



Enhancing Access to Prescription Drug Monitoring Programs  
Using Health Information Technology:

# Physician Practice Electronic Health Record Integration with a Prescription Drug Monitoring Program: A Pilot Study

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**MITRE**

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Health Information Technology  
Substance Abuse and Mental Health Services Administration  
**SAMHSA**



## Overview

### Goal

A pilot in Ohio that integrated a family medical practice with the Ohio Prescription Drug Monitoring Program (PDMP) demonstrated the value of health IT connectivity in an ambulatory care setting by:

- Making PDMP data readily available to physicians (prescribers) during patient encounters through the practice electronic health record (EHR).
- Presenting PDMP data during existing patient care workflow.

This pilot configuration showcased the workflow, ease of use, and added technical value of improved access to the PDMP in the ambulatory care setting by connecting the EHR to the PDMP and presenting patient-at-risk scores in the EHR. Patient-at-risk scores provide information about the probability that a patient is abusing prescription controlled substances; for this pilot, these scores were provided by a software solution called NARxCHECK.

### Pilot Design

The Springfield Center for Family Medicine (SCFM) connected to Ohio's PDMP, the Ohio Automated Rx Reporting System (OARRS), with SCFM's EHR (the NextGen Ambulatory EHR). Eagle Software's NARxCHECK system enabled the connection through HealthBridge, an independent non-profit health information exchange (HIE). The EHR requested and refreshed the data when (1) an appointment was scheduled and (2) when patients arrived for their appointment. Figure 1 shows the pilot workflow, which illustrates the following steps:

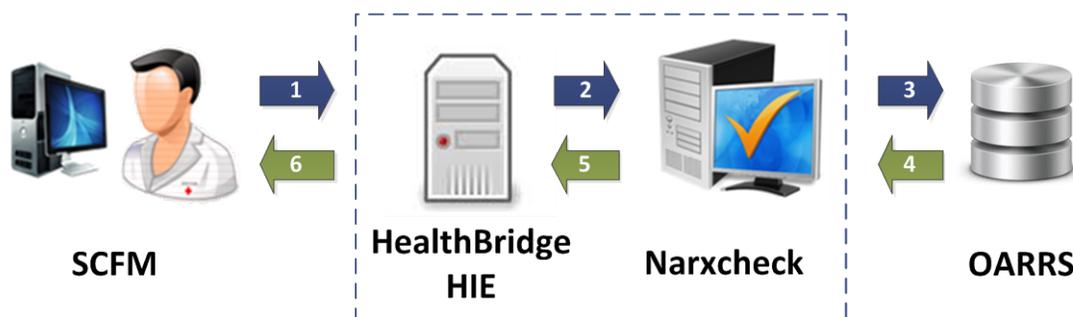


Figure 1. Pilot Workflow Diagram

1. SCFM's EHR queries the HIE upon patient appointment.
2. The HIE routes the request to NARxCHECK.
3. NARxCHECK requests the PDMP record.

4. The PDMP returns the record to NARxCHECK, which creates three Narx scores (3-digit representations of the PDMP data).
5. NARxCHECK passes the data through the HIE.
6. The Narx scores are displayed in SCFM's EHR patient record with a hyperlink to more detailed patient information.

Appendix A describes the pilot's technical considerations, including the list of participants. Appendices B and C discuss the operational and evaluation considerations, respectively.

## Experiment

### Pre-Pilot State

The Springfield Center for Family Medicine is a well-established family medicine practice with a stable patient base. The prescribers typically know their patients' medical history.

In the "pre-pilot state" at SCFM:

- NextGen Ambulatory EHR is the principal health IT system used by the practice.
- Checking the PDMP is currently not part of the prescribers' workflow because accessing the PDMP:
  - Takes too much time
  - Requires logging into a separate system outside NextGen
- Prescribers must perform multiple steps to access PDMP data via the OARRS portal.
- While prescription history data for controlled substances is available through the OARRS portal; there is no "score" indicating patient risk.

### Hypotheses and Specific Methods

The following hypotheses directly relate to the six areas of interest that were the basis for evaluating the effectiveness of the pilots. Appendix D describes the evaluation methods in detail.

