |

- Alerts are more likely to be sent for women than men.
- More alerts are sent for individuals between the ages of 45-64 and those that were 65 or older.
- Alerts are most commonly sent when a patient had been admitted or discharged from an emergency department than an inpatient setting.

**KEY FINDING #3: LONG TERM CARE/HOME HEALTH ORGANIZATIONS ARE THE LARGEST RECIPIENTS OF ALERTS**

Table 3. Types of Organizations that Received Alerts from Rochester RHIO.

|   | N      | %    |
|---|--------|------|
| <b>Receiving Organization Type</b>            |        |      |
| Primary Care Clinic <sup>1</sup>              | 8,746  | 4.6  |
| Federally Qualified Health Center             | 62,774 | 33.0 |
| Specialty/Multi-Specialty Clinic <sup>2</sup> | 534    | 0.3  |
| Long Term Care/Home Health                    | 75,672 | 39.8 |
| Health Home                                   | 14,285 | 7.5  |
| Behavioral Health                             | 8,284  | 4.4  |
| Other <sup>3</sup>                            | 20,046 | 10.5 |

<sup>1</sup>Primary care clinics include hospital-based clinics.

<sup>2</sup>Specialty/Multi-Specialty clinics may include primary care services offered as part of multi-specialty practices.

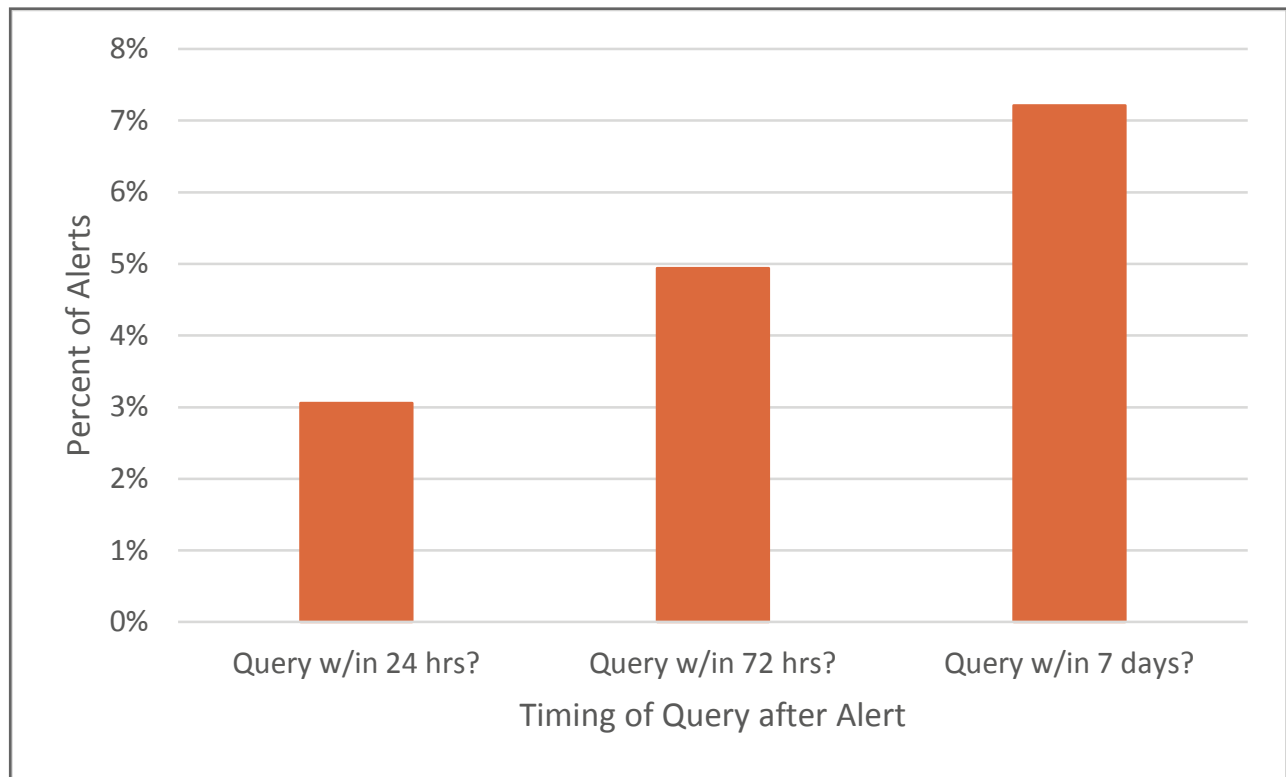
<sup>3</sup>“Other” includes social services, community services, and other non-clinical care settings.

