

HIV Prevention: Clinical Decision Support System to Increase HIV Screening, Updated 2026

Community Preventive Services Task Force Finding and Rationale Statement Ratified April 2020

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CPSTF Finding and Rationale Statement

Context

In 2018, 1.04 million adults and adolescents in the United States were living with diagnosed HIV infection, including around 38,000 new diagnoses (CDC 2020 [<https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-report-2018-updated-vol-31.pdf>]). The highest rates of diagnosis were for people aged 20-29 years, Black or African American people, those who have male-to-male sexual contact, and people living in the southern states (CDC 2020 [<https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-report-2018-updated-vol-31.pdf>]).

Ending the HIV Epidemic: A Plan for America [<https://www.hiv.gov/federal-response/ending-the-hiv-epidemic/overview>] is the operational plan developed by agencies across the U.S. Department of Health and Human Services (DHHS) to pursue the goal to reduce new HIV infections by 75% in 5 years and 90% in 10 years. DHHS identified four key strategies to achieve these goals in the United States, including diagnosing people living with HIV as early as possible, linking them to care, and starting treatment to achieve and maintain viral suppression to prevent transmission to others. The *National Strategic Plan: A Roadmap to End the Epidemic for the United States, 2021-2025* [<https://www.hiv.gov/federal-response/hiv-national-strategic-plan/hiv-plan-2021-2025>] (The Plan), also developed by HHS, is closely aligned with, and complements, the *Ending the HIV Epidemic*. The Plan covers the entire United States with a focus on collaboration between all sectors of society to prevent new HIV transmission, improve health outcomes of people with HIV, and reduce HIV-related disparities and health inequities. Testing for HIV is the first step for both plans. Identifying interventions that increase HIV screening, especially among population groups with the highest rates of diagnosis, can facilitate testing.

Intervention Definition

Clinical Decision Support Systems (CDSS) encompass a variety of tools to enhance decision making about patient care. These tools include computerized alerts and reminders to healthcare providers and patients, clinical guidelines, condition-specific order sets, focused patient data reports and summaries, documentation templates, and diagnostic support (Office of the National Coordinator for Health Information Technology, 2018).

To increase HIV screening, CDSS use patient data and current guidelines to identify those eligible for HIV screening and send healthcare providers computerized alerts or reminders to order tests. CDC guidelines (Branson et al. 2006) recommend routine screening for all patients aged 13-64 years and all pregnant people, and at least annual screening for people at high risk for HIV. Risk is assessed based on patients' or their partners' sexually transmitted disease diagnosis, sexual behavior, or history of injection drug use.

Patients may receive information about HIV transmission and testing prior to screening, and healthcare providers may receive education about HIV transmission, patient eligibility for screening, and how to correctly use CDSS.

CPSTF Finding (April 2020)

The Community Preventive Services Task Force recommends clinical decision support systems for HIV screening to increase screening based on strong evidence of effectiveness.

Studies included in the systematic review showed use of CDSS increases HIV screening for the general population and for people at higher risk for HIV infection. People testing positive for HIV can then be linked to care, which could lead to a

reduction in HIV transmission. CDSS for HIV screening were effective with all groups examined, including populations who are underserved. When implemented in healthcare settings serving these populations, CDSS for HIV screening could lead to improved health equity.

Rationale

Basis of Finding

The CPSTF recommendation is based on evidence from a systematic review of [23 studies](#) [<https://www.thecommunityguide.org/findings/hiv-prevention-clinical-decision-support-system-increase-hiv-screening#included-studies>] (search period January 1985 to October 2019) that evaluated the effectiveness of CDSS for increasing HIV screening.

Among the included studies, CDSS alerted providers to offer testing to all eligible patients. Providers offered testing to a median of 80% of eligible patients, and a median of 30% of those patients declined the offer. Compared with no intervention, CDSS increased HIV screening and identified more HIV infections (Table). The majority of patients who tested positive were linked to care (1 study). Patients were also identified at earlier stages of HIV infection based on CD4 cell count and viral load (1 study).

Table. Intervention Effects on HIV Screening Among Eligible Patients

Outcome Measure	Screening Rates at Baseline and Follow-up	Median (IQR) Number of Studies	Direction of Effect
Percent of patients tested	Baseline: median of 6% Post intervention: 16%	Absolute percentage point change: Increase of 10.3 percentage points (6.3 to 15.5) 16 studies	Favors the intervention
Number of patients tested per month	Baseline: median of 80 tests/month Post intervention: median of 495 tests/month	Absolute change: additional 415 patients tested per month (45 to 531) 7 studies	Favors the intervention
Number of patients who tested positive per month	Baseline: median of 1.3 persons tested positive/month Post intervention: median of 2.6 persons tested positive/month	Absolute change: additional 1.3 patients tested positive per month (0.02 to 2.8) 13 studies	Favors the intervention

Percent tested = number of patients tested/number of patients eligible for testing

Number tested per month = number of patients tested/study duration in number of months

Number tested positive per month = number of patients who tested positive/study duration in number of months

Applicability and Generalizability Considerations

Intervention Settings

The included studies evaluated interventions implemented in the United States (21 studies) and the United Kingdom (2 studies). The U.S. studies were implemented in the Western (6 studies), Midwestern (4 studies), Northeastern (8 studies), and Southern (4 studies) regions as [defined by the U.S. Census Bureau](#) [https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf]. Two of the studies were conducted in multiple regions and one study did not report on location. Interventions were implemented in urban (16 studies), rural

(2 studies), and a mix of urban, suburban, and rural (3 studies) areas. Two studies did not report information about urbanicity. Studies were implemented in clinics (8 studies), hospitals (3 studies), emergency departments (5 studies), Veterans Affairs healthcare facilities (6 studies), and managed care settings (1 study). CDSS increased HIV screening in all of these settings.

Population Characteristics

HIV screening increased for all age groups (7 studies). In four of these seven studies, patients aged 50 years or older had lower baseline HIV screening rates when compared with patients aged 18 to 30 years. They had greater increases in HIV screening with CDSS interventions, however, leading to comparable post-intervention rates for all age groups.

Interventions were effective for both males and females (5 studies), across different income levels (3 studies), and for all racial and ethnic groups examined (6 studies). One study only recruited American Indian and Alaska Native people and reported intervention effectiveness. One study that considered health coverage showed a greater increase in screening among patients without health insurance. CDSS for HIV screening were effective for underserved populations examined, suggesting this intervention has the potential to improve health equity.

Intervention Characteristics

Included studies evaluated interventions that were implemented for a median of 12 months and added HIV testing alerts to preexisting (22 studies) or new (1 study) electronic medical record (EMR) or electronic health record (EHR) systems.

HIV testing can be offered as opt-out or opt-in. CDC recommends opt-out testing, which notifies patients they will be tested for HIV as part of their standard preventive screenings unless they decline verbally or in writing. With opt-in testing, patients receive pre-test counseling and must give explicit written consent ahead of time (Branson et al., 2006). Interventions were effective with either opt-out (19 studies) or opt-in (3 studies) testing; one study did not report on this characteristic.

The review team categorized CDSS reminders as active or passive. Active reminders require providers to address an alert before moving to the next task or closing a patient's chart. Passive reminders can be ignored by providers. Interventions were effective with active (13 studies) and passive (4 studies) reminders. One study switched from passive to active reminders and reported an increase in HIV screening.

In some of the included studies, providers were educated about HIV, HIV testing, and CDSS (10 studies) prior to intervention implementation. These studies led to greater increases in screening when compared with studies that did not include an educational component (8 studies). The presence or absence of an educational component could not be determined for five of the included studies.

CDSS identified all eligible patients who had not been tested previously (12 studies), patients who were at high risk for HIV infection and had not been tested within the previous 12 months (6 studies), or both (5 studies). All three approaches showed comparable increases in HIV screening.

Data Quality Issues

In most of the included studies, the authors evaluated interventions that were already implemented and extracted data from medical records. This limited studies to mostly pre-post designs and convenience sampling.

Other Benefits and Harms

No additional benefits or potential harms were identified by the included studies.

Considerations for Implementation

The following considerations for implementation are drawn from studies included in the existing evidence review, the broader literature, and expert opinion from CPSTF deliberations, as noted below.

- EMR and EHR are widely used in the United States healthcare system.
 - 96% of non-federal acute care hospitals used EMR/EHR systems by 2015 (Henry et al., 2016).
 - 85.9% of office-based physicians used an EMR/EHR system by 2017 (Myrick et al., 2017).
 - Staff members already use EMR/EHR systems to track patient services and can adopt an additional alert for HIV screening (CPSTF).
- Despite the widespread use of EMR/EHR, incorporating reminders for HIV screening poses some challenges identified by included studies or the CPSTF.
 - For CDSS to effectively identify patients at high risk for HIV infection, providers will need to collect and record information about risk behaviors (e.g., sexual behavior, drug use history). Some providers or patients may feel uncomfortable and avoid these topics (CPSTF). CDC offers guidance to providers for discussing sexual health.
 - Some risk factors may be recorded in EMR/EHR fields that are not searchable, making it difficult for CDSS algorithms to identify patients eligible for screening (Burrell et al., 2018). Modifications to electronic forms might be needed to ensure complete recording of patient conditions.
- Providers might resist HIV screening in an already busy environment and choose not to offer patients tests despite CDSS prompts.
 - It could be helpful to streamline the process by considering the timing for screening prompts. For example, CDSS might alert emergency department providers to screen patients for HIV when blood has already been drawn (Chadwick et al., 2017; Lin et al., 2017).
- Interventions that offered providers training produced greater increases in HIV screening when compared to interventions that did not. Training could improve intervention effectiveness by
 - Teaching providers how to use the system so daily interruptions are minimized, which could reduce the perceived burden of HIV screening in a busy environment (Burrell et al., 2018).
 - Providing facts about HIV transmission and prevention that could address biases and stereotypes providers may hold about patients at risk for HIV infection, including those related to age, race/ethnicity, gender, or risk behaviors (CPSTF).
- Although most studies used an opt-out approach to testing, a median of 30% of patients declined an HIV test. The included studies and experts in the field have suggested providers could try the following:
 - Ask patients detailed questions about their reasons for declining and offer alternative solutions such as oral testing rather than needles or finger-stick tests (Clarke et al., 2013).
 - Offer brief counseling when time and resources allow (CPSTF).
- CDSS interventions for HIV screening identified more patients living with HIV compared to no CDSS. Patients who test positive need to be linked with appropriate follow-up care that is affordable and accessible. Included studies offered the following suggestions to help make these connections.
 - CDSS algorithms could be established to connect patients with downstream care. CDSS could automatically order confirmatory tests and submit referrals (Connors et al., 2012), provide direct links to

downstream care facilities to set up appointments (Burrell et al., 2018), or report confirmed cases to the local health department for tracking (Sha et al., 2019).