Table 1. Hypotheses and Intended Impacts

Area of Interest	Intended Impact
<b>Ease of Use</b>	The Narx scores will provide prescribers with a concise view of their patients' drug risk. The effort required to access the scores and PDMP data is minimized.
<b>Fit with Workflow</b>	By automatically integrating SCFM's NextGen EHR system with the NARxCHECK system, SCFM prescribers will be able to view their patients' PDMP data in the patient record that is part of their day-to-day workflow.
<b>Technical Impact</b>	Leveraging technical intermediaries, standards, and open-source software will facilitate a cost-efficient implementation.
<b>Clinical Impact</b>	Having the PDMP data refreshed the day of appointment and available at the time of decision-making with the patient improves decision-making.
<b>Driver of Adoption</b>	The reasonable implementation costs, coupled with the improved visibility into patient drug risk, will prove to be a compelling combination.
<b>Optimization Factors</b>	The system has additional opportunities to improve, and these can be identified and enumerated.

## Results

### Ease of Use and Fit of Workflow

Before pilot implementation, the physicians rarely accessed the PDMP data because this required them to exit the EHR workspace and then log on to the OARRS website to begin a patient search. The pilot configuration streamlined this process so that the technology performed the querying and processing tasks:

1. **Querying the PDMP** – An automatic query was initiated when the patient scheduled an appointment; the PDMP information was updated when patients arrived for their appointment, and their arrival was logged in the system.
2. **Processing PDMP Data** – The patient's demographic information was automatically passed from the EHR to the PDMP (via NARxCHECK) to perform the query.
3. **PDMP Response and Documentation** – The associated risk factor generated by NARxCHECK was integrated directly into the patient record and was hyperlinked to more detailed PDMP information.

### Technical and Clinical

During the study period of July 1 through July 31, 2012, a total of 7,504 patient encounters were logged into the NextGen system. Because the system automatically requests patients' Narx scores both when an appointment is made and when patients arrive for their appointment, a total of 12,119 queries were processed. The system logged 7,948 viewings of the Narx scores, 1,018 requests for full patient NARxCHECK reports, and 146 requests for patient OARRS reports.

The system logged prescribers’ reactions to the data in two dimensions: whether the data met their expectations (for example, based on their clinical knowledge of the patient, did the report data match what they thought they would see?), and whether it was helpful to them.

Table 2. Prescribers’ Reactions to the PDMP Data

	Data Was Helpful	Data Was Not Helpful	Total
Data met expectations	3,634	3,704	7,338
Data did not meet expectations	114	33	147
No answer	0	19	19
Total	3,748	3,756	7,504

## Technical System

This pilot involved the following technical processes:

- Implementation of bidirectional admission, discharge, transfer (ADT) feeds to notify NARxCHECK of patient appointments and arrivals
- Modification of NextGen display templates to display the Narx scores
- Modification of NextGen display templates to allow prescribers to review detailed patient PDMP data
- Integration between Eagle Software and OARRS to allow Eagle to use OARRS to authenticate prescribers

## Discussion

Several factors contributed to the successful implementation:

### Clinical Impact

Although SCFM prescribers reported that the PDMP data was helpful to them about 50% of the time (3,748 times during the pilot test), it was expected that few of the patients over the pilot period would be at-risk patients. This result indicates that the PDMP data proved useful for 50% of the patients who had care interactions with the physicians. Of these occurrences, prescribers indicated that the data did not match their expectations for 114 out of 3,748 “data was helpful” responses. This is an important result as it indicates that even though SCFM’s patient population is stable, and therefore SCFM prescribers usually know their patients well, on average at least several times per day a patient’s PDMP data told an SCFM prescriber something about their patient that they did not know and that was helpful to their medical decision-making.

## Fit with Workflow

Overwhelmingly, prescribers reported that the PDMP data is now easier to access. One primary reason for improvement is in the user interface implementation. The current implementation requires that prescribers log-in to OARRS only once per day. Their session can then be shared by OARRS and NARxCHECK. Single sign-on integration with NextGen would be preferable, however, as it would allow prescribers to access the detailed PDMP data without having to log-in to any system other than NextGen.

## Technical Impact

- The prescribers' knowledge and the developers' skill contributed to successful connectivity. Appendix A discusses this in more detail, but in summary, both developers on this project showed outstanding skill and dedication.
- The ability to leverage and take advantage of current health IT was instrumental in streamlining the prescribers' workflow. Industry standards (such as HL7's ADT) and open-source software (such as Mirth Connect) combined to provide the pilot test with a powerful accelerator. The ADT integration between NextGen and NARxCHECK was completed in a few days because open-source software (in this case Mirth Connect) was available that already implemented the ADT feed standard. In the absence of this software, the ADT integration would certainly have taken longer than it did, possibly several weeks.

## Next Steps

SCFM, Eagle Software, and OARRS plan to keep the connection active following the pilot.