- Long Term Care/Home Health received the largest number of alerts.
- Federally Qualified Health Centers were the next most common recipients of alerts.



**KEY FINDING #4: PROVIDERS USE QUERY-BASED EXCHANGE IN RESPONSE TO ALERTS**

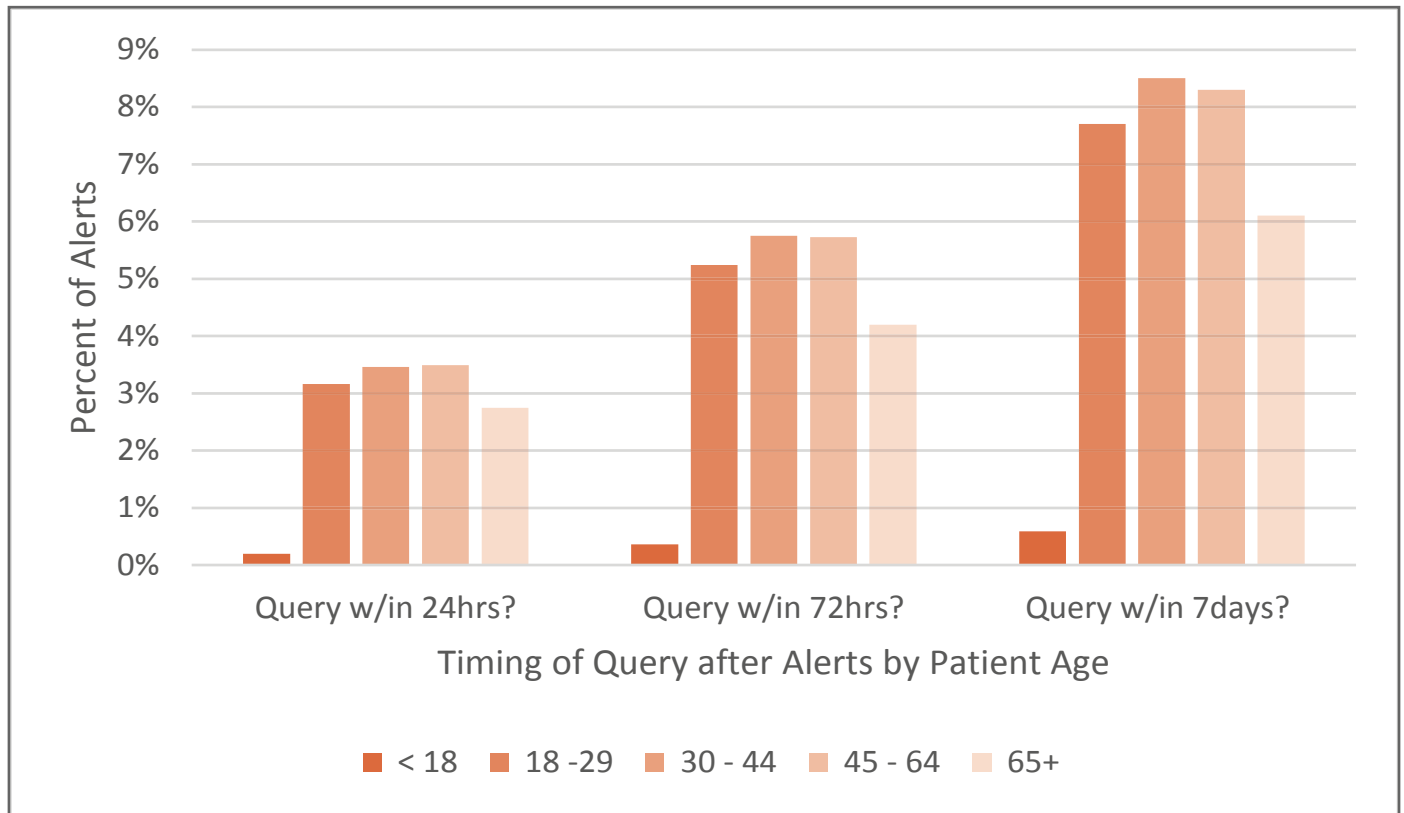
Figure 3. Percent of Alerts from Rochester RHIO with a Query within 24 hours, 72 hours, and 7 days