- Outreach workers could be engaged to deliver results to patients who test positive and facilitate linkage to care (Lin et al., 2017). Patients might be more receptive to information and advice offered by community health workers (CPSTF)..

Evidence Gaps

The CPSTF identified several areas that have limited information. Additional research and evaluation could help answer the following questions and fill existing gaps in the evidence base.

- Most studies reporting on HIV screening among people at high risk did not report effectiveness by specific risk behaviors. How effective are CDSS for HIV screening among people who have male-to-male sexual contact or inject drugs, and people who are transgender?
- How effective are CDSS for HIV screening in rural areas?

References

- Branson BM, Handsfield HH, Lampe MA, Janssen RS, Taylor AW. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. *Morbidity and Mortality Weekly Report: Recommendations and Reports* 2006;55(14):1-17.
- Burrell CN, Sharon MJ, Davis SM, Wojcik EM, Martin IB. Implementation of a collaborative HIV and hepatitis C screening program in Appalachian urgent care settings. *Western Journal of Emergency Medicine* 2018;19(6):1057.
- Centers for Disease Control and Prevention. HIV Surveillance Report, 2018 (Updated); vol. 31. <http://www.cdc.gov/hiv/library/reports/hiv-surveillance.html>. Published May 2020. Accessed September 2020.
- Chadwick DR, Hall C, Rae C, Rayment MI, Branch M, et al. A feasibility study for a clinical decision support system prompting HIV testing. *HIV Medicine* 2017;18(6):435-9.
- Clarke E, Bhatt S, Patel R, Samraj S. Audit of the effect of electronic patient records on uptake of HIV testing in a level 3 genitourinary medicine service. *International Journal of STD and AIDS* 2013;24(8):661-5.
- Connors EE, Hagedorn HJ, Butler JN, Felmet K, Hoang T, et al. Evaluating the implementation of nurse-initiated HIV rapid testing in three Veterans Health Administration substance use disorder clinics. *International Journal of STD and AIDS* 2012;23(11):799-805.
- Henry J, Pylypchuk Y, Searcy T, Patel V. Adoption of Electronic Health Record Systems among U.S. Non-Federal Acute Care Hospitals: 2008-2015. ONC Data Brief, no.35. Office of the National Coordinator for Health Information Technology: Washington DC. May 2016. Available at URL: <https://dashboard.healthit.gov/evaluations/data-briefs/non-federal-acute-care-hospital-ehr-adoption-2008-2015.php>
- Lin J, Mauntel-Medici C, Heinert S, Baghikar S. Harnessing the power of the electronic medical record to facilitate an opt-out HIV screening program in an urban academic emergency department. *Journal of Public Health Management and Practice* 2017;23(3):264-8.
- Myrick KL, Ogburn DF, Ward BW. Table. Percentage of office-based physicians using any electronic health record (EHR)/electronic medical record (EMR) system and physicians that have a certified EHR/EMR system, by U.S. state:

National Electronic Health Records Survey, 2017. National Center for Health Statistics. January 2019. Available at URL: https://www.cdc.gov/nchs/data/nehrs/2017_NEHRS_Web_Table_EHR_State.pdf.

Sha BE, Kniuksta R, Exner K, Kishen E, Shankaran S, et al. Evolution of an electronic health record based–human immunodeficiency virus (HIV) screening program in an urban emergency department for diagnosing acute and chronic HIV infection. *Journal of Emergency Medicine* 2019;57(5):732-9.

U.S. Preventive Services Task Force. Human Immunodeficiency Virus (HIV) infection: screening. Bethesda (MD): June 2019. Accessed March 2020. Available at URL: <https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/human-immunodeficiency-virus-hiv-infection-screening>

U.S. Office of the National Coordinator for Health Information Technology. Clinical Decision Support; 2018. Available from URL: <https://www.healthit.gov/topic/safety/clinical-decision-support>. Accessed: 1/12/21.

Disclaimer

The findings and conclusions on this page are those of the Community Preventive Services Task Force and do not necessarily represent those of CDC. Task Force evidence-based recommendations are not mandates for compliance or spending. Instead, they provide information and options for decision makers and stakeholders to consider when determining which programs, services, and policies best meet the needs, preferences, available resources, and constraints of their constituents.

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Appendices of Supporting Documents

HIV Prevention: Clinical Decision Support System to Increase HIV Screening

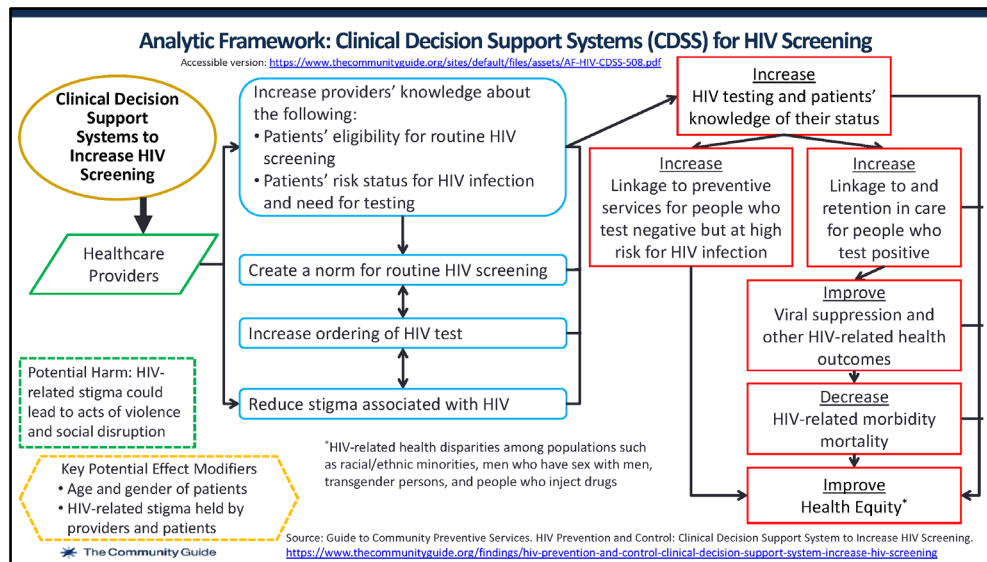
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Appendix A

Analytic Framework (Effectiveness Review)

HIV Prevention: Clinical Decision Support System to Increase HIV Screening



Analytic Framework Text Description

The analytic framework shows the postulated pathways through which Clinical Decision Support Systems (CDSS) may increase HIV screening.

CDSS use a variety of tools to help healthcare providers make informed clinical decisions at the point of care. CDSS to increase HIV screening use patient data to identify those eligible for HIV screening and send computerized alerts or reminders to healthcare providers, increasing providers’ knowledge about patients’ eligibility for routine HIV screening and risk status for HIV infection, creating a norm for routine HIV screening, increasing providers ordering of HIV tests, and reducing stigma association with HIV.

These changes can increase HIV testing and patients’ knowledge of their status. Patients who test negative and are at high risk for HIV infection can be linked to preventive services. Patients who test positive can be linked to, and retained in, HIV care, to improve their viral suppression and other HIV-related health outcomes, decreasing HIV-related morbidity and mortality.

HIV-related health disparities exist among population groups such as people from racial and ethnic minority groups, those who have male-to-male sexual contact, transgender persons, and people who inject drugs. CDSS could focus on these population groups, increase HIV screening among them and link patients tested positive to care and treatment and improve health equity.

One postulated harm is that patients learning and disclosing their HIV status may face HIV-related stigma that could lead to disruption of social relations and possible acts of violence.

Key potential effect modifiers include age and gender of patients, and HIV-related stigma held by providers and patients.

Icons in Community Guide Analytic Frameworks	
Icon	Interpretation
	Intervention
	Recommendation outcome
	Other intermediate outcome/variable (that are not recommendation outcomes)
	Population
	Potential Effect Modifiers (affecting causal relationships)
	Potential Additional Benefits/Potential Harms
	Unidirectional block arrows are applied between intervention and population icons
	Unidirectional arrows for causal relationships
	Bidirectional arrows show feedback loops
The Community Guide	

Appendix B

Search Strategy (Effectiveness Review): HIV Prevention: Clinical Decision Support System to Increase HIV Screening

The systematic review science team completed a broad search for English-language papers that evaluated the impact of clinical decision support system interventions to increase HIV screening. Searches were conducted in the following databases: Medline, Embase, PsycINFO, Global Health, Scopus, Cochrane Library, and CINAHL. The search period was January 1, 1985 to October of 2019. Two team members independently screened each paper to determine eligibility. Uncertainties and disagreements were resolved by consensus among review team members.

Database Search Result Summary

Database	Dates Searched	Results	Duplicates	Unique Results
Medline (OVID) 1945-	10/22/19	8,763	31	8,732
Embase (OVID) 1947-	10/22/19	2,805	1,683	1,122
PsycINFO (OVID) 1806-	10/24/19	371	137	234
Global Health (OVID) 1910-	10/24/19	544	321	223
Scopus 1960-	10/25/19	6,996	1,363	5,633
Cochrane Library	10/28/19	1,195	174	1,021
CINAHL (Ebsco)	10/28/19	908	491	417
Total		21,582	4,200	17,382

Notes: Duplicates were identified using EndNote automated “find duplicates” function with preference set to match on title, author, and year. There will likely be additional duplicates found that EndNote was unable to detect.

Database: Medline (OVID)

1 exp Decision Support Systems, Clinical/

2 Therapy, Computer-Assisted/

3 Reminder Systems/

4 Decision Making, Computer-Assisted/

5 (clinical decision support system* or computer assisted therapy or reminder system* or computer assisted decision making).ti,ab.

6 ((computer* or electronic) and (alert* or reminder*)).ti,ab.

7 decision support system*.ti,ab.

8 Mass Screening/

9 mass screening*.ti,ab.

10 medical records systems, computerized/ or exp electronic health records/

11 ((electronic or online or on-line) and (record* adj1 (medical or patient or health))).ti,ab.

12 exp HIV/ or exp Acquired Immunodeficiency Syndrome/

13 (sexually transmitted diseases or sexually transmitted infections or acquired immune deficiency syndrome or human immunodeficiency virus).ti,ab.

14 (AIDS or STD or STDs or STI or “STIs” or HIV or HIV testing or HIV test or HIV screen*).ti,ab.

