



Clinical Opioid Summary with Rx Integration (COSRI): A Clinical Decision Support (CDS) Tool for Increasing Safety in Prescribing Controlled Substance

FHIR App Competition (S72)

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#AMIA2022

<https://cosri.app>



Disclosures



Neither presenter nor their spouses/partners have relevant relationships with commercial interests to disclose.

The Problem(s) – 2 opioid goals, 2 tech goals

- Opioid decision support using state level prescription drug monitoring program data (PDMP) and EHR data to help providers make safer decisions about opioid Rx *with full context of meds, risks, CDC guidelines and WA State Rx Rules.*
- Make PDMP data available to statewide providers with diverse systems and integration pathways, remove barriers to use in clinical workflows. Use SMART on FHIR *both as an EHR app, and as a free-standing app.*
- Address gap between the *promise* of SoF and the *opportunities* to deploy it widely across diverse health care organizations.
- Explore use of SoF from *within* EHR to access and integrate data from sources *external* to the EHR.

What we did COSRI App: Patient Search

Clinical Opioid Summary with Rx Integration

COSRI Patient Search

Search filters:

First Name	Last Name	Birth Date	Last Accessed ↓		
Norman	Osborn	1964-07-29	2022-10-26 09:23	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
Marcus	Aurelius	1975-06-17	2022-10-24 13:14	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
martin	guerre	1982-06-18	2022-10-24 10:37	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
Elizabeth	Replacetherapy	1981-04-03	2022-10-21 16:07	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
elizabeth	browning	1983-05-03	2022-10-20 18:40	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
Charles	Dickens	1977-01-12	2022-10-20 16:58	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
harry	osborn	1974-09-01	2022-10-20 10:35	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
peter	pan	2010-08-06	2022-09-30 11:08	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
Heinrich	Dreser	1991-06-12	2022-07-13 09:14	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
roderick	kingsley	1983-03-04	2022-03-24 16:27	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
priscilla	rich	1943-10-01	2022-03-07 20:02	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
cheng	yung	1957-08-19	2022-03-07 20:01	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
roy	burns	1985-03-22	2022-03-07 19:58	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
John	Cushing	2000-12-10	2022-03-07 19:58	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
max	eisenhardt	1963-09-21	2022-03-07 19:57	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>
harley	quinn	1993-09-12	2022-03-07 19:24	<input type="button" value="VIEW"/>	<input type="button" value="🗑️"/> <input type="button" value="⋮"/>

COSRI Application: Rx Summary

demo version - not for clinical use



Marcus Aurelius

DOB: 1975-JUN-17
MALE

New Patient Search

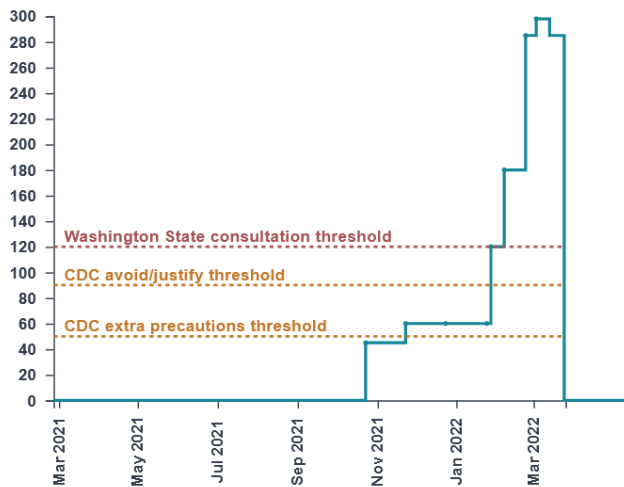


Clinical Opioid Summary with Rx Integration

LIMITATIONS Guidance **not intended** for palliative, inpatient, or active cancer care.

Patient Risk Overview

Morphine Equivalent Dose (MED)



Prescription Summary

Class	# Rx	# Prescribers	# Pharmacies
Opioids	9	3	3
Benzodiazepines	0		
Non-benzo Sedatives/Hypnotics	0		
Muscle Relaxants	0		
Stimulants	0		
Anti-Convulsants	0		
Steroids	0		

Patient Risk Assessment

- !** No urine drug screen date found for this patient. Please check the first controlled substance prescription to determine if they are due for their 12 month drug screen.
- !** A controlled substance agreement is due for this patient on or before 2023-02-13.

