Methods Research Report

Health System Panel To Inform and Encourage Use of Evidence Reports:

Findings From the Implementation and Evaluation of Two Evidence-Based Tools

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None of the investigators have any affiliations or financial involvement that conflicts with the material presented in this report.

The information in this report is intended to help healthcare decision makers—patients and clinicians, health system leaders, and policymakers, among others—make well-informed decisions and thereby improve the quality of healthcare services. This report is not intended to be a substitute for the application of clinical judgment. Anyone who makes decisions concerning the provision of clinical care should consider this report in the same way as any medical reference and in conjunction with all other pertinent information, i.e., in the context of available resources and circumstances presented by individual patients.

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Preface

The Agency for Healthcare Research and Quality (AHRQ), through its Evidence-based Practice Centers (EPCs), sponsors the development of evidence reports and technology assessments to assist public and private sector organizations in their efforts to improve the quality of healthcare in the United States. The reports and assessments provide organizations with comprehensive, science-based information on common, costly medical conditions and new healthcare technologies and strategies. The EPCs systematically review the relevant scientific literature on topics assigned to them by AHRQ and conduct additional analyses when appropriate prior to developing their reports and assessments.

AHRQ's EPC Program also supports other projects to help improve the use of its evidence reports by key stakeholders. These projects are intended to contribute to the research base and be used to improve the program's systematic reviews. They are not intended to be used as guidance for the EPC Program, although they may be considered by EPCs along with other scientific research when determining EPC Program guidance.

If you have comments on this methods research project they may be sent by mail to the Task Order Officer named below at: Agency for Healthcare Research and Quality, 5600 Fishers Lane, Rockville, MD 20857, or by email to epc@ahrq.hhs.gov.

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Acknowledgments

This report was made possible by many administrative and clinical health professionals at learning health systems (LHSs) who took the time to share their experiences with us. Eleven LHS panel members collaborated with the American Institutes for Research (AIR) and the Agency for Healthcare Research and Quality (AHRQ) to guide the development of tools to help health systems use findings from Evidence-based Practice Center (EPC) Program reports. The list of panel members is as follows:

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In addition, multiple health system leaders and clinicians participated in cognitive and usability testing of the tools and/or participated in interviews for the evaluation of the tools. These individuals are not named as they were promised confidentiality.

Amanda Borsky oversaw this work for AHRQ, and she and other colleagues at AHRQ provided helpful comments on an earlier draft of this report, as did Emily Elstad of AIR. Stephanie Neuben of AIR edited the report, and Sharon Wallace of AIR produced it.

Health System Panel To Inform and Encourage Use of Evidence Reports:

Findings From the Implementation and Evaluation of Two Evidence-Based Tools

Structured Abstract

Objectives. The Agency for Healthcare Research and Quality (AHRQ) Evidence-based Practice Center (EPC) Program wants learning health systems (LHSs) to use the evidence from its reports to improve patient care. In 2018, to improve uptake of EPC Program findings, the EPC Program developed a project to enhance LHSs' adoption of evidence to improve the quality and effectiveness of patient care. AHRQ contracted with the American Institutes for Research (AIR) and its partners to convene a panel of senior leaders from 11 LHSs to guide the development of tools to help health systems use findings from EPC evidence reports. The panel's contributions led to developing, implementing, and evaluating two electronic tools to make the EPC report findings more accessible. AIR evaluated the LHSs' use of the tools to understand (1) LHSs' experiences with and impressions of the tools, (2) how well the tools helped them access evidence, and (3) how well the tools addressed barriers to LHS use of the EPC reports and barriers to applying the evidence from the reports.

Data sources. (1) Implementation meetings with 6 LHSs; (2) interviews with 27 health system leaders and clinical staff who used the tools; and (3) website utilization metrics.

Results. The tools were efficient and useful sources of summarized evidence to (1) inform systems change, (2) educate trainees and clinicians, (3) inform research, and (4) support shared decision making with patients and families. Clinical leaders appreciated the thoroughness and quality of the evidence reviews and view AHRQ as a trusted source of information. Participants found both tools to be valuable and complementary. Participants suggested optimizing the content for mobile device use to facilitate health system uptake of the tools. In addition, they felt it would be helpful to have training resources about tool navigation and interpreting the statistical content in the tools.