15 12 or 13 or 14

16 or/1-11

17 15 and 16

18 exp Animals/ or exp Nonhuman/

19 Humans/

20 18 not 19

21 17 not 20

22 17 not (animals not humans).sh.

23 limit 22 to (english language and yr=”1985 -Current”)

Database: Embase (OVID)

1 exp Decision Support Systems, Clinical/

2 Therapy, Computer-Assisted/

3 Reminder Systems/

4 Decision Making, Computer-Assisted/

5 (clinical decision support system* or computer assisted therapy or reminder system* or computer assisted decision making).ti,ab.

6 ((computer* or electronic) and (alert* or reminder*)).ti,ab.

7 decision support system*.ti,ab.

8 Mass Screening/

9 mass screening*.ti,ab.

10 medical records systems, computerized/ or exp electronic health records/

11 ((electronic or online or on-line) and (record* adj1 (medical or patient or health))).ti,ab.

12 exp HIV/ or exp Acquired Immunodeficiency Syndrome/

13 (sexually transmitted diseases or sexually transmitted infections or acquired immune deficiency syndrome or human immunodeficiency virus).ti,ab.

14 (AIDS or STD or STDs or STI or “STIs” or HIV or HIV testing or HIV test or HIV screen*).ti,ab.

15 12 or 13 or 14

16 or/1-11

17 15 and 16

18 exp Animals/ or exp Nonhuman/

19 Humans/

20 18 not 19

21 17 not 20

22 limit 21 to (english language and yr=”1985 -Current”)

Database: PsycINFO (OVID)

1 computer assisted therapy/

2 exp Decision Support Systems/

3 (clinical decision support system* or computer assisted therapy or reminder system* or computer assisted decision making).ti,ab.

4 ((computer* or electronic) and (alert* or reminder*)).ti,ab.

5 decision support system*.ti,ab.

6 mass screening*.ti,ab.

7 medical records systems, computerized/ or exp electronic health records/

8 ((electronic or online or on-line) and (record* adj1 (medical or patient or health))).ti,ab.

9 exp HIV/ or exp Acquired Immunodeficiency Syndrome/

10 (sexually transmitted diseases or sexually transmitted infections or acquired immune deficiency syndrome or human immunodeficiency virus).ti,ab.

11 (AIDS or STD or STDs or STI or “STIs” or HIV or HIV testing or HIV test or HIV screen*).ti,ab.

12 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8

13 9 or 10 or 11

14 12 and 13

15 limit 14 to (english language and yr="1985 -Current")

Database: Global Health (OVID)

1 exp decision support systems/

2 (clinical decision support system* or computer assisted therapy or reminder system* or computer assisted decision making).ti,ab.

3 ((computer* or electronic) and (alert* or reminder*)).ti,ab.

4 decision support system*.ti,ab.

5 mass screening*.ti,ab.

6 ((electronic or online or on-line) and (record* adj1 (medical or patient or health))).ti,ab.

7 or/1-6

8 exp HIV/

9 exp acquired immune deficiency syndrome/

10 (sexually transmitted diseases or sexually transmitted infections or acquired immune deficiency syndrome or human immunodeficiency virus).ti,ab.

11 (AIDS or STD or STDs or STI or "STIs" or HIV or HIV testing or HIV test or HIV screen*).ti,ab.

12 8 or 9 or 10 or 11

13 7 and 12

14 limit 13 to (english language and yr="1985 -Current")

Database: Scopus

((INDEXTERMS("Decision Support Systems" OR "Reminder Systems" OR "electronic health records") OR TITLE-ABS("decision support system" OR "decision support systems" OR "computer assisted therapy" OR "computer assisted therapies" OR "reminder system" OR "computer assisted decision making" OR "mass screening") OR TITLE-ABS((computer* OR electronic") AND (alert* OR reminder*")) OR TITLE-ABS(record* W/1 (medical OR patient* OR "health"))) AND (INDEXTERMS("HIV" OR "Acquired Immunodeficiency Syndrome") OR TITLE-ABS("sexually transmitted diseases" OR "sexually transmitted infections" OR "acquired immune deficiency syndrome" OR "human immunodeficiency virus" OR AIDS OR STD OR STDs OR STI OR STIs OR HIV))) AND LIMIT-TO (PUBYEAR) 1985 2019

AND (LIMIT-TO (LANGUAGE , "English"))

Database: Cochrane

#1 (“clinical decision support system*” or “computer assisted therapy” or “reminder system*” or “computer assisted decision making”):ab,ti

#2 ((computer* or electronic) and (alert* or reminder*)):ab,ti

#3 decision support system*:ti,ab

#4 mass screening:ti,ab

#5 ((electronic OR online OR on-line) AND (record* NEAR/1 (medical OR patient OR health))):ti,ab

#6 (“sexually transmitted diseases” OR “sexually transmitted infections” OR “acquired immune deficiency syndrome” OR “human immunodeficiency virus”):ti,ab

#7 (AIDS or STD or STDs or STI or “STIs” or HIV or HIV testing or HIV test or HIV screen*):ti,ab

#8 #1 OR #2 OR #3 OR #4

#9 #5 OR #6 OR #7

#10 #8 AND #9 with Cochrane Library publication date Between Jan 1985 and Oct 2019

#11 #10 with Publication Year from 1985 to 2019, in Trials

Database: CINAHL

S18 S12 AND S17

S17 S13 OR S14 OR S15 OR S16

S16 TI (AIDS or STD or STDs or STIs or HIV or HIV testing or HIV test or HIV screen*) OR AB (AIDS or STD or STDs or STIs or HIV or HIV testing or HIV test or HIV screen*)

S15 TI (sexually transmitted disease* or sexually transmitted infection* or acquired immune deficiency syndrome or human immunodeficiency virus) OR AB (sexually transmitted disease* or sexually transmitted infection* or acquired immune deficiency syndrome or human immunodeficiency virus)

S14 (MH “HIV Infections+”)

S13 (MH “Human Immunodeficiency Virus+”)

S12 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S9 OR S10 OR S11

S11 TI (((electronic or online or on-line) and (record* N1 (medical or patient or health)))) OR AB (((electronic or online or on-line) and (record* N1 (medical or patient or health)))

S10 TI computerized medical records system* OR AB computerized medical records system*

S9 (MH “Electronic Health Records+”)

S8 computerized medical record systems

S7 TI mass screening* OR AB mass screening*

S6 TI decision support system* OR AB decision support system*

S5 TI (((computer* or electronic) N3 (alert* or reminder*))) OR AB (((computer* or electronic) N3 (alert* or reminder*)))

S4 TI ((clinical decision support system* or computer assisted therapy or reminder system* or computer assisted decision making)) OR AB ((clinical decision support system* or computer assisted therapy or reminder system* or computer assisted decision making))

S3 (MH “Reminder Systems”)

S2 (MH “Therapy, Computer-Assisted”)

S1 MH “Decision Support Systems, Clinical+”)

Appendix C

Included Studies (Effectiveness Review): HIV Prevention: Clinical Decision Support System to Increase HIV Screening

The number of studies and publications do not always correspond (e.g., a publication may include several studies or one study may be explained in several publications).

Anaya H, Butler J, Solomon J, et al. Implementation of nurse-initiated rapid HIV testing at high prevalence primary care sites within the US Veterans Affairs health care system. *Sexually Transmitted Diseases* 2013;40(4):341-5.

Avery AK, Del Toro M, Einstadter D. Decreasing missed opportunities for HIV testing in primary care through enhanced utilization of the electronic medical record. *Journal of AIDS and Clinical Research* 2012;Suppl 4:10.4172/2155-6113.S4-006.

Burrell CN, Sharon MJ, Davis SM, Wojcik EM, Martin IB. Implementation of a collaborative HIV and hepatitis C screening program in Appalachian urgent care settings. *Western Journal of Emergency Medicine* 2018;19(6):1057.

Chadwick DR, Hall C, Rae C, Rayment MI, Branch M, et al. A feasibility study for a clinical decision support system prompting HIV testing. *HIV Medicine* 2017;18(6):435-9.

Clarke E, Bhatt S, Patel R, Samraj S. Audit of the effect of electronic patient records on uptake of HIV testing in a level 3 genitourinary medicine service. *International Journal of STD and AIDS* 2013;24(8):661-5.

Connors EE, Hagedorn HJ, Butler JN, Felmet K, Hoang T, et al. Evaluating the implementation of nurse-initiated HIV rapid testing in three Veterans Health Administration substance use disorder clinics. *International Journal of STD and AIDS* 2012;23(11):799-805.

Crumby NS, Arrezola E, Brown EH, Brazzeal A, and Sanchez TH. Experiences implementing a routine HIV screening program in two Federally Qualified Health Centers in the southern United States. *Public Health Reports* 2016;131(Suppl 1):21-9.

Federman DG, Kravetz JD, Vasquez LS, Campbell SM. Improving human immunodeficiency virus testing rates with an electronic clinical reminder. *American Journal of Medicine* 2012;125(3):240-2.

Felsen UR, Cunningham CO, Heo M, et al. An expanded HIV testing strategy leveraging the electronic medical record uncovers undiagnosed infection among hospitalized patients. *Journal of Acquired Immune Deficiency Syndrome* 2017;75(1):27.

Goetz MB, Hoang T, Bowman C, et al. A system-wide intervention to improve HIV testing in the Veterans Health Administration. *Journal of General Internal Medicine* 2008;23(8):1200.

Goetz MB, Hoang T, Knapp H, et al. Central implementation strategies outperform local ones in improving HIV testing in Veterans Healthcare Administration facilities. *Journal of General Internal Medicine* 2013;28(10):1311-7.

Goetz MB, Hoang T, Knapp H, et al. Exportability of an intervention to increase HIV testing in the Veterans Health Administration. *Joint Commission Journal on Quality and Patient Safety* 2011;37(12):553-9.

Golden MR, Duchin J, Chew LD, et al. Impact of an electronic medical record-based system to promote human immunodeficiency virus/hepatitis C virus screening in public hospital primary care clinics. Paper presented at: Open Forum Infectious Diseases 2017.

Hechter RC, Bider-Canfield Z, Towner W. Effect of an electronic alert on targeted HIV testing among high-risk populations. *Permanente Journal* 2018;22:18-15.

Kershaw C, Taylor JL, Horowitz G, et al. Use of an electronic medical record reminder improves HIV screening. *BMC Health Services Research* 2018;18(1):14-21.

Lin J, Mauntel-Medici C, Heinert S, Baghikar S. Harnessing the power of the electronic medical record to facilitate an opt-out HIV screening program in an urban academic emergency department. *Journal of Public Health Management and Practice* 2017;23(3):264-8.