## Other Pilots

The Enhancing Access to PDMP project conducted five additional pilots in Fiscal Year 2012 which are available for review. The pilots encompass a variety of user groups, including dispensers (pharmacists) and prescribers (ambulatory and emergency department) as well as different technological solutions. These papers can be found at the Office of the National Coordinator for Health Information Technology (ONC) PDMP website:

<http://healthit.hhs.gov/portal/server.pt?open=512&mode=2&objID=3870>.

## Appendix A. Technical Considerations

This section contains a description of the pilot design, including participants and technologies.

### Participants

The following parties participated in the pilot:

- **Springfield Center for Family Medicine (SCFM)** – A six-doctor private family practice facility in Springfield, IL, established 25 years ago. Peter J. Muir, M.D., one of SCFM’s physicians, implemented the changes to SCFM’s health information technology (HIT) systems.
- **Eagle Software Corporation (ESC)**, <http://www.eaglesoftware.com/> – A woman-owned small business founded in 1994 and based in Dayton, OH. Eagle Software develops web-based productivity enhancement tools for the legal and healthcare professions.
- **HealthBridge** (<http://www.healthbridge.org>) – A not-for-profit corporation that supports HIT adoption, health information exchange (HIE), and innovative use of information for improved healthcare outcomes.
- **Ohio Automated Rx Reporting System (OARRS)**, <https://www.ohiopmp.gov/> – The State of Ohio’s PDMP, established in 2006 as a tool to assist healthcare professionals in providing better treatment for patients with medical needs while quickly identifying drug-seeking behaviors.

### Relevant Technologies and Tools

These principal technologies were vital components of the pilot. All were available prior to the pilot test, so no new core technologies were invented to conduct the pilot.

#### NextGen Ambulatory EHR

SCFM uses NextGen Healthcare’s NextGen Ambulatory EHR product to assist SCFM providers with their patient care workflow. SCFM implemented NextGen in 2003 and has since developed substantial expertise in its implementation. Several NextGen features were useful to the pilot test. First, NextGen stores its data in a commercial relational database management system, which makes it possible to access the data for other purposes. The system integration with NARxCHECK, for example, accessed the NextGen database to learn about patient appointment and arrival events. Second, NextGen uses user-interface “templates” that allowed Dr. Muir to modify the user interface to display patient Narx scores alongside other patient data.

## **NARxCHECK / Narx Scores**

NARxCHECK is a software solution developed by ESC that provides three levels of service to clinical providers:

1. An automated scoring system (Narx Score) that ranges from 000-999 and generally represents the composite prevalence of prescription drug misuse risk factors within a PDMP report
2. Automated “one-click” access to Narx Report and OARRS
3. Care coordination ability between providers through the use of flags and notes that communicate specific details about a patient’s prescription drug use

From a provider’s perspective, the Narx scores were primarily treated as triage data, similar to vital signs, and used prior to seeing a patient to develop an awareness of overall prescription drug use risk factors. The following approach is recommended for evaluating Narx Scores:

- |                 |                     |  |
|-----------------|---------------------|--|
| <b>&lt; 200</b> | <b>Be Confident</b> | The patient’s record is unlikely to reveal a concerning pattern or level of use. |
| <b>200-500</b>  | <b>Be Curious</b>   | The patient’s record may reveal a concerning pattern or level of use.            |
| <b>&gt;500</b>  | <b>Be Cautious</b>  | The patient’s record is likely to reveal a concerning pattern or level of use.   |

## **Mirth Connect Interface Engine**

Mirth Connect is an open source cross-platform HL7 interface engine that enables bidirectional sending of HL7 messages between systems and applications over multiple transports. It is available under the open source Mozilla Public License (MPL) 1.1.

## **PostgreSQL (Structured Query Language) Relational Database**

PostgreSQL is a powerful, open-source, object-relational database system. It has more than 15 years of active development and a proven architecture that has earned it a strong reputation for reliability, data integrity, and correctness. PostgreSQL's source code is available under the liberal, open-source PostgreSQL License. This license gives users the freedom to use, modify, and distribute PostgreSQL in any form, open- or closed-source.

## **Design Overview**

The pilot test development effort can be divided into three principal areas:

1. A bidirectional HL7 admission, discharge, transfer (ADT) feed between SCFM and NARxCHECK (via HealthBridge) to notify NARxCHECK of SCFM patients and provide their prescription drug risk data to SCFM
2. User interface enhancements to the NextGen Ambulatory EHR to present the patients’ risk scores to prescribers and allow prescribers to “drill down” into detailed patient controlled substance history

### 3. Single sign-on integration between NARxCHECK and OARRS

#### ADT Integration

An instance of the Mirth Connect interface engine running in the SCFM office generates a bidirectional HL7-format ADT feed. SCFM’s Mirth Connect interfaces to another Mirth Connect instance running at HealthBridge over a persistent virtual private network (VPN) connection. HealthBridge’s Mirth Connect then passes the ADT messages to NARxCHECK. The ADT feed transfers patient demographic data from SCFM to NARxCHECK and returns prescription drug risk data back to SCFM, including the patient’s Narx Score and a link to a patient-specific web page on the NARxCHECK system.