MED today 0 (2022-10-26)

Most recent MED 285 (2022-03-25)

Average MED in the last 60 days 0

Average MED in the last 90 days 0

COSRI Application: Rx Details

demo version - not for clinical use



Marcus Aurelius
DOB: 1975-JUN-17
MALE

New Patient Search



State PMP Prescriptions (9)

Drug Description	Class	Quantity	Duration	MME	Written Date	Dispensed	Prescriber	Pharmacy
fentanyl 0.1 MG Buccal Tablet	opioid	10	10	13.0	2022-Mar-03	2022-Mar-03	Domita Calvilla	Nerva Pharmacy
OxyCONTIN 30 MG Extended Release Oral Tablet	opioid	30	30	45.0	2022-Feb-23	2022-Feb-23	Domita Calvilla	Nerva Pharmacy
Fentanyl Transdermal System, 0.1 mg/hr	opioid	10	30	240.0	2022-Feb-23	2022-Feb-23	Domita Calvilla	Nerva Pharmacy
Fentanyl Transdermal System, 0.075 mg/hr	opioid	5	15	180.0	2022-Feb-07	2022-Feb-07	Domita Calvilla	Nerva Pharmacy
Fentanyl Transdermal System, 0.05 mg/hr	opioid	3	9	120.0	2022-Jan-28	2022-Jan-28	Anton Pius	Minor Pharmacy
Fentanyl Transdermal System, 0.025 mg/hr	opioid	1	3	60.0	2022-Jan-24	2022-Jan-24	Caesar Roman	Pax Pharmacy, INC.
MS Cotin 30 MG Oral Tablet	opioid	60	30	60.0	2021-Dec-24	2021-Dec-24	Domita Calvilla	Nerva Pharmacy
MS Cotin 30 MG Oral Tablet	opioid	60	30	60.0	2021-Nov-23	2021-Nov-23	Anton Pius	Minor Pharmacy
MS Contin 15mg Oral Tablet	opioid	90	30	45.0	2021-Oct-23	2021-Oct-23	Caesar Roman	Pax Pharmacy, INC.

The query was last executed at October 26th 2022, 1:13:13 pm. [see additional data quality information]

Pertinent Medical History

COSRI Application: Risk Considerations

Risk Considerations (1)

Benzodiazepine Medications [more info](#)

Drug Description	Quantity	Written Date	Dispensed	Prescriber	Pharmacy
oxazepam 10 MG Oral Capsule	30	2019-Nov-11	2019-Nov-11	Stan Lee	Central Manhattan Pharmacy, INC.

CDC Guideline #11: Avoid concurrent opioid and benzodiazepine prescribing.

WA AMDG Guideline: Washington State rules require that co-prescribing of opioids and benzodiazepine medications requires documentation, discussion of risks, and consideration of tapering medications.

Sedative Medications [more info](#)

no entries found

WA AMDG Guideline: Washington State rules require that co-prescribing of opioids and sedatives requires documentation, discussion of risks, and consideration of tapering medications.

Barbiturate Medications [more info](#)

no entries found

WA AMDG Guideline: Washington State rules require that co-prescribing of opioids and barbiturates requires documentation, discussion of risks, and consideration of tapering medications.

Carisoprodol Medications [more info](#)

no entries found

WA AMDG Guideline: Washington State rules require that co-prescribing of opioids and carisoprodol medications requires documentation, discussion of risks, and consideration of tapering medications.

Prescription Summary

Class	# Rx	# Prescribers	# Pharmacies
Opioids	9	1	2
Benzodiazepines	1	1	1
Non-benzo Sedatives/Hypnotics	0		
Muscle Relaxants	0		
Stimulants	1	1	1
Anti-Convulsants	0		
Steroids	1	1	1


Patient Risk Assessment

- Possible co-prescribing of Benzodiazepine with opioids.
- It has been more than 12 months since this patient's last urine drug screen. (2021-Jul-01)
- No controlled substance agreement found for this patient.

Urine Drug Toxicology Screen (4)

COSRI Application: UDS & CSA

COSRI View



Clinical Opioid Summary with Rx Integration

Marcus Aurelius
DOB: 1975-JUN-17
MALE

New Patient Search

demo version - not for clinical use

Clinical Informatics Research Group
DEMOSYSTEM

Urine Drug Toxicology Screen ⓘ

no entries found

ⓘ No urine drug screen date found for this patient. Please check the first controlled substance prescription to determine if they are due for their 12 month drug screen.