Marcelin JR, Tan EM, Marcelin A, et al. Assessment and improvement of HIV screening rates in a Midwest primary care practice using an electronic clinical decision support system: a quality improvement study. *BMC Medical Informatics and Decision Making* 2016;16(1):76.

Rodriguez V, Lester D, Connelly-Flores A, Barsanti FA, Hernandez P. Integrating routine HIV screening in the New York City community health center collaborative. *Public Health Reports* 2016;131(1_suppl):11-20.

Rudd S, Gemelas J, Reilley B, Leston J, Tulloch S. Integrating clinical decision support to increase HIV and chlamydia screening. *Preventive Medicine* 2013;57(6):908-9.

Schnall R, Liu N, Sperling J, et al. An electronic alert for HIV screening in the emergency department increases screening but not the diagnosis of HIV. *Applied Clinical Informatics* 2014;5(01):299-312.

Schnall R, Sperling JD, Liu N, et al. The effect of an electronic “hard-stop” alert on HIV testing rates in the emergency department. *Studies in Health Technology and Informatics* 2013;192:432-6.

Sha BE, Kniuksta R, Exner K, Kishen E, Shankaran S, et al. Evolution of an electronic health record based human immunodeficiency virus (HIV) screening program in an urban emergency department for diagnosing acute and chronic HIV infection. *Journal of Emergency Medicine* 2019;57(5):732-9.

White DA, Todorovic T, Petti ML, Ellis KH, Anderson ES. A comparative effectiveness study of two nontargeted HIV and Hepatitis C virus screening algorithms in an urban emergency department. *Annals of Emergency Medicine* 2018;72(4):438-48.

Appendix D

Summary Evidence Table (Effectiveness Review): HIV Prevention: Clinical Decision Support System to Increase HIV Screening

This table outlines information from the studies included in the Community Guide systematic review of Clinical Decision Support Systems to Increase HIV Screening. It details study quality, population and intervention characteristics, and study outcomes considered in this review. Complete references for each study can be found in the Included Studies section of the review summary.

Abbreviations Used in this Document

Outcomes Reported in This Review: Percent tested

- Number tested per month Percent tested positive
- Number tested positive per month
- Percent of patients tested positive and linked to care Percent of eligible patients offered HIV test
- Percent of patients offered HIV test and declined

Formula used:

- Percent tested: $(\text{number tested} / \text{number eligible for testing}) * 100$
- Number tested per month: $\text{number tested} / \text{Number of months in intervention duration}$
- Percent tested positive: $(\text{number tested positive} / \text{number tested}) * 100$
- Number tested positive per month: $\text{number tested positive} / \text{number of months in intervention duration}$
- Percent linked to care: $\text{number linked to care} / \text{number tested positive}$
- Percent test offered: $(\text{number tests offered} / \text{number eligible}) * 100$ s
- Percent test declined: $(\text{number test declined} / \text{number tests offered}) * 100$

Other terms:

- CDC: Centers for Disease Control and Prevention ED: emergency department
- EHR: electronic health record EMR: electronic medical record
- FQHC: federally qualified health center HCV: Hepatitis C virus
- HIV: Human Immunodeficiency Virus MSM: men having sex with men
- NR: not reported
- SES: socioeconomic status
- STI: sexually transmitted infection
- USPSTF: United States Preventive Services Task Force
- VA: United States Department of Veterans Affairs
- VHA: Veterans Health Administration

Notes:

- **Suitability of design** includes three categories: greatest, moderate, or least suitable design. [Read more >>](#)
- **Quality of Execution** – Studies are assessed to have good, fair, or limited quality of execution. [Read more >>](#)
- **Race/ethnicity** of the study population: The Community Guide only summarizes race/ethnicity for studies conducted in the United States.

Study	Intervention Characteristics	Population Characteristics	Results
Author Year: Anaya et al., 2013 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Fair	Location: Northeast, Southwest, U.S. Urbanicity: urban Setting: 2 urban VA hospitals Intervention Duration: Site 1: 6 months Site 2: 4 months Screening Reminder: Nurse-initiated rapid HIV testing, using electronic reminders Preexisting or new EHR: preexisting Guidelines used: CDC 2006 Routine or targeted testing: routine Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: nurses Providers receiving alert: nurses under physician supervision Physician consent for ordering test: NR Education on CDSS/HIV: yes Follow-up Care: Patients informed of test results: - Site 1, nurses forwarded results to providers who delivered results to patients during visit - Site 2, nurses delivered results to patients Services for patients tested positive: automatic follow-up orders for confirmatory testing and referral to infectious disease clinic	Eligibility Criteria: Clinics: 2 study sites in regions with high HIV prevalence Site 1: 2 clinics participated Site 2: all 5 clinics participated Patients: For routine testing: all veterans visiting sites, between 18 and 64 years of age; no HIV test in past year; not previously diagnosed with HIV Sample Size: Clinics: 2 hospital sites with 7 clinics Providers: NR Patients: 36,036 Demographics: Providers: NR Patients: post-intervention only Mean age: 60.5 Gender: 92.3% male Race/Ethnicity: 44.2% white, 45.6% African American SES: NR Education: NR Insurance: 100% insured HIV risk factor: 8.7% HCV infection, 0.5% Hep B infection, 1.6% prior STI, 10.1% illicit drug use, 5.2% homelessness	Outcome Measure: Percent tested How Ascertained: medical records Follow-up Time: intervention ongoing Results: Percent tested: Site 1 Pre: $(101/8,417) \times 100 = 1.2\%$ Post: $(2364/8,265) \times 100 = 28.6\%$ Absolute change: 27.4 percentage points Site 2 Pre: $(10/26,646) \times 100 = 0.04\%$ Post: $(2522/27,771) \times 100 = 9.1\%$ Absolute change: 9.1 percentage points Overall Pre: $(111/35,063) \times 100 = 0.3\%$ Post: $(4886/36,036) \times 100 = 13.6\%$ Absolute change: 13.3 percentage points

Study	Intervention Characteristics	Population Characteristics	Results
	Services for patients tested negative: NR Comparison: baseline only HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR		
Author Year: Avery et al., 2012 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Good	Location: Cleveland, Ohio, U.S. Urbanicity: urban Setting: 7 primary care clinics that are part of a safety-net hospital system Intervention Duration: 18 months Screening Reminder: "HIV Testing Once" implemented in Metro Health System, a publicly funded academic teaching hospital in Cleveland Preexisting or new EHR: preexisting Guidelines used: CDC 2006 Routine or targeted testing: routine Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: primary care providers Providers receiving alert: primary care providers Physician consent for ordering test: NR Education on CDSS/HIV: yes Follow-up Care: Patients informed of test result: NR	Eligibility Criteria: Clinic: 7 selected primary care practice sites Patients: For routine testing: all patients 18-64 years old with at least one office visit from January 2008 to June 2012; excluded patients aged 13-17 and patients living with HIV/AIDS Sample Size: Clinics: 7 Providers: NR Patients: 58,071 Demographics: Providers: NR Patients: post-intervention only Mean age: 41.8 Gender: 37.9% male Race/Ethnicity: 7.9% Hispanic, 29.6% White, 53.1% African American, 6.1% other, 3.3% unknown SES: NR Education: NR Insurance: 65.6% insured	Outcome Measure: Percent tested Percent tested positive Number tested positive per month How Ascertained: medical records Follow-up Time: intervention ongoing Results: Percent tested: Pre: 11.7% Post: 39.7% Absolute change: 28 percentage points Percent tested positive remained at 0.2% Number tested positive per month: Pre: 14/30 months=0.5 Post: 46/18 months=2.6 Absolute change: additional 2.1 tested positive Relative change: 420%

Study	Intervention Characteristics	Population Characteristics	Results
	Services for patients tested positive: NR Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR		
Author Year: Burrell et al., 2018 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Fair	Location: Central Appalachia, U.S. Urbanicity: rural Setting: 3 clinics 2 local urgent care clinics: 1 stand alone, 1 multi-specialty based 1 student health services clinic affiliated with a large, mid-Atlantic university Intervention Duration: 12 months Screening Reminder: EMR-based HIV and HCV screening program that used alerts to prompt providers to order tests for eligible patients Preexisting or new EHR: preexisting Guidelines used: CDC 2006 Routine or targeted testing: both Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: physicians, nurses, and technicians Providers receiving alert: physicians, nurses, and technicians Physician consent for ordering test: NR	Eligibility Criteria: Clinic: 2 urgent care clinics and a student clinic; no detail provided on how they were chosen Patients: EMR identified eligible patients by searching charts of registered patients to see if they met screening guidelines For routine testing: general population, 13-64 years of age, at least once a year as part of routine healthcare For high risk: had a history of risk factors identified in the EMR; specific risk factors not reported Sample Size: Clinics: 3 Providers: NR Patients: 36,389 Demographics: Providers: NR Patients: Mean age: NR Gender: NR	Outcome Measure: Number tested per month Percent tested positive Number tested positive per month Percent of eligible patients offered HIV test Percent of patients offered HIV test and declined How Ascertained: medical records Follow-up Time: intervention ongoing Results: Number tested per month: Pre: 1,639/12=136.6 Post: 1,972/12=164.3 Absolute change: additional 27.7 tests per month Relative change: 20.3% No new HIV positive cases were found Percent tested positive: 0 Number tested positive per month: 0 Post-intervention only: Percent offered: $(11,131/36,389)*100=30.6\%$ Percent declined: $(3,388/11,131)*100=30.4\%$

Study	Intervention Characteristics	Population Characteristics	Results
	Education on CDSS/HIV: yes Follow-up Care: Patients informed of test result: telephone call from a registered nurse Services for patients tested positive: scheduled follow-up appointments, referred patients to "Positive Health Clinic" for follow-up appointments, and offered transportation assistance Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	Race/Ethnicity: NR SES: NR Education: NR Insurance: NR	
Author Year: Chadwick et al., 2016 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Fair	Location: North Yorkshire, United Kingdom Urbanicity: urban Setting: general practices, clinics Intervention Duration: 3 months Screening Reminder: Incorporating alerts for HIV testing within general practices in North Yorkshire Preexisting or new EHR: preexisting Guidelines used: derived from panel discussion with hospital doctors, general practitioners, specialist/ practice nurses and HIV physicians both in London and North Yorkshire	Eligibility Criteria: Clinic: general practices; no details on how the clinics were chosen Patients: For high risk: patients going to the clinics during intervention period who had tests ordered (e.g. Pneumocystis stain, acid- fast bacilli stain, blood film, tests for STI) that triggered HIV testing offer Sample Size: Clinics: NR Providers: NR Patients: NR Demographics:	Outcome Measure: Number tested per month Percent tested positive How Ascertained: medical records Follow-up Time: intervention ongoing Results: Number tested per month: Pre: 502 Post: 532 Absolute change: additional 30 tested per month Relative change: 6% Percent tested positive/# tested positive: no new HIV positive cases were found