#### User Interface

SCFM modified its NextGen Ambulatory EHR to display the patient risk scores on the patient’s Subjective, Objective, Assessment, and Plan (SOAP) Notes page and Communication page. The risk score was accompanied by buttons to allow prescribers to access detailed patient controlled substance data and fill out a feedback form to measure the effectiveness of the pilot test integration. The prescribers could access both a NARxCHECK report on the patient and the patient’s OARRS report.

#### Single Sign-on

NARxCHECK and OARRS implemented a single sign-on integration to allow SCFM prescribers to access both OARRS and NARxCHECK data using OARRS credentials.

#### Detailed Design

##### ADT Integration

Figure A-1 shows the flow of information between the components of this pilot.

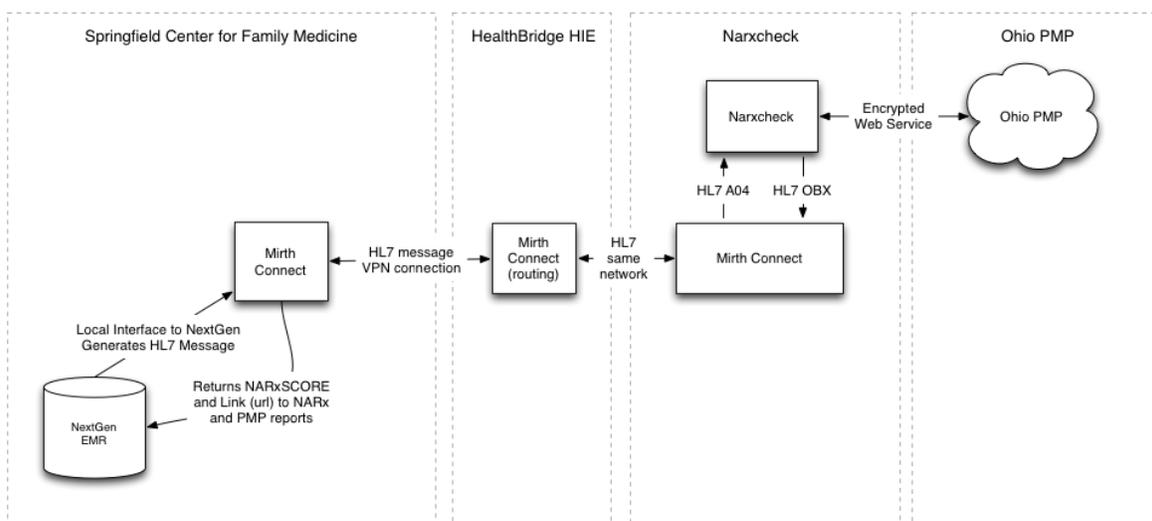


Figure A-1. Network Topology

Within the NextGen EHR, a database trigger fires when an appointment is made and when a patient presents for an appointment. The trigger copies data from the main database into a table used specifically for integration with Narxcheck. This table contains one record per patient with the following data: person\_id, last\_name, first\_name, middle\_name, date\_of\_birth, sex, street address, city, state, zip, create\_date, and modify\_date.

The Mirth Connect interface engine polls this table periodically and, if new records are present, constructs and sends an HL7 A04 message to Narxcheck that indicates patient registration. The message contains the following segments: MSH (message header), PID (patient identifier), and PV1 (patient visit).

This is a sample de-identified message:

```
MSH|^~\&|SCFM002^NEXTGEN|OH2752^SCFM|Narxcheck|OHPMP|20120713103438||ADT^A04|20120713103438|P|2.5.1||NE|NE|
```

```
PID|||90895754-9A6A-40B1-9C48-C3B1D1FE1C31^^^PN||LASTNAME^FIRSTNAME^^^^MI||19640125|M||1111 MAIN ST^^SPRINGFIELD^OH^45502^^^^||
```

```
PV1||R||||1194763193^ LASTNAME ^ FIRSTNAME^^^^NPI||||||||||||||||||||||||||||||||||||||20120713103429|20120713103438|
```

The message is sent over a persistent VPN to HealthBridge, where Narxcheck's servers are located. The message is first processed by HealthBridge's Mirth Connect instance and routed to Narxcheck's servers.