Controlled Substance Agreement (1) ⓘ

Date ⌵

ⓘ 2022-Feb-13

A Controlled Substance agreement with the patient is required annually.

Education Materials

Urine Drug Toxicology Screen

Patient Risk Overview


State PMP Prescriptions (9)

Pertinent Medical History

Risk Considerations

Data Entry View (in Patient Search)

demo version - not for clinical use



Clinical Opioid Summary with Rx Integration

COSRI Patient Search

First Name Last Name YYYY-MM-DD [Calendar Icon] [X] [VIEW] [CLEAR]

First Name	Last Name	Birth Date	Last Accessed
Marcus	Aurelius	1975-06-17	2022-10-26 13:13
Norman	Osborn	1964-07-29	2022-10-26 09:23
martin	guerre	1982-06-18	2022-10-24 10:37
Elizabeth	Replacetherapy	1981-04-03	2022-10-21 16:07

[VIEW] [Trash Icon] [More Icon]

- ⊕ Add Urine Tox Screen
- ⊕ Add Controlled Substance Agreement

COSRI Patient Search

First Name Last Name Birth Date Last Accessed

Marcus	Aurelius	1975-06-17	2022-10-26 13:13
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[VIEW] [Trash Icon] [More Icon]

Urine Drug Toxicology Screen for Marcus Aurelius [CLOSE X]

Add New

Order Date
YYYY-MM-DD [Calendar Icon] [X]

Urine Drug Screen Name
Drug Monitoring, Panel 6 with Confirmation, Urine

[ADD] [CLEAR]

Last Urine Drug Screen

ⓘ No urine drug screen found for this patient.

COSRI Application: Education Materials

No entries found

No urine drug screen date found for this patient. Please check the first controlled substance prescription to determine if they are due for their 12 month drug screen.

Controlled Substance Agreement (1)

Date

2022-Feb-13

A Controlled Substance agreement with the patient is required annually.

Education Materials

Patient Resources

[Chronic Pain Patient](#) (PDF, size: 552 KB)

[Surgical Pain Patient](#) (PDF, size: 492 KB)

[Acute Pain Patient](#) (PDF, size: 495 KB)

[Sub-Acute Patient](#) (PDF, size: 487 KB)

[Naloxone Patient / Public](#) (PDF, size: 1.1 MB)

[Patient / Public Video](#) >

[Visit the rest of the DOH toolkit](#)

Provider Resources

[Clarification of Opioid Prescribing Rules](#) (PDF, size: 103 KB)

Links to WA State DoH materials at
<https://doh.wa.gov/sites/default/files/legacy/Documents/Pubs/631078-ChronicPain.pdf>

Please see the [CDC Guideline for Prescribing Opioids for Chronic Pain](#) for additional information and prescribing guidance.

COSRI development and open source software details [\[show/hide\]](#)

Development Tools [\[show/hide\]](#)

These development tools are for troubleshooting issues and intended to be used by technical support.

Version Number: 2181

Prescription Opioids for Chronic (Long-Term) Pain

October 2019 | DOH Pub 631-078

2018 Opioid Prescribing Requirements

Between the years 1999 to 2016, over 200,000 people in the United States died from a prescription opioid related overdose (CDC, 2017). A Washington State law passed in 2017 requiring opioid prescribing rules be written in response to



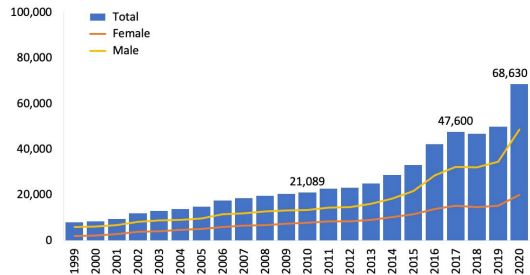
What you need to know as a patient

- Health care providers are required to consult with a pain expert if they are prescribing high doses of opioids.
- Health care providers are required to