Study	Intervention Characteristics	Population Characteristics	Results
	Routine or targeted testing: targeted Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: nurses, physicians Providers receiving alert: nurses, physicians Physician consent for ordering test: NR Education on CDSS/HIV: no Follow-up Care: Patients informed of test results: NR Services for patients tested positive: NR Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	Providers: NR Patients: Mean age: NR Gender: NR Race/Ethnicity: NR SES: NR Education: NR Insurance: NR	
Author Year: Clarke et al., 2013 Study Design: Pre-post with comparison group Suitability of Design: Greatest Quality of Execution: Good	Location: United Kingdom Urbanicity: urban Setting: genitourinary medicine service in a hospital Intervention Duration: 14 months Screening Reminder: Paper record system was replaced with an electronic patient record system that included a prompt to offer HIV screening Preexisting or new EHR: new Guidelines used: British Association for Sexual Health and HIV, Medical	Eligibility Criteria: Clinic: genitourinary medicine service was chosen; authors were affiliated with the hospital Patients: For high risk: all new and rebooked patients receiving service during the evaluation period; all patients attending the genitourinary medicine service considered at high risk for HIV infection Sample Size: Clinics: 2 Providers: NR Patients: 4,220	Outcome Measure: Percent tested Percent of eligible patients offered HIV test Percent of patients offered HIV test and declined How Ascertained: medical records (electronic and paper) Follow-up Time: intervention ongoing Results: Percent tested: Intervention: Pre: $(562/772) \times 100 = 72.8\%$ Post: $(891/1,141) \times 100 = 78.1\%$ Change: 5.3 percentage points Control: Pre: $(221/517) \times 100 = 42.7\%$

Study	Intervention Characteristics	Population Characteristics	Results
	Foundation for AIDS and Sexual Health Standards for the Management of STIs, 2010 Routine or targeted testing: targeted Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: clinicians Providers receiving alert: clinicians Physician consent for ordering test: NR Education on CDSS/HIV: NR Follow-up Care: Patients informed of test results: NR Services for patients tested positive: NR Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	Demographics: Providers: NR Patients: Mean age: NR Gender: NR Race/Ethnicity: NR SES: NR Education: NR Insurance: NR	Post: $(189/439) \times 100 = 43.1\%$ Change: 0.4 percentage points Overall absolute difference: $5.3 - 0.4 = 4.9$ percentage points Percent test declined: Pre: 27.2% Post: 21.9% Absolute change: -5.3 percentage points Post-intervention only: Percent test offered: 100%
Author Year: Connors et al., 2012 Study Design: Simple time series Suitability of Design: Least Quality of Execution: Fair	Location: West Coast and Northeast Region, U.S. Urbanicity: urban Setting: 7 substance use disorder sub-clinics in 3 VHA medical centers Intervention Duration: 6 months Screening Reminder: A routine HIV rapid test clinical reminder and documentation template was installed into the VHA Computerized Patient Record System	Eligibility Criteria: Clinic: VHA substance use disorder clinics with high to medium HIV prevalence Patients: For high risk: veterans who attended the clinics during the intervention period, 18 years or older, had no HIV positive record, and had not been tested for HIV in the past year; population considered at high risk due to substance use disorder Sample Size:	Outcome Measure: Percent tested How Ascertained: VHA electronic database Follow-up Time: immediately after intervention ended (0 months) and 6 months following Results: Percent tested Pre: $(15/1,291) \times 100 = 1.2\%$ Post, 0 months: $(226/1,146) \times 100 = 19.7\%$ Absolute change: 18.5 percentage points Pre: $(15/1,291) \times 100 = 1.2\%$ Post, 6 months: $(128/872) \times 100 = 14.7\%$

Study	Intervention Characteristics	Population Characteristics	Results
	Preexisting or new EHR: preexisting Guidelines used: CDC 2006 Routine or targeted testing: targeted Opt-out or opt-in: NR Provider Characteristics: Providers involved: nurses Providers receiving alert: nurses Physician consent for ordering test: NR Education on CDSS/HIV: yes Follow-up Care: Patients informed of test results: rapid testing delivered results in 20 minutes Services for patients tested positive: CDSS automatically ordered a confirmatory Western blot, CD4 cell count and viral load, and submitted a referral to infectious disease clinics Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	Clinics: 7 Providers: 18 Patients: 1,538 Demographics: Providers: NR Patients: patients from 3 sites reported here Mean age: 52.5 Gender: 96.1% male Race/Ethnicity: 2.2% Hispanic, 46.6% White, 46.7% African American, 0.9% Asian, 3.6% unknown SES: NR Education: NR Insurance: 100% insured	Absolute change: 13.5 percentage points
Author Year: Crumby et al., 2006 Study Design: Pre-post only Suitability of Design: Least	Location: 2 arms Southside Medical Center, Atlanta, Georgia. U.S. Central Care, Houston, Texas, U.S. Urbanicity: urban Setting: FQHC Intervention Duration: 12 months Screening Reminder:	Eligibility Criteria: Clinic: 2 FQHC in U.S. southern region, part of a larger collaborative, HIV on the Frontlines of Communities in the United States; HIV prevalence relatively high in the U.S. south Patients: For routine testing: 13-64 years of age, visited clinics during evaluation period, and did not	Outcome Measure: Number tested per month Number tested positive per month Percent of patients tested positive and linked to care Percent of eligible patients offered HIV test Percent of patients offered HIV test and declined How Ascertained: EMR records Follow-up Time: intervention ongoing

Study	Intervention Characteristics	Population Characteristics	Results
Quality of Execution: Fair	Alert for HIV testing incorporated into routine testing Preexisting or new EHR: preexisting Guidelines used: CDC 2006 Routine or targeted testing: targeted Opt-out or opt-in: NR Provider Characteristics: Providers involved: Southside, medical assistants and medical providers; Central Care, nurses and providers Provider receiving alert: nurses and medical assistants Physician consent for ordering test: NR Education on CDSS/HIV: yes Follow-up Care: Patients informed of test results: Southside, letter sent to all patients with abnormal test results requesting them to come in for results, people not in within a week are referred to local health departments; Central Care, results given during same visit Services for patients tested positive: confirmatory tests offered and patients tested positive linked to care Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: no	have HIV test documented in EMR in past year and those not previously diagnosed Sample Size: Clinics: 2 Providers: NR Patients: Southside Medical Center: 52,437 eligible Central Care: 22,658 eligible Demographics: Providers: NR Patients: data for patients who received HIV test only Southside: Age: 13.6% 13-22, 25.2% 23-30, 24.9% 31-40, 18.6% 41-50, 17.7% 51+ Gender: 29.6% male Race/Ethnicity: 7.5% Hispanic, 11.4% White, 83.2% African American, 2.9% other/multiracial, 2.5% NR SES: NR Education: NR Insurance: NR Central Care: Age: 22.7% 13-22, 24.5% 23-30, 20.5% 31-40, 16.1% 41-50, 16.3% 51+ Gender: 36.8% male Race/Ethnicity: 16.9% Hispanic, 4.8% White, 63% African American, 5.7% other/multiracial, 26.5% NR SES: NR Education: NR Insurance: NR	Results: Number tested per month Southside: Pre: 812/12=67.7 Post: 6,767/12=563.9 Absolute change: additional 496.2 tests per month Relative change: 693.1% Central Care: Pre: 738/12=61.5 Post: 5,297/12=441.4 Absolute change: additional 379.9 tests per month Relative change: 617.7% Number tested positive per month Southside: Pre: 13/12=1.1 Post: 44/12=3.7 Absolute change: additional 2.6 tested positive per month Relative change: 236.4% Central Care: Pre: 6/12=0.5 Post: 42/12=3.5 Absolute change: additional 3.0 tested positive per month Relative change: 600.0% Post-intervention only, 23 months follow-up Percent linked to care Southside: $(74/75)*100=99\%$ Central Care: $(41/52)*100=79\%$ Percent offered Southside: $(41,720/52,437)*100=80\%$ Central Care: $(10904/22,658)*100=48\%$ Percent declined Southside: $(30,628/41,720)*100=73\%$

Study	Intervention Characteristics	Population Characteristics	Results
			Central Care: $(995/10,904) \times 100 = 9\%$
Author Year: Federman et al., 2012 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Fair	Location: Connecticut, U.S. Urbanicity: NR Setting: VA Connecticut Healthcare System Intervention Duration: 7 months Screening Reminder: Preexisting or new EHR: preexisting Guidelines used: CDC 2006 Routine or targeted testing: both Opt-out or opt-in: assume opt-out Provider Characteristics: Providers involved: NR Provider receiving alert: NR Physician consent for ordering test: NR Education on CDSS/HIV: NR Follow-up Care: Patients informed of test results: NR Services for patients tested positive: NR Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	Eligibility Criteria: Clinic: NR Patients: For routine testing: people visiting the VA without a prior diagnosis of HIV For high risk: recently diagnosed STI, hepatitis, high-risk sexual behavior, illicit drug use, and/or alcohol abuse Sample Size: Clinics: NR Providers: NR Patients: NR Demographics: Providers: NR Patients: Mean age: NR Gender: NR Race/Ethnicity: NR SES: NR Education: NR Insurance: NR	Outcome Measure: Number tested per month Percent tested positive Number tested positive per month How Ascertained: medical records Follow-up Time: intervention ongoing Results: Number tested per month: Pre: 149.4 Post: 701.1 Absolute change: additional 551.7 tests per month Relative change: 369.3% Percent tested positive Pre: 0.83% Post: 0.18% Absolute change: -0.7 percentage points Number tested positive per month: Pre: 1.25 Post: 1.29 Absolute change: additional 0.04 tested positive per month Relative change: 3.2%
Author Year: Felsen et al., 2017 Study Design:	Location: New York City, New York, U.S. Urbanicity: urban	Eligibility Criteria: Clinic: CDSS implemented in hospitals that serve mostly underserved population in an area with 2% HIV prevalence; all	Outcome Measure: Percent tested Number tested positive per month How Ascertained: medical records