Upon receipt of the message, Narxcheck queries OARRS for that patient's controlled substance history. If the patient demographics match a single patient, that patient's history is returned in two forms: structured data (used to calculate the NARx Score) and a PDF-formatted report in a human-readable format. Narxcheck then calculates the scores using a proprietary algorithm and formats a report for that patient.

In response to SCFM's A04 message, Narxcheck constructs and sends an HL7 OBX message, which indicates a result to SCFM. The message contains the following segments: MSH (message header), PID (patient identifier), and OBX (observation/result).

This is a sample de-identified message:

```
MSH|^~\&|Narxcheck|Healthbridge|SCFM002^NEXTGEN|OH2752^SCFM||ADT^A08|634777724926866826|P|2.5.1||NE|NE|
```

```
PID|||90895754-9A6A-40B1-9C48-C3B1D1FE1C31^^^PN||LASTNAME^ FIRSTNAME^^^^MI||19640125|M||111 MAIN ST^^SPRINGFIELD^OH^45502^^^^||
```

```
OBX|1|FT|NARX||190.170.080^https://narxcheck.example.org/patient/RdHi6M2igY7dwPlizOAoaavgJk5Fp7m6lcvS36Qg9ai3nkTtXrohVyglqZetLwvm|||
```

The patient demographic data in PID is identical to the data received from SCFM, allowing the data to be matched to the original patient encounter in NextGen. The Narx scores are represented in the OBX segment, separated by periods. In order, they are Narcotic (190), Sedative (170), and Stimulant (080). The second element in the result is the link for the patient's record in Narxcheck, as described below.

When SCFM's Mirth Connect receives the OBX message, it uses the patient demographics to find and update the appropriate row in the Narxcheck integration table.

## User Interface

The NextGen user interface templates for the SOAP notes and patient communication pages were modified to read the patient data from the Narxcheck integration table (described above), display the Narx Score, and allow prescribers to retrieve detailed data about each patient.

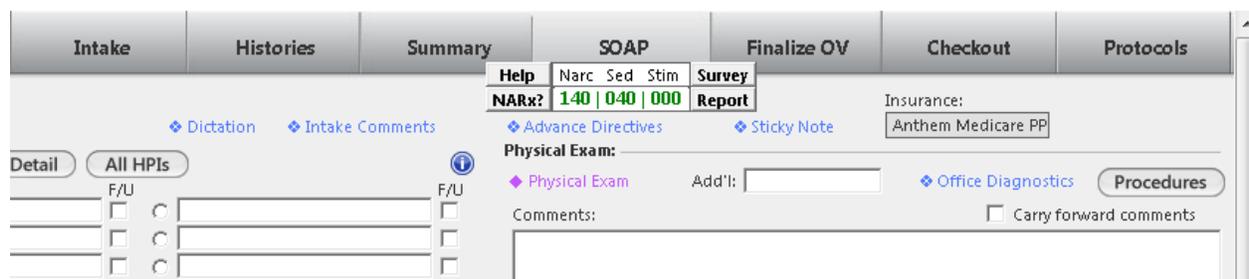


Figure A-2. SOAP Notes Template

Figure A-2 is a screenshot of the patient SOAP Notes template. The Narx Score is displayed in green, consisting of three separate 3-digit scores: one each for narcotics, sedatives, and stimulants. The following four buttons surround the Narx Score:

- **Help** – A brief help screen (local to the application)
- **Survey** – Allows the prescriber to fill out a feedback form about Narxcheck and the PDMP
- **Report** – Allows the prescriber to retrieve the patient's Narxcheck report and OARRS report
- **Narx?** – Links to the Narxcheck website for more information about Narx Scores

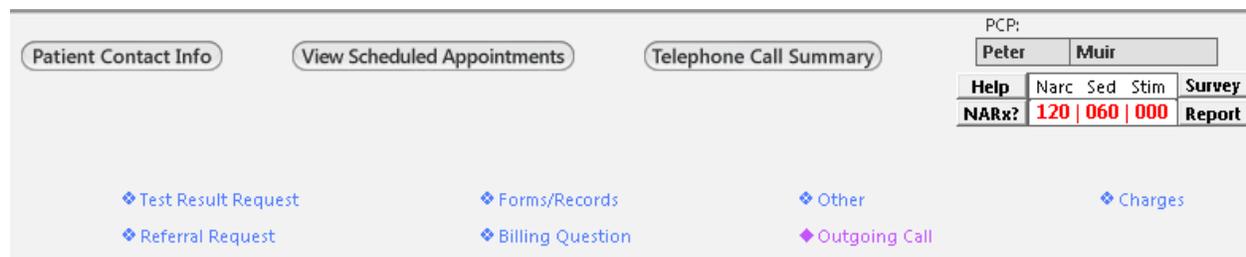


Figure A-3. Patient Communication Template

Figure A-3 shows the Patient Communication template. The Narx Score is displayed in red, and the four buttons surrounding it provide the same functionality as they do on the SOAP Notes page.