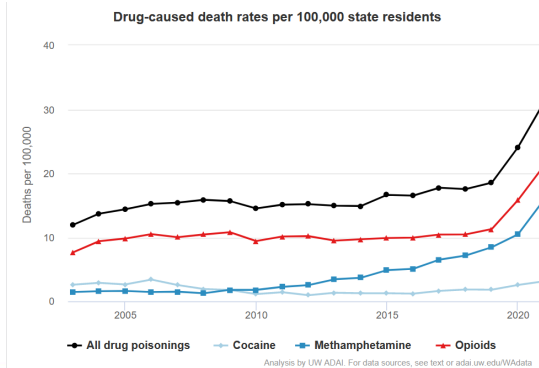
Rationale

- Prescription drug monitoring programs (PDMPs) established to curtail US opioid epidemic
- Washington (WA) State Dept of Health/Health Care Authority (Medicaid agency, HIE)
 - Fatal overdoses of non-heroin opioids continue to increase
 - Despite concerted efforts chronic opioid Rx are high (~90/1000 population)
 - 2019 UW study, providers reported difficulty accessing and cost as barriers to PDMP use

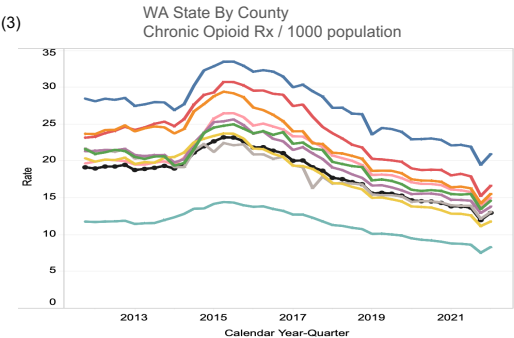
(1) **Figure 3. National Overdose Deaths Involving Any Opioid, Number Among All Ages, by Gender, 1999-2020**



(2)



(3)



- 2020-2021 Washington State Opioid and Overdose Response Plan
 - Strategies to promote best opioid prescribing practices and increase use of PDMP data
- UW Clinical Informatics Research Group (CIRG) & WA DoH collaboration
 - Usable clinical decision support (CDS) app for opioid prescribing using emerging HIT standards (FHIR, CQL, SMART)
 - Goal: increased use of PDMP & support Health IT standards, support DOH: FHIR innovation in Public Health, address SMART-on-FHIR gap in deployment, FHIR integration of non-EHR data

Washington State Opioid and Overdose Response Plan 2021–2022

EXECUTIVE SUMMARY

In pursuit of a coordinated and collaborative solution to the issues, Washington state has identified the following goals that serve as the theoretical underpinning of our work to address opioids, stimulants, and overdoses:

- Goal 1 – Prevent opioid and other drug misuse
- Goal 2 – Identify and treat opioid misuse and stimulant use disorder
- Goal 3 – Ensure and improve the health and wellness of people who use opioids and other drugs
- Goal 4 – Use data and information to detect opioid misuse, monitor drug user health effects, analyze population health, and evaluate interventions
- Goal 5 – Support individuals in recovery

<https://www.hca.wa.gov/assets/program/WashingtonStateOpioidandOverdoseResponsePlan-final-2021.pdf>



Health IT Standards to Watch

- **Consolidated-Clinical Document Architecture** (C-CDA) — C-CDA is a framework for creating clinical documents that contain both human-readable text and machine-readable XML
- **Direct** — is a standard for sending health information securely over the internet.
- **Fast Healthcare Interoperability Resource** (FHIR) — FHIR is a specification for exchanging clinical and administrative health care data. The standard is based on REST and OAuth.
- **Validated Healthcare Directory Implementation Guide** — an HL7 FHIR based implementation guide and architectural considerations for attesting to, validating, and exchanging validated data as well as a RESTful FHIR API for accessing data from that directory.

<https://www.healthit.gov/topic/standards-technology/health-it-standards>

Design

Utilized participatory design methodology to meet the needs of state/federal agencies (HIT standards, opioid prescribing guidelines) and providers (efficient, accessible, inexpensive)



- Reused open-source SMART-on-FHIR application codebase from the AHRQ CDS Connect Pain Management Summary project as template
<https://github.com/uwcirg/cosri-pain-management-summary>
- Extended/Reengineered code for secure production use, optional free-standing use, updated to FHIR R4, incorporated an MME calculator (CQL with WA rules), and production connectivity to WA PDMP
- Iterative Participatory Design (focus groups & qualitative interviews, Providers/Stakeholders)
 - Developed a local SMART-on-FHIR host to launch COSRI when in free-standing mode
 - Controlled substance classification implemented through logic mapping from NIH/NLM RxNav API returns
 - Developed ETL services to receive information from clinics in the free-standing mode and store them as FHIR resources in fEMR's HAPI FHIR database
 - Ability to record urine drug screen (UDS) & controlled substance agreements (CSA) as FHIR resources & integrate into user interface
 - Alerts for contra-indicated co-prescribing, UDS and CSA, high MME, failure of MME calculation, and other risks through rules implemented in Java script and CQL
 - Second cycle of participatory design for final configuration during implementation