Conclusions. The evaluation shows that LHSs find the tools to be useful resources for making the EPC Program reports more accessible to health system leaders. The tools have the potential to meet some, but not all, LHS evidence needs, while exposing health system leaders to AHRQ as a resource to help meet their information needs. The ability of the EPC reports to support LHSs in improving the quality of care is limited by the strength and robustness of the evidence, as well as the relevance of the report topics to patient care challenges faced by LHSs.

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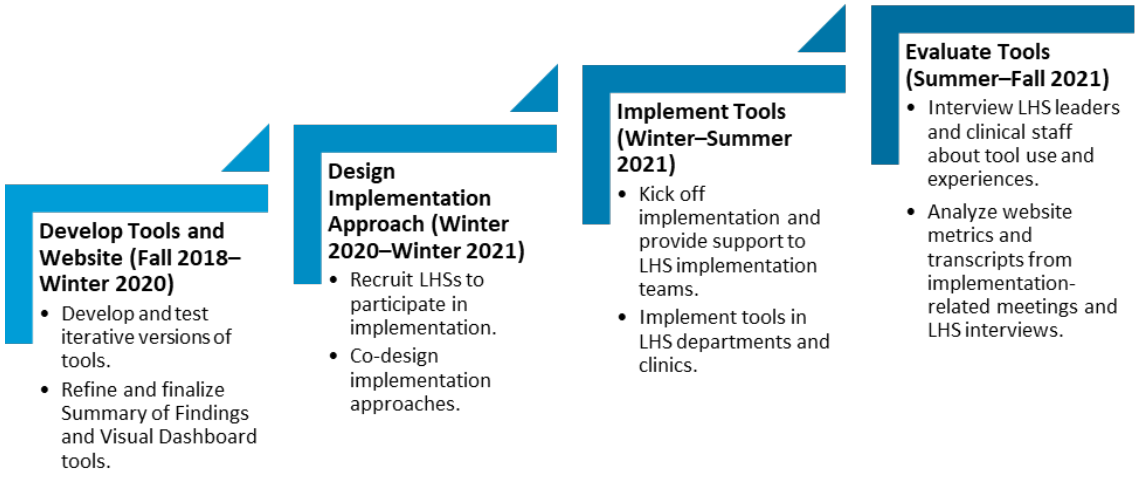
Executive Summary

The Agency for Healthcare Research and Quality (AHRQ) knows that access to high-quality, usable knowledge is the linchpin for making healthcare safer, higher quality, and more accessible, equitable, and affordable. In 1997, the AHRQ Evidence-based Practice Center (EPC) Program was established "to promote evidence-based practice in everyday care."[1] EPCs review the scientific literature on topics relevant to clinical issues and healthcare organizations and produce reports to inform evidence-based healthcare practice, delivery, policies, and research. A Scientific Resource Center (SRC) provides scientific and technical support for EPC Program activities.

Despite the EPC Program's high scientific standards and strong dissemination, many learning health systems (LHSs) do not routinely use EPC evidence reports.[2] LHSs may not find a particular report's focus and content to be relevant to them. In addition, the EPC evidence report format does not easily convey key takeaways for clinical practice. Furthermore, the report findings can be ambiguous. Even if an evidence report topic addresses their needs, LHSs must still translate the information into a format that promotes evidence-based decision making.[3]

The AHRQ EPC Program wants to help LHSs use the evidence from its evidence reports to improve patient care. In 2018, to improve uptake of EPC Program findings, the AHRQ EPC Program started a project to enhance LHSs' adoption of evidence to improve the quality and effectiveness of patient care. AHRQ contracted with the American Institutes for Research (AIR) and its partners to convene a panel of senior leaders from 11 LHSs to guide the development of tools to help health systems use findings from EPC evidence reports. The purpose of the LHS panel was to help make the findings from EPC Program reports more useful and actionable to health systems. The LHS panel's contributions led to developing, implementing, and evaluating two electronic tools to make the EPC report findings more accessible (Figure A). The panel also nominated topics for EPC reports that would be relevant to LHSs. Figure B presents project accomplishments.