The color of the Narx Score is significant. Clicking the score changes it from red to green and adds a comment to document that the score has been viewed. Clicking the "Narc Sed Stim" label displays the date of the last completed report in black, and clicking again displays the date of the last request in gray.

### Single Sign-on

In the State of Ohio, access to PMP information is strictly controlled. Narxcheck has an audit requirement to report the identity of the patient and the name and location of the prescriber any time PMP information is accessed through the Narxcheck product.

To facilitate the direct access to Narxcheck and PMP information from the NextGen EHR, Narxcheck worked with the Ohio PMP to develop a federated authentication system. The flow of this system is as follows:

- A prescriber from SCFM attempts to access the Narxcheck data for a patient by clicking a link in the NextGen EHR. The link goes to the Narxcheck application, which determines if an open, authenticated session is already available for the prescriber.
- If a session is open, the prescriber is taken directly to the Narxcheck dashboard for the requested patient.
- If a session is not open, the prescriber is redirected to the Ohio PMP. At the Ohio PMP website, the prescriber authenticates using their Ohio PMP credentials and is automatically redirected to the Narxcheck site. The Narxcheck application then decrypts the request from the Ohio PMP and takes the prescriber directly to the Narxcheck dashboard for the requested patient.

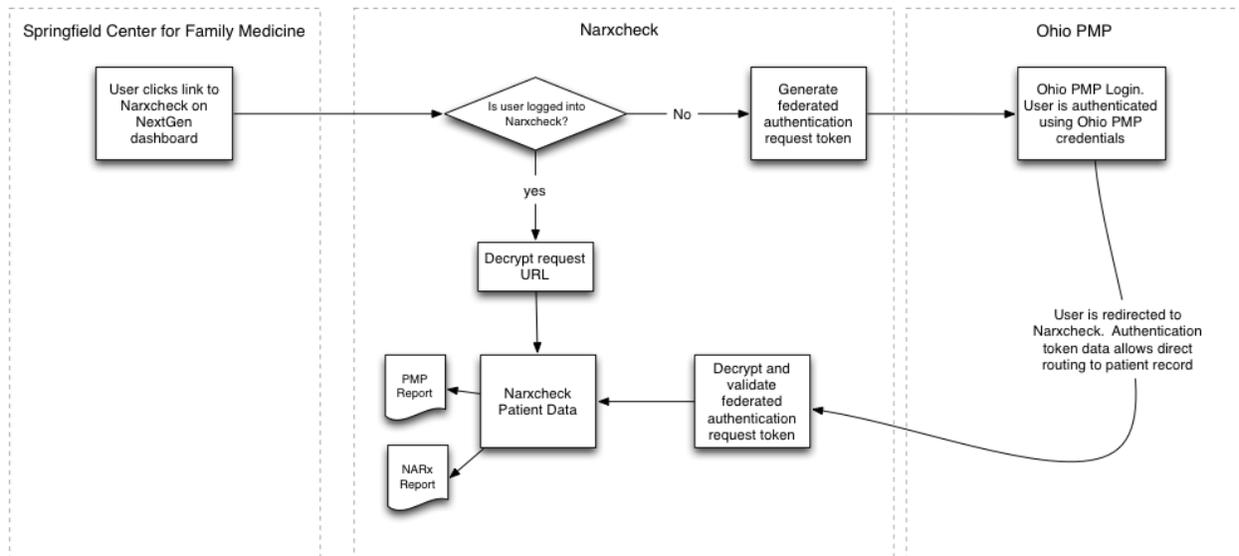


Figure A-4. Pilot System Connections

Figure A-4 illustrates the connections between SCFM, Narxcheck, and OARRS. To make this federated authentication system work, two primary elements are required:

- **A time-based, one-time password (TOTP) algorithm**

The tokens generated as a part of the federated authentication process are time-based and single-use. A standard TOTP algorithm (<http://tools.ietf.org/html/rfc6238>) is used to ensure that tokens have no value outside of the federated authentication process. A common network time server (nist.gov) is used to eliminate timing discrepancies between servers.