- Both alerts and query-based information exchange are supported by New York State and the Federal Government.
- Within 24 hours, approximately 3% of alerts resulted in end users accessing query portals for additional patient information.
- Within 7 days, more than 7% of alerts resulted in query access.

**KEY FINDING #5: QUERIES AFTER ALERTS ARE RECEIVED ARE MOST COMMON FOR ADULT PATIENTS**

Figure 4. Percent of Alerts from Rochester RHIO with a Query within 24 hours, 72 hours, and 7 days by patient age.



- Organizations are most likely to access Qualified Entities’ query-based portal services if they received an alert for patients that were 30-64 years old.

## KEY FINDING #6: QUERIES AFTER AN ALERT IS RECEIVED ARE MOST COMMON IN FEDERALLY QUALIFIED HEALTH CENTERS

Table 4. Organizational Characteristics Associated with Utilization of Query-Based Services Following an Alert from Rochester RHIO.

|   | Total number of alerts received (n) | Query w/in 24hrs? | Query w/in 72hrs? | Query w/in 7days? |
|---|-------------------------------------|-------------------|-------------------|-------------------|
|   |                                     | Y                 | Y                 | Y                 |
| <b>All Alerts</b>                             | 190,341                             | 3.1               | 4.9               | 7.2               |
| <b>Receiving Organization Type</b>            |                                     |                   |                   |                   |
| Primary Care Clinic <sup>1</sup>              | 8,746                               | 3.8               | 6.6               | 9.6               |
| Federally Qualified Health Center             | 62,774                              | 5.6               | 9.2               | 13.7              |
| Specialty/Multi-Specialty Clinic <sup>2</sup> | 534                                 | 0.0               | 0.0               | 0.0               |
| Long Term Care/Home Health                    | 75,672                              | 0.9               | 1.2               | 1.8               |
| Health Home                                   | 14,285                              | 0.0               | 0.0               | 0.0               |
| Behavioral Health                             | 8,284                               | 3.8               | 6.5               | 13.8              |
| Other <sup>3</sup>                            | 20,046                              | 4.0               | 6.5               | 8.9               |

<sup>1</sup>Primary care clinics include hospital-based clinics.

<sup>2</sup>Specialty/Multi-Specialty clinics may include primary care services offered as part of multi-specialty practices.

<sup>3</sup>“Other” includes social services, community services, and other non-clinical care settings.

- Federally Qualified Health Centers are more likely to use query-based portals within 24 hours than other types of providers.

**KEY FINDING #7: QUERIES WITHIN 24 HOURS ARE MOST COMMON WHEN A PATIENT HAD BEEN DISCHARGED OR WAS SEEN IN AN INPATIENT SETTING**

Table 5. Characteristics Associated with Utilization of Query-Based Services Following an Alert from Rochester RHIO.