Figure A. Timeline for evidence-based tool development, implementation, and evaluation



LHS = learning health system

The EPC Program's SRC and AIR each developed a Web-based tool to help disseminate the EPC Program reports. The Summary of Findings tool, which was created by AIR, uses a table format to present high-level results from an EPC Program report, enabling users to quickly evaluate the relevance of evidence. The Visual Dashboard tool, which was created by the SRC, uses graphic displays to present the overall data from an evidence report and enables users to view detailed data from specific studies. The tools presented findings from two evidence reports selected by the LHS panel: Antipsychotics for the Prevention and Treatment of Delirium and Treatment of Depression in Children and Adolescents. AIR and the SRC integrated these electronic, interactive tools into a pilot website for LHSs to test.

In spring and early summer 2021, six LHSs implemented the tools in a variety of inpatient and outpatient settings. Each system selected the topic(s) based on their system's priorities. With coaching and support from AIR, the LHSs implemented the tools over a 4-month period. Implementation champions and teams from the participating LHSs introduced the tools to clinical leadership and staff. Participants used the tools as part of an implementation workgroup formed to review the tools or in a clinical setting where the topic was relevant to patient care.

Evaluation

To evaluate the tools, AIR conducted telephone interviews with a diverse group of 27 clinical leaders and clinicians from the six participating LHSs who reviewed and used the tools. The purpose of the interviews was to understand their experiences with the tools, their impressions of the tools, and how well the tools helped them access evidence. We also learned how well the tools overcame barriers to LHS use of the EPC reports and barriers to applying the evidence from the EPC reports. The key findings are summarized in Box A.

Clinical leaders found the Summary of Findings and Visual Dashboard tools to be efficient and useful sources of summarized evidence to (1) inform systems change, (2) educate trainees and clinicians, (3) inform research, and (4) support shared decision making with patients and families. Interview participants felt that the tools improved on the standard literature databases and search engines that they typically rely on to access research reports. Clinical leaders—many of whom were unfamiliar with the EPC Program's products—noted that they appreciated the thoroughness and quality of the evidence reviews. They saw AHRQ as a trusted source of information. Participants were hopeful that AHRQ would incorporate additional EPC Program reports into the tools. Table A summarizes the advantages and challenges of using the tools as reported by participants. Some of the challenges concerned the evidence included in the tools rather than the tools themselves.

Box A. Key findings from the evaluation of evidence-based tools

- The tools were useful sources of summarized evidence to—
  - Inform systems change
  - Educate trainees and clinicians
  - Inform research
  - Support shared decision making with patients and families
- Clinical leaders appreciated the thoroughness and quality of the evidence reviews; they saw AHRQ as a trusted source of information.
- Participants found both tools to be valuable, efficient, and complementary; some favored one tool over the other.
- Participants suggested optimizing the content for mobile device use to facilitate health system uptake of the tools.
- Training resources about tool navigation and interpretation of the statistical content in the tools would be helpful.
- EPC reports with strong and robust evidence on topics most relevant to patient care challenges faced by LHSs would be of most value to LHSs seeking to improve the quality of care.