- **Advanced Encryption Standard (AES) encryption**

The data inside of the token is encrypted using the AES algorithm. When decrypted, it provides the shared data necessary for federated login and patient identification.

## Appendix B. Operational Considerations

### Key Operational Assumptions

- The SCFM practice wanted to limit the OARRS accounts to prescribers, and no other access was given for non-prescriber staff.
- OARRS user accounts were required to view the full PDMP data that was displayed in Narxcheck, so all SCFM physicians had OARRS accounts.
- Modifications to SCFM’s NextGen installation could not disrupt SCFM operations.
- OARRS has specific audit requirements to ensure that its data is used only by authorized people. Narxcheck met all of those requirements.

### Operational Advantages or Barriers

An important advantage that this pilot benefitted from was the experience and skill of the developers involved. Within SCFM and Eagle Software, the developers had extensive knowledge of the systems that they were modifying, which allowed them to meet aggressive development schedules.

A potential barrier was the belief that PDMP data would be less important in a stable ambulatory care setting. PDMP data is highly valued by ED clinicians who care for strangers, but the doctors at SCFM typically have long-term relationships with their patients, so the incidence of patient malfeasance was expected to be rare.

### Pilot Schedule

Task Name	Start	Finish	Duration
Planning	April 18, 2012	June 15, 2012	43 days
Development	May 14, 2012	July 11, 2012	42 days
Execution/Monitoring	July 3, 2012	August 1, 2012	21 days
Post-Pilot Analysis/Report	July 2, 2012	August 31, 2012	44 days

### Pilot Costs

Vendor	Services	Subcontract
Eagle Software	Development	\$22,500
SCFM	Interface to NextGen	\$10,000
	<b>Total</b>	<b>\$32,500</b>

MITRE subcontracts are fixed price instruments. It is noted that no participants requested legal review costs for business (e.g., MITRE subcontract). Other expenses may also have been insufficiently enumerated in this list, and regional cost factors may likewise play a role in the quoted prices. Thus, the actual cost of reproducing this pilot elsewhere may be more or less than this amount, even when attempting to exactly replicate these circumstances.

## Appendix C. Legal Considerations

This section looks at the legal considerations and obstacles, as well as the agreements implemented.

The following agreements were made to implement this pilot:

- A business agreement and license on the practice level (for Narxcheck reports) was implemented between SCFM and Eagle Software.
- A business agreement and license on the practice level for HIE connection was implemented between SCFM and HealthBridge/Collaborating Communities HIE.
- A business agreement and license on the practice level for the NextGen EHR was implemented between SCFM and NextGen and Group Business Software (a NextGen reseller).
- A general contract for development/support was implemented between Eagle Software and OARRS.
- A data use agreement and service level agreement was implemented between Eagle and HealthBridge.

### Policy and Regulatory Considerations

Ohio PMP reporting and auditing requirements necessitated that the PMP and Narx Reports be hosted on the Narxcheck dashboard. Prescribers had access to this data via integrated login with the Ohio PMP.

## Appendix D. Evaluation Methods

### Evaluation Approach – Hypotheses and Specific Methods

The Federal Government and the MITRE Corporation conducted pilot studies, small-scale experiments, to test the feasibility of proposed workflows and evaluate their outcomes before investing resources in a full-scale, permanent implementation. These pilots provide valuable insights concerning time requirements, system challenges, and opportunities for process improvement—all of which can be addressed to improve final system design and performance success.

Evaluating the PDMP Pilots required a disciplined and consistent approach to examine the impact of the new or changed technical and clinical work process features toward achieving the following goals:

- **Workflow Logistics** – Providing the correct amount of the appropriate information, in the proper condition, at the right place and time, in the necessary position/sequence
- **System Performance** – Achieving desired outcomes
- **Predicting Implementation Success** – Extrapolating the results to a larger system

MITRE’s systematic analytic approach effectively consolidated these objectives into a set of three consistent evaluation themes: usability, impact, and scalability. The PDMP Pilots varied from simple to more complex health IT connectivity configurations to the PDMP, so testing afforded the opportunity to examine the different facets of performance along a continuum of technical sophistication (see Figure D-1).