|                              | Total number of alerts received (n) | Query w/in 24hrs? | Query w/in 72hrs? | Query w/in 7days? |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------|
|                              |                                     | Y(%)              | Y(%)              | Y(%)              |
| <b>All Alerts</b>            | 190,341                             | 3.1               | 4.9               | 7.2               |
| <b>Alert Timing</b>          |                                     |                   |                   |                   |
| Admit                        | 63,892                              | 2.8               | 4.9               | 7.6               |
| Discharge                    | 56,939                              | 3.6               | 5.2               | 7.2               |
| Both                         | 69,420                              | 2.9               | 4.8               | 6.8               |
| <b>Alert Setting</b>         |                                     |                   |                   |                   |
| Emergency Department         | 137,601                             | 2.8               | 4.8               | 7.0               |
| Inpatient                    | 44,836                              | 3.7               | 5.3               | 7.6               |
| Both                         | 6,204                               | 3.4               | 6.0               | 9.6               |
| <b>Alert Source Location</b> |                                     |                   |                   |                   |
| Metropolitan                 | 168,019                             | 2.9               | 4.6               | 6.7               |
| Micropolitan                 | 17,669                              | 4.6               | 7.9               | 11.4              |
| Rural                        | 4,468                               | 4.0               | 6.3               | 10.2              |
| <b>Direct to EHR</b>         |                                     |                   |                   |                   |
| Yes                          | 14,315                              | 0.0               | 0.0               | 0.0               |
| No                           | 176,026                             | 3.3               | 5.3               | 7.8               |

- Alerts sent after an individual had been discharged from an emergency department or inpatient setting were most likely to result in an organization accessing QE query-based portal services within 24 hours.
- Alerts that were sent when a patient had been to both the ED and inpatient setting in the same day were most likely to result in an organization accessing QE query-based portal services within 72 hours and 7 days.

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## TECHNICAL & SUPPLEMENTAL INFORMATION

**Data:** Healthix, HEALTHeLINK, and the Rochester Regional Health Information Organization provided records of alerts from inpatient and emergency departments from their participating hospitals and health systems. The alert records included: patient demographics (age and gender), sending facility type (general medicine or specialty hospital), sending facility location (metropolitan, micropolitan, or rural), the timing (admit, discharge, both admit and discharge), and setting (ED, inpatient, both inpatient and ED) of the alert and the delivery method of the alert (direct to EHR or not). One QE attached continuity of care documents (CCD) to their alerts. To be consistent across the QEs, we excluded all records from sending facilities that were not hospitals or health systems and alerts that were not for an admission/discharge from a hospital or emergency department. Because more than one alert may be sent per health care encounter, we reduced all records into unique sender-recipient combinations for a single patient per day. Due to changes in systems or software upgrades, QEs supplied data for slightly different historical periods. All QEs provided data for Quarter 2, 2016 to Quarter 2, 2017. These consistent data are presented in Figure 1, which illustrates the cumulative number of alerts. However, for our descriptive analyses we used all the data available, which includes all alerts from Quarter 1, 2015 to Quarter 4, 2017.

In addition to alert notifications, our analyses also included the QE's query-based exchange systems user access log files. We included all queries for patients that had received an alert within the study period. All query records without any associated alerts were excluded from the analysis. We matched queries to alerts based on patient ID, the receiving facility, and dates. Based on feedback from NYeC and the QEs, we identified queries that occurred within 24 hours, 72 hours, and 7 days of an alert being sent. The QEs also provided us with information about the types of organizations that are enrolled in their alert and query-based exchange services and are currently receiving alerts. We did have patient consent information for both alert and query-based exchange services; however, due to inconsistencies in how current consent was identified across QEs, we did not include it in our analyses.

Quotes were obtained through interviews with QE end users.

**Analyses:** The unit of analysis was the alert. We described the overall sample, and by QE, using frequencies and percentages. We conducted stratified analyses to describe differences in the frequency of querying within 24 hours, 72 hours, and 7 days of an alert.

**Notes:** Figure 3 shows the overall percent of alerts that result in a query within 24 hours, 72 hours, and 7 days. Figure 4 and Tables 4 and 5 provide additional information about factors that are associated with an organization's likelihood to access query-based exchange services after receiving an alert. This represents the first quantification of the relationship between alerts and query-based exchange (to the best of our knowledge) anywhere. Therefore, we cannot comment on whether the percentages are high, low, or even appropriate as no benchmarks exist for comparison.