Figure B. Project accomplishments

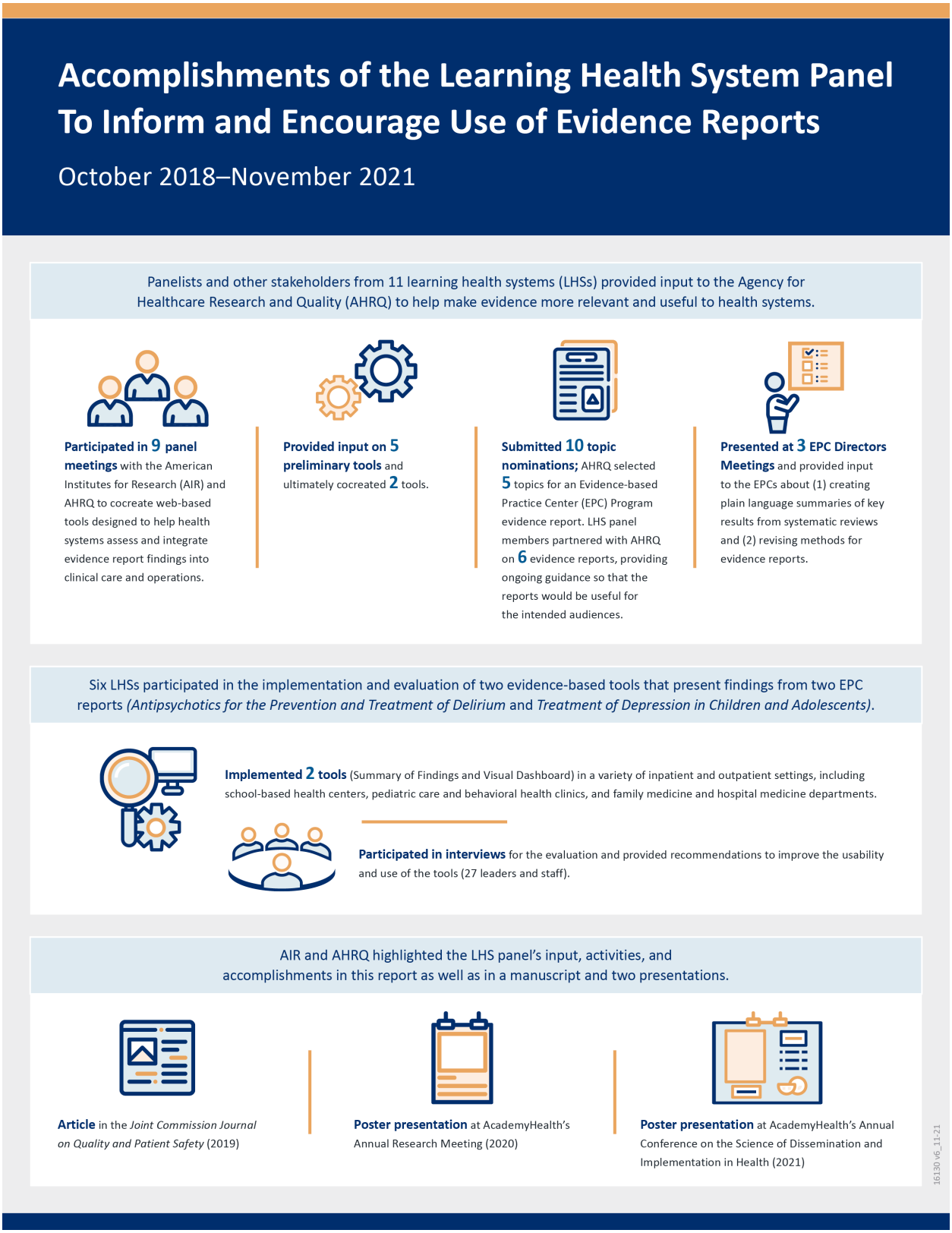


Table A. Summary of LHS-reported advantages and challenges of using the tools

Advantages of Tools	Challenges of Tools (Format and Content)
Multi-use: The tools meet four LHS evidence needs: system change, clinician training, a content refresh for experienced clinicians, and help for researchers developing a research proposal. **Complementary:** The Visual Dashboard and Summary of Findings tools are complementary and appeal to people with different preferences for how information is presented. **Concise:** The tools offer a concise synthesis relative to the full evidence report. **Layered information:** Layering of information with filters allows efficient access to summary results as well as detailed evidence report results.	**Focus of filters:** Filters are too specific (e.g., adolescents with depression of all types). **Need for filters with more than one patient characteristic:** There should be filters for populations with common characteristic profiles (e.g., people over age 65 with dementia). **Tool content:** • The delirium and depression reports that were included in the tools mostly reported insufficient or inconclusive evidence, resulting in information that does not provide clear answers for how to treat patients. • LHSs and many clinicians had already adopted the evidence. • The reports do not include the most recent studies.* **Not point-of-care friendly:** Challenges to point-of-care use include: • Tools include a lot of information. • Some clinicians struggle to interpret the statistical data presented in the Visual Dashboard. • Tools are not mobile friendly or optimized for mobile use.

LHS = learning health system.
****Antipsychotics for the Prevention and Treatment of Delirium***, released in November 2019, covered studies published through June 2018. ***Treatment of Depression in Children and Adolescents***, released in April 2020, covered studies published through May 2019. The LHSs implemented the tools in mid-2021.

Recommendations and Considerations To Improve the Tools

We developed recommendations and ideas for how to improve the tools. These recommendations were based on participants' overall feedback and their specific suggestions for how to strengthen the tools and the EPC reports. The recommendations and considerations are organized into six categories: (1) presentation of the tool content and data; (2) tool access; (3) tool usability and uptake; (4) resources for use at the point of care; (5) considerations for improving the timeliness and relevance of the evidence reports; and (6) considerations for improving the evidence reports' relevance to the health systems. In Table B, we have assigned a label—short, middle, or long term—based on the expected time and resources required to implement the recommendations and considerations. Details on the recommendations and considerations are available in the Recommendations and Considerations section of the full report.