Study	Intervention Characteristics	Population Characteristics	Results
Pre-post only Suitability of Design: Least Quality of Execution: Good	Setting: 3 adult hospitals included in Montefiore Medical Center (MMC), largest provider of medical care in Bronx, NY Intervention Duration: 199 days or 6.6 months Screening Reminder: Preexisting or new EHR: preexisting Guidelines used: NR Routine or targeted testing: both Opt-out or opt-in: opt-in Provider Characteristics: Providers involved: providers and HIV counselors Provider receiving the alert: providers Physician consent for ordering test: yes Education on CDSS/HIV: NR Follow-up Care: Patients informed of test results: NR Services for patients tested positive: NR Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	sites share an EMR first implemented in 1997 Patient: patients 21 to 64 who were admitted into any of the MMC adult hospitals during study period General group: no HIV test results in the EMR High-risk group: had a high-risk diagnosis subsequent to last documented negative HIV test High-risk diagnoses: STIs, Hep B or C, substance use, HIV indicator conditions, AIDS-related conditions Sample Size: Clinics: 3 Providers: NR Patients: 18,943 Demographics: Providers: NR Patients: post-intervention only Age: median of 51 Gender: 44.6% male Race/Ethnicity: 43.5% Hispanic, 35.6% Black, 10.4% White, 2% Asian, 5.2% other, 3.3% unknown or missing SES: NR Education: NR Insurance: 69.6% public, 26.1% private, 1.5% uninsured, 2.7% unknown or missing	Follow-up Time: intervention ongoing Results: Percent tested Pre: $(3,486/36,610) \times 100 = 9.5\%$ Post: $(4,122/18,943) \times 100 = 21.8\%$ Absolute change: 12.3 percentage points Number tested positive per month Pre: $(48/12.6) \times 100 = 3.8$ Post: $(27/6.6) \times 100 = 4.1$ Absolute change: additional 0.3 tested positive per month Relative change: 7.9%
Author, Year:	Location: Nevada and California, U.S.	Eligibility Criteria: Clinic: NR	Outcome Measure: Percent tested

Study	Intervention Characteristics	Population Characteristics	Results
Goetz et al., 2008 Study Design: Pre-post with comparison group Suitability of Design: Greatest Quality of Execution: Good Linked Study: Goetz 2009	Urbanicity: NR Setting: 5 VHA facilities; 2 intervention healthcare systems had 18 facilities, and the 3 controls had 19 facilities Intervention Duration: 12 months Screening Reminder: Preexisting EHR or new: pre-existing Guidelines used: USPSTF, CDC, VHA Routine or targeted testing: targeted Opt-out or opt-in: opt-in Provider Characteristics: Providers involved: academic and non-academic staff physicians, postgraduate medical trainees, and mid-level providers Provider receiving alert: academic and non-academic staff physicians, postgraduate medical trainees, and mid-level providers Physician consent for ordering test: NR Education on CDSS/HIV: yes Follow-up Care: Patients informed of test results: telephone notification if they were negative test results. Not reported how patients with positive test results were informed Services for patients tested positive: NR Services for patients tested negative: yes; brief post-test counseling Comparison: HIV testing offered: yes Reminders used: no	Patients: For high risk: patients receiving healthcare between August 2004 and September 2006 at the 5 selected VHA regional healthcare systems; at risk for HIV but not previously tested for HIV, OR evidence of prior Hep B or C infection, illicit drug use, STDs (gonorrhea, chlamydia, syphilis, genital herpes), homelessness, and certain behavioral risk factors Sample Size: Clinics: 2 intervention healthcare systems with 18 facilities; 3 control healthcare systems with 19 facilities Providers: 4,321 (pre-intervention only) Patients: 29,885 post-intervention Demographics: Providers: NR Patients: Age: 42.9% in 51-64 age group Gender: NR Race/Ethnicity: 17.8% White, 8.8% African American, 3.6% Hispanic, 8% Asian/Native American, 61.8% missing data. SES: 69.8% low income Education: NR Insurance: NR	Percent tested positive Number tested positive per month How Ascertained: medical records Follow-up Time: intervention ongoing Results: Percent tested Intervention: Pre: 5.2% Post: 11.8% Absolute change: 6.7 percentage points Control: Pre: 3.8% Post: 3.8% Absolute change: 0 percentage points Overall absolute difference: 6.7-0=6.7 percentage points Percent tested positive Pre: 0.5% Post: 0.5% Absolute change: 0 percentage points Number tested positive per month Pre: 15/12=1.3 Post: 30/12=2.5 Absolute change: additional 1.2 tested positive per month Relative change: 92.3%

Study	Intervention Characteristics	Population Characteristics	Results
	Other interventions to increase screening: NR		
Author, Year: Goetz et al., 2011 Study Design: Pre-post with comparison group Suitability of Design: Greatest Quality of Execution: Fair	Location: Southern Nevada and California, U.S. Urbanicity: NR Setting: major VHA healthcare system sites Intervention Duration: 12 months Screening Reminder: Preexisting EHR or new: pre-existing Guidelines used: NR Routine or targeted testing: targeted Opt-out or opt-in: opt-in Provider Characteristics: Providers involved: academic and non-academic staff physicians, postgraduate medical trainees, and midlevel providers Provider receiving the alert: academic and non-academic staff physicians, postgraduate medical trainees, and midlevel providers Physician consent for ordering test: NR Education on CDSS/HIV: yes Follow-up Care: Patients informed of test results: nurse-led telephone counseling after negative test results were encouraged Services for patients tested positive: NR Services for patients tested negative: nurse-led counseling encouraged	Eligibility Criteria: Clinic: two major VHA healthcare system sites chosen as intervention site Patients: For high risk: veterans with no record of previous HIV testing; at risk status determined by presence of prior hep B virus infection or positive HBV core antibody test or positive surface antigen, HCV infection, illicit drug use, a STD, homelessness, and behavioral risk factors (excessive alcohol use, lack of housing, unexplained liver disease and exposure to blood products, lab tests, or data captured in specified "Hep C risk factor" fields in the VHA electronic medical record) Sample Size: Clinics: 3 (2 intervention sites and 1 control site) Providers: 1,070 (intervention sites only) Patients: 25,654 (intervention sites only) Demographics: Providers: NR Patients: only intervention sites were reported Mean age: 60 years Gender: NR	Outcome Measure: Percent tested How Ascertained: medical records Follow-up Time: intervention ongoing Results: Percent tested Intervention: Pre: $(986/20,254) \times 100 = 4.9\%$ Post: $(3,183/20,254) \times 100 = 15.7\%$ Absolute change: 10.8 percentage points Control: Change: 0 percentage points Overall absolute difference: $10.8 - 0 = 10.8$ percentage points

Study	Intervention Characteristics	Population Characteristics	Results
	Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	Race/Ethnicity: 22% White, 3.7% Black, 8% other, 63% unknown or missing data, 4% Hispanic SES: 38% low-income Education: NR Insurance: NR Baseline screening of intervention group: 4.9%	
Author, Year: Goetz et al., 2013 Study Design: Pre-post with comparison group Suitability of Design: Greatest Quality of Execution: Fair	Location: South Central and Northeastern region, U.S. Urbanicity: NR Setting: VHA; facilities in Veterans Integrated Service Networks (VISN), consisting of a main clinic often co-located with a hospital and several satellite outpatient clinics Intervention Duration: 6 months Screening Reminder: Intervention separated into 2 arms: Central arm: receiving ongoing support from Project Management Team Local arm: no continued support Preexisting or new EHR: preexisting Guidelines used: CDC and VHA Routine or targeted testing: both Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: interns, residents, attending physicians, physicians Provider receiving the alert: interns, residents, attending physicians, physicians Physician consent for ordering test: NR	Eligibility Criteria: Clinic: facilities in South Central and Northeastern VHA networks who consented to join as intervention facilities; facilities with similar baseline HIV testing rates and complexity in 2 other VISNs were selected as controls Patients: data from June 2009 to Sept 2011 assessed For high risk: Phase I: veterans visiting clinics during intervention period and at higher risk for HIV infection For routine testing: Phase II: all veterans visiting clinics during intervention period without previous test recorded Sample Size: Clinics: 21 Providers: 529 (control), 554 (local), 381 (central) Patients: post-intervention only HIV testing among people with higher risk for HIV infection: 14,698(control), 12,554(local), and 6,659(central).	Outcome Measure: Percent tested How Ascertained: medical records Follow-up Time: intervention ongoing Results: Percent tested High risk population Intervention, Central arm: Pre: 5.1% Post: 15.2% Absolute change: 10.1 percentage points Intervention, Local arm: Pre: 6.0% Post: 11.6% Absolute change: 5.6 percentage points Control: Pre: 4.4% Post: 4.8% Change: 0.4 percentage points Overall absolute difference between Central arm and control arm: 10.1-0.4=9.7 percentage points Overall absolute difference between Local arm and control arm: 5.6-0.4=5.2 percentage points General population Intervention, Central arm: Pre: 3.6% Post: 12.7% Absolute change: 9.1 percentage points

Study	Intervention Characteristics	Population Characteristics	Results
	Education on CDSS/HIV: yes Follow-up Care: Patients informed of test results: patients were informed through telephone Services for patients tested positive: post-test counseling strongly encouraged Services for patients tested negative: telephone post-test counseling after HIV negative results Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	HIV screening for general population: 67,118(control) and 29,617(central) Demographics: Providers: 46% male Patients: post-intervention only Mean age: 64.2 years Gender: 96.6% male Race/Ethnicity: 25.8% Black SES: NR Education: NR Insurance: NR Baseline screening of intervention group: ranges from 3.6% to 6%	Control: Pre: 3.9% Post: 4.4% Absolute change: 0.5 percentage points Overall absolute difference: 9.1-0.5=8.6 percentage points
Author, Year: Golden et al., 2017 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Good	Location: Seattle, Washington, U.S. Urbanicity: urban Setting: 3 primary care clinics (Harborview Medical Center) Intervention Duration: 30 months Screening Reminder: Preexisting or new EHR: preexisting Guidelines used: CDC and USPSTF Routine or targeted testing: routine Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: nurses; medical providers; medical assistants pre-enter test orders	Eligibility Criteria: Clinic: no details provided; 3 clinics affiliated with Harborview Medical Center, a public hospital owned by King County and managed by the University of Washington Patient: For routine testing: persons 18-65 who visited clinics and no record of HIV testing Sample Size: Clinics: 3 Providers: NR Patients: 16,784 Demographics: Providers: NR	Outcome Measure: Percent tested Number tested positive per month How Ascertained: medical records Follow-up Time: intervention ongoing Results: Percent tested Pre: (1,094/7,331)*100=14.9% Post: (2,193/7,112)*100=30.8% Absolute change: 15.9 percentage points Number tested positive per month Pre: 5/30=0.17 Post: 5/30=0.17 Absolute change: 0 Relative change: 0%