- Developed a database of faux patient PDMP messages, including errors for complete testing of all components
 - identified and mapped all potential COSRI error pathways and alerting pathways and developed a library of test patient PDMP data that could trigger these potential errors or alerts
- Each application component (e.g., authentication, authorization, ETL services, etc.) was extensively tested during development using the faux patients
- Patient safety-related components were further validated including
 - Alert messages and suppression of the MME summary graphs in the UI, and backend alerts to developers when NIH/NLM Rx NAV API does not return details for a given National Drug Code (NDC)
 - Validation of MME calculator against a library of 220 validation patients with >7000 prescriptions, based on all available opioid classes and formulations as identified from the RxNav full prescription database
- Prior to release of new production versions, end-to-end testing on all application components is completed using a standardized checklist

Implementation

- Developer alert system
 - Developed clearly COSRI-tagged alerts for unexpected application behavior based on programming logic sent to all developer and support team members
- End User Support
 - Established responsive helpdesk email cascade
 - Developed an end user guide including trouble shoot and expect application behavior
 - Created and schedule 30-minute training course
- Site Implementation
 - Training occurred on the day of implementation
 - COSRI staff were on site at implementation & responsive to end user queries and concerns
 - Development team on stand-by for unexpected issues

Initial implementation occurred at two resource-constrained, community primary care clinics with ~50% Medicaid supported patients

Evaluation

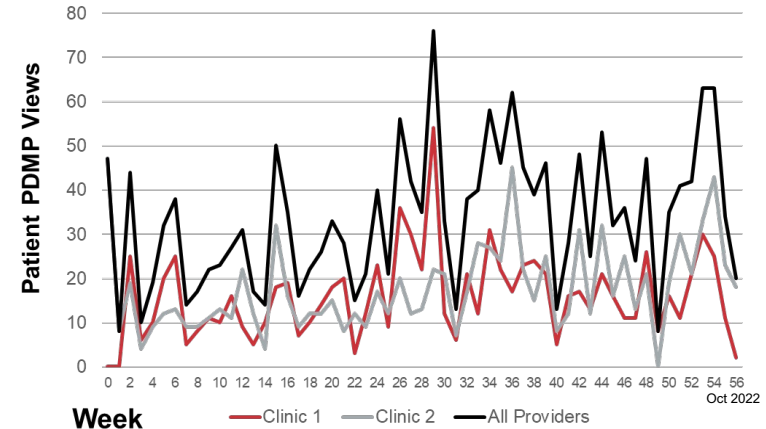
Mixed methods approach

- COSRI App logs
- 1911 patient views/ 26 weeks
- Qualitative Interviews
- 9 user support issues

Provider Evaluation Interview Comments

- Ease of use**
- “...it’s a pretty straightforward system which is nice...”
 - “I was leaving a lot of time because before I would be like, oh login to secure access, oh go to this step go, let me send you a text message for code verification... and this is like this whole ordeal. And now I just go and I hit my Google tab and I have the bookmark saved for COSRI, and there’s just the one login thing and then search the patient. It’s really fast.”
 - “that’s the biggest thing, its just very, very quick. A couple of clicks and you have the information...”
- Patient Search**
- “I really like the patient search. I like how I don’t have to have the patient’s date of birth, you know, in front of me, like with the PDMP.”
 - “It’s really fast when I type in the last name and I love how the patient, just pops up right there and it’s so much easier.”
- Patient Engagement**
- “I like the like the display with the kind of bar chart of, you know, hitting the threshold. It can be a useful thing to show patients, like [talking to patient] ‘Okay, see how it’s red here? So that’s the problem that I’m talking about. We’ve got this red line here, what are we going to do about that?’”
- Favorite Features**
- “My favorite thing? How fast it is. It’s very fast. I cannot emphasize how important that is to me.”
 - “.. Then its readability is also very nice, very clear...”
 - “The layout is just very nice and easy to see. It’s easier to look at than the PDMP [State Portal]”