Table B. Short-, medium-, and long-term recommendations and considerations for the tools, the pilot website, and evidence reports

Time Period	Recommendations/Considerations
Short term	**Tools** • Revise the labels for the tools on the website home page to make it easier to understand what information is available under each tab. • Improve formatting of the findings and data. • Add bulleted summary of key takeaways to the Visual Dashboard. • Highlight study publication dates more prominently in the tools. • Improve navigation from one tool to the other. • Improve access to the tools through electronic health record (EHR) systems and smaller laptops. • Enhance the functionality of the tools to provide more information about the studies included in the report and to be more user friendly. • Populate the tools with new report content as soon as possible after EPC Program reports are published. • Reassess the communication plan to make LHSs aware of new EPC Program reports and the populated tools as soon as they are released.
Middle term	**Tools** • Report findings for the overall population first before providing the option of seeing the results by subpopulation. • Provide training resources to help people learn how to use the tools and interpret the data. • Provide continuing medical education (CME) credits to incentivize physicians and other clinical leaders to use the tools. **Website** • Link to actionable information to assist with implementation of the evidence. • Develop plain language summaries of the evidence reports or link to plain language resources for patients and families to support shared decision making. **EPC Reports** • Update EPC Program reports of high interest to health systems. • Provide updates on in-progress evidence reports. • Proactively engage with health system leaders to identify EPC evidence report topics that are most relevant to their systems. • Work with health system leaders to focus evidence review research questions so the reports provide maximal guidance that is relevant to practice.
Long term	**Tools** • Summarize the key points for clinical practice with links to the evidence supporting the statement. • Explore how to further layer information based on key questions clinicians need answers to when treating a patient. • Improve access to the tools through mobile devices. • Explore ways that AHRQ could facilitate the creation of a point-of-care tool that provides clinical guidance with links to the EPC report evidence that supports the guidance.

AHRQ = Agency for Healthcare Research and Quality; EPC = Evidence-based Practice Center; LHS = learning health system.

Limitations of the Implementation and Evaluation

When reviewing the findings from this evaluation, the following two limitations should be considered.

- Because of the need to focus resources on the response to the COVID-19 pandemic, LHSs implemented the tools over a 3-month period rather than over 12 months as originally planned. AHRQ wanted to be as flexible as possible with the LHSs during this time so as to retain LHS participation and engagement in light of these competing demands. Therefore, in some cases, the implementation teams were different than originally planned. Specifically, the tools and their content were tested in clinical environments for which they were not necessarily designed. Ideally, the implementation would have taken place with groups of clinical, operational, and quality leaders who would review and discuss the reports to inform changes or improvements in healthcare delivery, rather than in settings of direct patient care.
- The other limitation concerns the content of the reports. The LHSs collectively selected report topics for the implementation that aligned with organizational priorities. Unfortunately, the scientific literature on the topics selected—particularly in terms of guidance for clinical decision making—is largely inconclusive. The lack of robust and conclusive literature frustrated participants who were hoping to learn about recent research supporting the use of specific treatments to improve clinical practice.

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Introduction

The Agency for Healthcare Research and Quality (AHRQ) knows that access to high-quality and usable knowledge is the linchpin for making healthcare safer, higher quality, more accessible, equitable, and affordable. In 1997, the AHRQ Evidence-based Practice Center (EPC) Program was established "to promote evidence-based practice in everyday care."[1] EPCs review scientific literature on topics that are relevant to clinical issues and healthcare organizations. AHRQ works with non-Federal partners (e.g., professional societies, health plans, insurers, employers, patient groups, and learning health systems [LHSs]), who nominate these topics for the evidence reports. EPCs synthesize the literature and produce evidence reports to inform evidence-based healthcare practice, delivery, policies, and research. These reports are publicly available on the Effective Health Care (EHC) Program website. A Scientific Resource Center (SRC) provides scientific and technical support for EPC Program activities. The SRC reviews EPC products, coordinates meetings of AHRQ and EPC Directors, provides methodological support for reviews and other research projects, and supports the topic nomination process.