Study	Intervention Characteristics	Population Characteristics	Results
	Provider receiving alert: medical assistants Physician consent for ordering test: yes Education on CDSS/HIV: NR Follow-up Care: Patients informed of test results: NR Services for patients tested positive: NR Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	Patients: Age: 13% 18-29, 18% 30-39, 5% 40-49, 32% 50-59, 14% 60-70 Gender: 62% male Race/Ethnicity: 13% Hispanic, 41% White, 32% African American, 7% Asian American, 2% American Indian, 4% other, 1% Pacific Islander SES: NR Education: NR Insurance: NR Baseline screening of intervention group: 14.9% tested among eligible, previously untested persons	
Author, Year: Hechter et al., 2018 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Good	Location: Southern California, U.S. Urbanicity: NR Setting: integrated healthcare system (Kaiser Permanente Southern California [KPSC]) Intervention Duration: 30 months Screening Reminder: Preexisting or new EHR: preexisting Guidelines used: CDC Routine or targeted testing: targeted Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: clinicians Provider receiving the alert: NR Physician consent for ordering test: NR Education on CDSS/HIV: NR	Eligibility Criteria: Clinic: NR Patient: all KPSC members, greater than or equal to 14 years old, received at least one other STI test (ordering tests for syphilis, chlamydia, gonorrhea, hep B surface antigen, or hep C antibody), unknown HIV status or no HIV test result in past 30 days Sample Size: Clinic: all healthcare facilities within KPSC network Providers: NR Patients: 885,439 post-intervention Demographics: Providers: NR	Outcome Measure: Percent tested Percent tested positive Number tested positive per month Percent tested positive with CD4 cells/mm3 <200 Percent tested positive with viral load <200 copies/mL How Ascertained: medical records Follow-up Time: intervention ongoing Results: Percent tested Pre: $(854,925/2,326,701) \times 100 = 36.7\%$ Post: $(600,719/1,362,479) \times 100 = 44.1\%$ Absolute change: 7.4 percentage points Percent tested positive Pre: $(141/854,925) \times 100 = 0.016\%$ Post: $(245/600,719) \times 100 = 0.04\%$ Absolute change: 0.02 percentage points

Study	Intervention Characteristics	Population Characteristics	Results
	Follow-up Care: Patients informed of test results: NR Services for patients tested positive: NR Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	Patients: post-intervention only Age: 37.8% of participants are in the 25-39 age range Gender: 31.1% male Race/Ethnicity: 43.7% Hispanic, 29.6% White, 11.2% African American, 10.2% Asian, 3% unknown, 2.2 multiple/other SES: NR Education: NR Insurance: 6.2% Medicaid insured Baseline screening of intervention group: 36.7%	Number tested positive per month Pre: 141/54=2.6 Post: 245/30=8.2 Absolute change: additional 5.6 tested positive per month Relative change: 215% Percent tested positive with CD4 cells/mm³ <200 Pre: (37/135)*100=27.4% Post: (23/236)*100=9.7% Absolute change: -17.7 percentage points Percent tested positive with viral load <200 copies/mL Pre: (6/134)*100=4.5% Post: (125/239)*100=52.3% Absolute change: 47.8 percentage points
Author, Year: Kershaw et al., 2018 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Good	Location: Boston, Massachusetts, U.S. Urbanicity: urban Setting: Beth Israel Deaconess Medical Center (large academic medical center) Intervention Duration: 24 months Screening Reminder: Preexisting or new EHR: preexisting Guidelines used: NR Routine or targeted testing: routine Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: attending physicians and resident physicians Provider receiving the alert: NR Physician consent for ordering test: NR	Eligibility Criteria: Clinic: NR Patients: For routine testing: between the ages of 18-65 years with at least one visit to the clinic from January 2012 through October 2015, with no previous HIV screening; excluded if no demographic information available Sample Size: Clinic: 1 Providers: NR Patients: 20,640 Demographics: Providers: NR Patients: post-intervention only	Outcome Measure: Percent tested Percent tested positive Number tested positive per month How Ascertained: medical records Follow-up Time: intervention ongoing Results: Percent tested Pre: 15.3% Post: 30.7% Absolute change: 15.4 percentage points Percent tested positive Pre: 0.3% Post: 0.7% Absolute change: 0.4 percentage points Number tested positive per month Pre: 12.7/22=0.6

Study	Intervention Characteristics	Population Characteristics	Results
	Education on CDSS/HIV: NR Follow-up Care: Patients informed of test results: NR Services for patients tested positive: NR Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	Age: 8% <25, 22% 26-35, 19% 36-45, 51% 46-65 Gender: 41.7% male Race/Ethnicity: 62.1% White, 16.8% African American, 7.4% Asian, 12.4% Other SES: median income \$67,338 Education: NR Insurance: NR Baseline screening of intervention group: 15.3% among previously untested and 22.5% among new patients	Post: $44.4/24=1.9$ Absolute change: additional 1.3 tested positive per month Relative change: 216.7%
Author, Year: Lin et al., 2017 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Fair	Location: Chicago, Illinois, U.S. Urbanicity: urban Setting: emergency department of University of Illinois Hospital and Health Sciences System Intervention Duration: 8 months Screening Reminder: Preexisting or new EHR: preexisting Guidelines used: CDC Routine or targeted testing: both Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: nurses Provider receiving alert: nurses Physician consent for ordering test: no Education on CDSS/HIV: NR Follow-up Care: Patients informed of test results: patients informed by outreach workers	Eligibility Criteria: Clinic: emergency department of a hospital Patients: all patients who visit ED were checked for eligibility for HIV testing For routine testing: ages 13-64, no HIV testing recorded in EMR For high risk: recorded in EMR one of the following risks: living in zip codes with >1% HIV prevalence; MSM; intravenous drug use; homelessness; unsafe sex; no HIV test within past 365 days Sample Size: Clinic: 1 Providers: NR Patients: 15,928 (post only) Demographics: Providers: NR	Outcome Measure: Number tested per month Percent of patients tested positive and linked to care Percent of patients offered HIV test and declined How Ascertained: medical records Follow-up Time: intervention ongoing Results: Number tested per month Pre: 7 Post: 550 Absolute change: additional 543 tested per month Relative change: 7,757% Post-intervention only: Percent linked to care: $(8/12)*100=67\%$ Percent declined: $(2,353/9,177)*100=25.6\%$

Study	Intervention Characteristics	Population Characteristics	Results
	Services for patients tested positive: pharmacists receive all HIV positive results and notify a designated outreach worker who delivers test results in person, facilitates linkage to care, and records linkage in the EMR Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	Patients: post-intervention only Age: 12% 13-19, 23% 20-29, 20% 30-39, 19% 40-49, 26% 50-64 Gender: 43% male Race/Ethnicity: 24% Hispanic, 11% White, 54% African American, 3% Asian, <1% American Indian, 7% missing SES: NR Education: NR Insurance: NR Baseline screening of intervention group: 7 HIV tests per month	
Author, Year: Marcelin et al., 2016 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Good	Location: Rochester, Minnesota, U.S. Urbanicity: urban Setting: Primary Care Internal Medicine, Mayo Clinic Intervention Duration: 8 months Screening Reminder: Preexisting or new EHR: preexisting Guidelines used: CDC Routine or targeted testing: routine Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: internists, nurse practitioners, physician assistants, internal medicine residents Provider receiving alert: internists, nurse practitioners, physician assistants, internal medicine residents Physician consent for ordering test: NR Education on CDSS/HIV: yes	Eligibility Criteria: Clinic: NR Patients: For routine testing: patients visiting the clinic during the study period who are between the ages of 18-65 and had never been screened for or diagnosed with HIV Sample Size: Clinic: 1 Providers: 43 internists, 9 nurse practitioners/physician assistants, 96 internal medicine residents Patients: 6,526 post-intervention Demographics: Providers: NR Patients: post-intervention only Mean age: 48.4 Gender: 45.8% male Race/Ethnicity: 84.8% White	Outcome Measure: Percent tested How Ascertained: medical records Follow-up Time: intervention ongoing Results: Percent tested Pre: $(109/6,070) \times 100 = 1.8\%$ Post: $(218/6,526) \times 100 = 3.3\%$ Absolute change: 1.5 percentage points

Study	Intervention Characteristics	Population Characteristics	Results
	Follow-up Care: Patients informed of test results: NR Services for patients tested positive: NR Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	SES: NR Education: NR Insurance: NR Baseline screening of intervention group: 1.8%	
Author, Year: Rodriguez et al., 2016 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Fair	Location: Bronx, Queen, New York, U.S. Urbanicity: urban Setting: Urban Health Plan (UHP), federally qualified health centers Intervention Duration: 24 months Screening Reminder: Preexisting or new EHR: preexisting Guidelines used: NR Routine or targeted testing: routine Opt-out or opt-in: NR Provider Characteristics: Providers involved: physicians, physician assistants, nurse practitioners, gynecologists, obstetric providers, and medical assistants Provider receiving alert: medical assistants offer the test to patients Physician consent for ordering test: NR Education on CDSS/HIV: yes Follow-up Care: Patients informed of test results: NR	Eligibility Criteria: Clinic: clinics associated with UHP, serving low-income and underserved populations in Bronx and Queens in NYC; 5 clinics in the beginning, expanded to 17 clinics in 2013 Patients: For routine testing: individuals at UHP clinics, 13-64 years of age, no HIV test within the past 12 months. For pre-intervention sample, patients aged 13-64 who requested HIV testing and/or those known to be at high risk (intravenous drug use, multiple sex partners, MSM, not using condoms, existing STIs) Sample Size: Clinics: 5 clinics in the beginning that expanded to 17 in 2013 Providers: 25 physicians, 16 physician assistants, 8 nurse practitioners, and 8 gynecologists and obstetric providers, and their medical assistants	Outcome Measure: Percent tested Percent tested positive Number tested positive per month Percent of patients tested positive and linked to care Post only: Percent of eligible patients offered HIV test Percent of patients offered HIV test and declined How Ascertained: medical records Follow-up Time: intervention ongoing Results: Percent tested Pre: $(2,079/26,853)*100=7.7\%$ 1st year: $(11,219/30,457)*100=36.8\%$ Post (2 years): $(16,577/31,675)*100=52.3\%$ Absolute change: After 12 months: 29.1 percentage points After 24 months: 44.6 percentage points Percent tested positive Pre: $(19/2,079)*100=0.9\%$ 1st year: $(51/11,219)*100=0.5\%$ Post (2 years): $(52/16,577)*100=0.3\%$