	Other PMP Interfaces (seconds)	COSRI (seconds) Mean (median; range)	p-value
Login time			
Password saved	NA	4 (4; 3-5)	<0.0001
Password not saved	137	8.5 (8; 7-10)	
PMP patient look up & load time	120	18.7 (16; 1-57)	<0.0001



Sustainability & Future Directions

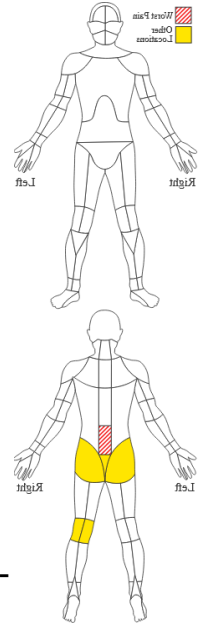
- Sustainability

- Usage of COSRI has remained consistent after the formal project evaluation
- Users remain enthusiastic and willing to help us recruit new sites
- Owners of one site sold their practice and the new management adopted COSRI

- Future Directions

- Expand sites using COSRI in WA State, work with WA DOH identifying priority sites
- Explore expansion outside WA State
- Integration of our patient-facing PainTracker App (<https://cprohealth.org/> - Chronic Pain, in use clinically ~ 5 years)

- Support provider-patient shared decision making
- Pain, depression, post-traumatic stress, anxiety, opioid dependency risk and other chronic pain-related measures
- Data integration & visualization via COSRI



ORT Score	5 (0-26)	
AUDIT-C	6 (0-12)	⚠️
PHQ-9	17 (0-27)	⚠️
SI	1 (0-3)	⚠️
GAD-7	16 (0-21)	⚠️
PTSD	4 (0-4)	⚠️
STOP	3 (0-4)	⚠️
FM	9 (0-31)	📧
Opioids		
Problems	Low	
Concerns	Low	
Helpfulness	No	
Taper	No	



- **Development:**
 - Interagency Agreement from the Washington Department of Health
 - Washington State Healthcare Authority and the US Centers for Medicare & Medicaid Services
- **Implementation**
 - Contract #GS-35F-540GA order# HHSP233201800327G, under which Accenture Federal Services served as a contractor to the Office of the National Coordinator for Health Information Technology (ONC)
- **Explore Scaling in WA State**
 - Fall 2022 funding through CDC and ONC

Acknowledgements

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COSRI Development Team

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Jan Flowers

Maggie Dorr

Seth Wolpin

Other Research Partners

- Laura-Mae Baldwin
- WWAMI region Practice and Research Network (WPRN)
- Provider Participants for Early Adaptors Interviews

Stakeholders:



**Pilot Clinic
Providers!**



COSRI was Built with:



Agency for Healthcare
Research and Quality



CDS Connect

Thank you!

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COSRI Demo – two ways to launch:

Free-standing: <https://demo.cosri.app>

EHR-integrated: <https://apps.smarthealthit.org/app/cosri>

The screenshot displays the COSRI interface for patient Marcus Aurelius (DOB: 1975-JUN-17, MALE). The main section is titled "Clinical Opioid Summary with Rx Integration" and includes a "LIMITATIONS" warning: "Guidance not intended for palliative, inpatient, or active cancer care." The "Patient Risk Overview" section features a "Morphine Equivalent Dose (MED)" step chart. The chart shows a significant increase in MED starting in late 2021, peaking at approximately 285 MED in March 2022. Three horizontal thresholds are marked: "Washington State consultation threshold" at 120 MED, "CDC avoid/justify threshold" at 80 MED, and "CDC extra precautions threshold" at 40 MED. A "Prescription Summary" table and a "Patient Risk Assessment" section are also visible.

Class	# Rx	# Prescribers	# Pharmacies
Opioids	9	3	3
Benzodiazepines	0		
Non-benzo Sedatives/Hypnotics	0		
Muscle Relaxants	0		
Stimulants	0		
Anti-Convulsants	0		
Steroids	0		

1	No urine drug screen date found for this patient. Please check the first controlled substance prescription to determine if they are due for their 12 month drug screen.
1	A controlled substance agreement is due for this patient on or before 2023-02-13.

MED today 0 (2022-10-26) Average MED in the last 60 days 0
Most recent MED 285 (2022-03-25) Average MED in the last 90 days 0