Despite the EPC Program's high scientific standards and dissemination approaches, many LHSs do not routinely use EPC evidence reports.[2] There are three reasons for this. First, the focus and content of the reports may not appear to be relevant to LHSs. Second, the report format does not easily convey key takeaways for clinical practice. Third, the current evidence grading system emphasizes clinical trials, tends to exclude potentially valuable LHS-generated knowledge about quality improvement and other dynamic areas, and leads to ambiguous findings.

Even if an evidence report topic addresses LHS-specific evidence needs, the LHSs must translate the information into a format that promotes LHS evidence-based decision making.[3] The current report format is too long and complicated; the preferred format would include short summaries written in plain language that emphasize results and interpretation.[4] Bridging the gap between evidence and practice requires tools to deliver evidence that is timely, trustworthy, actionable, flexible, contextualized, and integrated.[5,6]

The AHRQ EPC Program wants to help learning health systems use the findings from its evidence reports to improve patient care. In 2018, to improve uptake of EPC Program findings, EPC Program started a project to enhance LHSs' adoption of evidence to improve the quality and effectiveness of patient care. AHRQ contracted with the American Institutes for Research (AIR) and its partners to convene a panel of senior leaders from 11 LHSs to guide the development of tools to help health systems use findings from EPC evidence reports. The LHS panel generated ideas for developing electronic tools designed to help health systems assess and integrate evidence report findings from AHRQ's EPC Program into routine clinical care and operations. The LHS panel also suggested topics for future EPC Program reports. The LHS panel engaged with AIR and AHRQ in a 2-year process to cocreate electronic tools to make the EPC Program evidence report findings more accessible to LHSs. The LHSs assisted by providing feedback during tool development and testing the tools during development and again once beta versions of the tools were finalized.

The EPC Program's SRC and AIR each developed a web-based tool to help disseminate the EPC Program reports. The Summary of Findings tool, which was created by AIR, presents high-level results of an EPC Program report, thereby enabling users to quickly evaluate the relevance of evidence. The Visual Dashboard tool, which was created by the SRC, presents the overall data from an evidence report and enables users to view detailed data from specific studies. AIR and

the SRC integrated these electronic and interactive tools into a pilot website for LHSs to review and use. In spring and summer 2021, six LHSs implemented the tools within select departments and clinics. After the LHSs had used the tools for 1 or more months, AIR researchers interviewed clinicians to (1) learn about their experiences using the tools and (2) obtain feedback on how the tools could be improved and ways to increase LHSs' use of EPC Program report findings.

This Introduction section of this report describes the LHS panel, the panel's contributions to the project, and the tool and website development process. Table 1 provides an overview of the tools. The project timeline is presented in Figure A of the Executive Summary and project accomplishments are shown in Figure B. Subsequent sections of this report describe the implementation and evaluation phases of the project and findings from the evaluation. The report concludes with recommendations for improving the tools. The appendixes provide further detail on LHS panel input, activities, and accomplishments during the project; the tool development process; and other related project activities.

Table 1. Description of Summary of Findings and Visual Dashboard tools

Tool	Intended Users	Purpose	Key Features
Summary of Findings	LHS staff with high-level decision-making responsibilities, such as LHS leaders, payers, or policymakers, and C-suite executives	Determine whether the full evidence report is relevant	High-level results of evidence reports and links to more granular data in the reports and the Visual Dashboard
Visual Dashboard	Health system leaders, clinicians, researchers, patients, and policymakers	Quickly access the bottom line (e.g., magnitude and direction of effect, confidence intervals, evidence strength)	Data from the evidence report and individual studies in a dynamic, interactive, Web-based tool

LHSs = learning health systems.

LHS Panel and Involvement With the Project and the EPC Program

This section describes the LHS panel and its overall contributions to the EPC Program, as well as to the development, implementation, and evaluation of the tools.

Composition of the LHS Panel

In 2018, AIR recruited the 11 LHSs participating on the panel based on their experience as an LHS and their geographic diversity, teaching status, and size (the list of LHSs and their respective panel members is in Appendix A). The LHSs that were recruited serve regions throughout the country, from the east coast to Hawaii, and serve patients representing the racial, ethnic, social, and economic spectrum of the U.S. population. Panelists are decision makers, clinical and executive leaders, and knowledge brokers within their systems. At various points in the project, three panel members left because they took a position at a different organization or had competing priorities.