Study	Intervention Characteristics	Population Characteristics	Results
	Services for patients tested positive: linkage to care Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: counselor-based HIV screening model	Patients: 31,675 Demographics: Providers: NR Patients: Mean age: 21% 13-22, 21% 23-30, 21% 31-40, 18% 41-50, 14% 1-60, 4% 61-64 Gender: 36% male Race/Ethnicity: 85% Hispanic, 1% White, 11% African American, 50% bi- or multi-racial, 36% unknown SES: NR Education: NR Insurance: 56% Medicaid, 5% Medicare, 30% self-pay, 9% other Baseline screening of intervention group: 7.7%	Absolute change: After 12 months: -0.4 percentage points After 24 months: -0.6 percentage points Number tested positive per month Pre: $19/12=1.6$ Post (2 years): $52/24=2.2$ Absolute change: additional 0.6 tested positive per month Relative change: 38% Percent linked to care Pre: $(19/19)*100=100\%$ 1st year: $(43/51)*100=84.3\%$ Post (2 years): $(41/52)*100=78.8\%$ Absolute change: After 12 months: -15.7 percentage points After 24 months: -21.2 percentage points Post-intervention only: Percent offered: $(79,649/100,369)*100=79.4\%$ Percent declined: $(30,003/79,649)*100=37.7\%$
Author, Year: Rudd et al., 2013 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Fair	Location: Pacific Northwest, U.S. Urbanicity: rural Setting: U.S. Indian Health Service clinic Intervention Duration: 12 months Screening Reminder: Preexisting EHR or new: pre-existing Guidelines used: CDC 2006, USPSTF, Agency for Healthcare Research and Quality Routine or targeted testing: routine Opt-out or opt-in: opt-out	Eligibility Criteria: Clinic: NR Patients: For routine testing: patients visiting clinic, 13-64 age range Sample Size: Clinic: 1 Providers: NR Patients: NR Demographics: Providers: NR Patients: Mean age: NR Gender: NR	Outcome Measure: Number tested per month How Ascertained: medical records Follow-up Time: intervention ongoing Results: Number tested per month Pre: $250/12=20.8$ Post: $1340/12=111.7$ Absolute change: additional 90.9 tested per month Relative change: 437%

Study	Intervention Characteristics	Population Characteristics	Results
	Provider Characteristics: Providers involved: nurses Provider receiving alert: nurses Physician consent for ordering test: no Education on CDSS/HIV: NR Follow-up Care: Patients informed of test results: NR Services for patients tested positive: NR Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	Race/Ethnicity: NR SES: NR Education: NR Insurance: NR Baseline screening of intervention group: 20.8 tests per month	
Author, Year: Schnall et al., 2013 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Good	Location: New York, U.S. Urbanicity: urban Setting: adult emergency department at a large tertiary care center; this ED is a large, level-one trauma center Intervention Duration: 2 months Screening Reminder: Preexisting or new EHR: preexisting Guidelines used: New York State legislation and CDC Routine or targeted testing: routine Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: clinicians and providers Provider receiving the alert: NR Physician consent for ordering test: NR	Eligibility Criteria: Clinic: NR Patients: For routine testing: all persons under the age of 65 years seeking ED services; excluded patients who left the ED before being seen by a prescribing provider Sample Size: Clinic: 1 Providers: NR Patients: 8,712 post-intervention Demographics: Providers: NR Patients: Mean age: NR Gender: NR Race/Ethnicity: NR	Outcome Measure: Percent tested Percent of eligible patients offered HIV test Percent of patients offered HIV test and declined How Ascertained: medical records Follow-up Time: intervention ongoing Results: Percent tested Pre: $(136/7,048) \times 100 = 1.9\%$ Post: $(583/6,706) \times 100 = 8.7\%$ Absolute change: 6.8 percentage points Percent offered Pre: $(452/7048) \times 100 = 6.4\%$ Post: $(6305/6706) \times 100 = 94.0\%$ Absolute change: 5.3 percentage points Percent declined Pre: $(298/452) \times 100 = 65.9\%$

Study	Intervention Characteristics	Population Characteristics	Results
	Education on CDSS/HIV: NR Follow-up Care: Patients informed of test results: NR Services for patients tested positive: NR Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	SES: NR Education: NR Insurance: NR Baseline screening of intervention group: 1.9%	Post: $(5348/6305) \times 100 = 84.8\%$ Absolute change: 18.9 percentage points
Author, Year: Schnall et al., 2014 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Fair	Location: New York, U.S. Urbanicity: urban Setting: 3 adult EDs that were all a part of the same hospital network and are non-profit institutions Intervention Duration: 6 months Screening Reminder: Preexisting or new EHR: preexisting Guidelines used: New York State legislation and CDC Routine or targeted testing: routine Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: physicians, residents, physician assistants, nurse practitioners Provider receiving alert: physicians, residents, physician assistants, nurse practitioners Physician consent for ordering test: NR Education on CDSS/HIV: NR	Eligibility Criteria: Clinic: NR Patients: For routine testing: all treat-and-release patients from the ED aged 18-64 Sample Size: Clinics: 3 Providers: NR Patients: 49,786 post-intervention Demographics: Providers: NR Patients: Mean age: NR Gender: 43.2% male Race/Ethnicity: NR SES: NR Education: NR Insurance: NR Baseline screening of intervention group: 5.4%	Outcome Measure: Percent tested Percent tested positive Percent of eligible patients offered HIV test How Ascertained: medical records Follow-up Time: intervention ongoing Results: Percent tested Pre: $(1,631/30,028) \times 100 = 5.4\%$ Post: $(4,353/49,876) \times 100 = 8.7\%$ Absolute change: 3.3 percentage points Percent tested positive Pre: $(9/1,631) \times 100 = 0.6\%$ Post: $(21/4,353) \times 100 = 0.5\%$ Absolute change: -0.1 percentage points Post-intervention only Percent offered: 99.8%

Study	Intervention Characteristics	Population Characteristics	Results
	Follow-up Care: Patients informed of test results: NR Services for patients tested positive: NR Services for patients tested negative: no Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR		
Author, Year: Sha et al., 2019 Study Design: Pre-post only Suitability of Design: Least Quality of Execution: Fair	Location: Chicago, Illinois, U.S. Urbanicity: urban Setting: large urban hospital/ED (Rush University Medical Center) Intervention Duration: 45 months Screening Reminder: Active alert: May 2015 to October 2016, hard-stop alert; action must be taken to resolve the alert Passive alert: October 2016 to June 2017, no action required by provider Test algorithm: June 2017 to January 2019, persons with a complete blood count ordered would have an HIV test auto-ordered if 13-64 years of age, no HIV test in past 12 months Preexisting or new EHR: preexisting Guidelines used: 2006 CDC guidelines and 2013 USPSTF recommendation Routine or targeted testing: routine Opt-out or opt-in: opt-out	Eligibility Criteria: Clinic: NR Patients: For routine testing: any patient seen in ED between 13-64 years of age who did not have an HIV test in the EHR within the past 12 months when an order was placed, and not diagnosed with HIV Sample Size: Clinic: 1 Providers: NR Patients: 137,749 Demographics: Providers: NR Patients: Mean age: NR Gender: NR Race/Ethnicity: NR SES: NR Education: NR Insurance: NR	Outcome Measure: Number tested per month How Ascertained: medical records Follow-up Time: intervention ongoing Results: Number tested per month Active alert: Pre: 93 Post: 543 Absolute change: additional 450 tested per month Relative change: 484% Passive alert: Pre: 93 Post: 222 Absolute change: additional 129 tested per month Relative change: 139% Test algorithm: Pre: 93 Post: 654

Study	Intervention Characteristics	Population Characteristics	Results
	Provider Characteristics: Providers involved: nurses and providers Provider receiving alert: nurses and providers Physician consent for ordering test: NR Education on CDSS/HIV: no Follow-up Care: Patients informed of test results: personnel in Infectious Diseases were notified and informed the patient in person or via phone Services for patients tested positive: all positive patients reported to Chicago Department of Public Health (CDPH); all who did not respond after 3 calls were reported to CDPH; standard and certified letters also sent Services for patients tested negative: all patients notified and given an "After Services Summary" with information about testing Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: NR	Baseline screening of intervention group: 2.5%	Absolute change: additional 561 tested per months Relative change: 603%
Author, Year: White et al., 2018 Study Design: Pre-post only Suitability of Design:	Location: Oakland, California, U.S. Urbanicity: urban Setting: Highland Hospital ED Intervention Duration: 5 months Screening Reminder:	Eligibility Criteria: Clinic: NR Patients: For routine testing: all patients 18 to 75 years of age who presented to ED, completed triage and physician evaluation, and had a lab test ordered; EHR configured to automatically order	Outcome Measure: Percent tested Percent tested positive Number tested positive per month How Ascertained: medical records Follow-up Time: intervention ongoing

Study	Intervention Characteristics	Population Characteristics	Results
Least Quality of Execution: Fair	Preexisting or new EHR: preexisting Guidelines used: CDC Routine or targeted testing: routine Opt-out or opt-in: opt-out Provider Characteristics: Providers involved: nurses Provider receiving alert: nurses Physician consent for ordering test: no Education on CDSS/HIV: NR Follow-up Care: Patients informed of test results: NR Services for patients tested positive: EHR reflexively ordered and processed HIV and Hep C RNA tests in case of a reactive HIV antigen-antibody test Services for patients tested negative: NR Comparison: HIV testing offered: yes Reminders used: no Other interventions to increase screening: nurse-ordered nontargeted HIV test	an HIV or Hep C test for age- eligible patients who had any test ordered that required lab processing of whole blood, or a urine test or urethral swab for chlamydia or gonorrhea testing Sample Size: Clinic: 1 Providers: NR Patients: 19,887 post- intervention Demographics: Providers: NR Patients: Mean age: NR Gender: NR Race/Ethnicity: NR SES: NR Education: NR Insurance: NR Baseline screening of intervention group: 19.6%	Results: Percent tested Pre: $(4,121/20,975)*100=19.6\%$ Post: $(6,736/19,887)*100=33.9\%$ Absolute change: 14.3 percentage points Percent tested positive Pre: $(34/4,121)*100=0.8\%$ Post: $(59/6,736)*100=0.9\%$ Absolute change: 0.1 percentage points Number tested positive per month Pre: $34/5=6.8$ Post: $59/5=11.8$ Absolute change: additional 5 tested positive per month Relative change: 73.5%