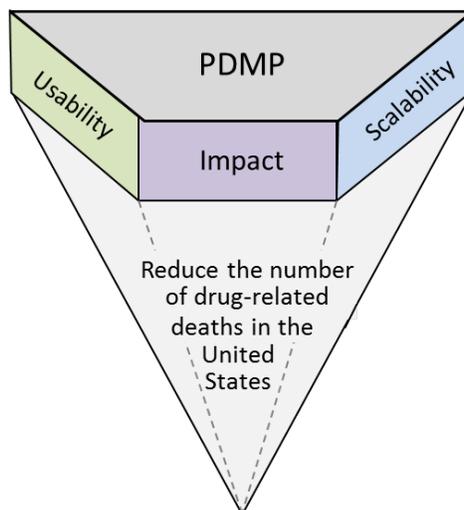


Figure D-1 Evaluation Themes

This appendix describes the three evaluation themes in detail. Each theme and its accompanying areas of interest, with associated evaluation metrics, were the basis for evaluation of the PDMP pilots.

### Usability

The primary focus of the usability theme is the user’s perspective. The following areas of interest concern the optimization of the care delivery experience and the efficiency in performing work processes by leveraging and maximizing technical integration:

- **Ease of Use** – Promoting easier and more efficient ways to access to the PDMP prescription drug data than the previous method for providers and dispensers
- **Fit with Workflow** – Natural integration into existing clinical and health IT workflows for providers and dispensers

Area of Interest	Evaluation Metrics	Data Source
Ease of Use	% reporting PDMP data provided was of acceptable quality for use	Participant Feedback (Solicited Response, Interview)
	% reporting PDMP data now easier to access (pilot versus prior methods)	Participant Feedback (Solicited Response, Interview)
	Distribution of previous methods used to access data	Identification of Methods / Logged System Data
Fit with Workflow	% indicating proper integration with position in workflow	Participant Feedback (Solicited Response, Interview)
	% indicating access to PDMP data was better than alternative option	Participant Feedback (Solicited Response, Interview)

### Impact

The impact theme is meant to validate that the connectivity method to the PDMP was achieved and ultimately resulted in a positive impact to clinical care outcomes (reducing the number of prescription drug related deaths). The following areas of interest assess the technical and clinical impact:

- **Technical Impact** – Resulted in maximizing connections to existing technologies and increased queries to the PDMP data
- **Clinical Impact** – Resulted in timely and meaningful PDMP prescription drug information, readily available at the time of decision-making, that positively impacted care delivery to the patient

Area of Interest	Evaluation Metrics	Data Source
Technical Impact	% change in PDMP queries (pilot versus prior)	Logged System Data
	Distribution of patients at threshold condition (at risk versus not at risk)	Logged System Data
Clinical Impact	% satisfied with data provided in pilot configuration for clinical use	Participant Feedback (Solicited Response, Interview)
	% reporting change in treatment as result of better PDMP access	Participant Feedback (Solicited Response, Interview)
	% change in prescriptions for controlled substance written or fulfilled (pilot versus prior)	Logged System Data

### Scalability

The scalability theme assessed the capability of the new work processes to be widely applied and accommodate growth in the existing system of providers and dispensers. The following areas of interest assessed how well participants adopted the new process and the degree to which it improved the existing workflow:

- **Driver of Adoption** – Accepted by the participants so that pilot drove further adoption by other sites or user groups (e.g., providers), if applicable
- **Optimization Factors** – Generated identifiable improvement opportunities to increase the usefulness and timely availability of PDMP prescription drug information

Area of Interest	Evaluation Metrics	Data Source
Driver of Adoption	% wishing to continue to use the new process	Participant Feedback (Solicited Response, Interview)
	% willing to recommend the new process to their peers or colleagues	Participant Feedback (Solicited Response, Interview)
Optimization Factors	% able to identify specific, actionable steps to further refine process	Participant Feedback (Solicited Response, Interview)
	Distribution of specific suggestions for improvement	Participant Feedback (Solicited Response, Interview)

## Acronyms

<b>ADT</b>	Admission, Discharge, Transfer
<b>AES</b>	Advanced Encryption Standard
<b>EHR</b>	Electronic Health Record
<b>HIE</b>	Health Information Exchange
<b>HIT</b>	Health Information Technology
<b>MPL</b>	Mozilla Public License
<b>OARRS</b>	Ohio Automated Rx Reporting System
<b>OBX</b>	Observation, Result
<b>ONC</b>	Office of the National Coordinator for Health Information Technology
<b>PDMP</b>	Prescription Drug Monitoring Program
<b>PID</b>	Patient Identifier
<b>SCFM</b>	Springfield Center for Family Medicine
<b>SOAP</b>	Subjective, Objective, Assessment, and Plan
<b>SQL</b>	Structured Query Language
<b>TOTP</b>	Time-Based, One-Time Password
<b>VPN</b>	Virtual Private Network