Input to the EPC Program on Evidence Reports

Panel members provided ongoing input to the EPC Program on topic nominations for evidence reports and key considerations to increase health systems' ability to access and use evidence reports and related EPC products or tools. Panel members provided input at nine LHS

panel meetings and three EPC Director meetings throughout the three years of the project (see Box 1 on the LHS Panel's Input to the EPC Program). EPC Directors also attended the LHS panel meetings to improve their understanding of the health systems' evidence needs and engage with the panel to discuss how best to meet those needs. Below, we detail the input LHSs provided to the EPC Program. Figure B in the Executive Summary provides a complete list of project accomplishments.

Topic nominations. Panel members submitted 10 topic nominations (Appendix A), five of which AHRQ selected to be developed into evidence reports. Panel members served as partners on all five reports (Box 1). One panel member also served as a partner for an evidence report on patient-generated health data that had previously been submitted by someone outside of the panel (Box 1). Partners provide input to the EPC Program as reports are being developed to help ensure that they will meet their intended purpose. In addition to their nominations and their work as partners on reports, panel members provided input on two AHRQ priority areas—palliative care and care for people with multiple chronic conditions in ambulatory settings.

Box 1. Learning Health Systems panel's input to the Evidence-based Practice Center Program

- Submitted 10 topic nominations for evidence reports
- LHS panel members served as partners on six evidence reports
- Strategies for patient, family, and caregiver engagement
  - Interventions to Decrease Hospital Length of Stay
  - Prehabilitation and Rehabilitation for Major Joint Replacement Surgery
  - Virtual Health During COVID-19
  - Diagnostic Errors in the Emergency Department
  - Management of High-Need, High-Cost Patients
- Provided input on key considerations to increase the usability and accessibility of evidence reports by health systems at nine LHS panel meetings and three EPC Director meetings (Table 2)

Key considerations to increase LHS use of evidence reports. During LHS panel meetings and meetings with directors of the EPCs (referred to hereafter as EPC Directors meetings), panel members and EPC Directors discussed opportunities to increase the relevance and use of evidence reports by health systems (Table 2). The feedback that LHSs provided ultimately led to the development and publication of (1) a white paper, Improving the Utility of Evidence Synthesis for Decision Makers in the Face of Insufficient Evidence and (2) a Roadmap for Narratively Describing Effects of Interventions in Systematic Reviews.

Table 2. LHS panel and selected EPC Directors meetings: Topics and key learnings

Meeting Topic	Key Learnings From LHS and EPC Discussion
Usefulness of 2018 EPC pilot (companion) products* (January 2019 LHS panel meeting)	• Reinforced previous findings about challenges faced by health systems in translating evidence into practice. • Highlighted health systems' needs for timely, concise, and actionable evidence that can be easily operationalized into existing clinical workflows.

Meeting Topic	Key Learnings From LHS and EPC Discussion
Contextual information that LHSs would like EPC evidence reports to include (June 2019 LHS panel meeting, joint session of LHSs and EPC Directors)	• LHSs shared examples of contextual information to include in EPC evidence reports such as: (1) resources required to implement the intervention; (2) elements of the intervention that are critical to effectiveness (e.g., what can be adapted); (3) local resources and the feasibility of having those resources; and (4) detailed information about the patient population on which the evidence is based. • Including contextual information in the EPC Program reports is difficult as publications often do not provide clear, contextual details or do not include this information.
Clearly describing statistical effects for LHSs (October 2019 LHS panel meeting)	• LHSs would like comprehensive yet concise summary statements that quantify the strength of evidence (e.g., low, high). • Directors designing care programs would appreciate more details and data, such as the effect size and the number of studies and participants. • Executive-level administrators (e.g., chief executive officer, chief financial officer) would want to have a high-level summary about whether the intervention or treatment worked.
Value of EPC evidence reports to LHSs and how EPCs can be more responsive to LHSs' needs (October 2021 EPC Directors meeting)	• EPC evidence reports can be used by health systems to help create clinical care pathways; the reports are also particularly useful to academic medical centers that are seeking to address evidence gaps. • LHSs suggested including information in the EPC reports about the most useful metrics to track and characteristics of the most common metrics. • LHSs also suggested developing additional living reviews and including information in EPC reports on process measures related to healthcare delivery.

EPC = Evidence-based Practice Centers; LHSs = learning health systems

*Additional information about LHS panel feedback on the EPC pilot products can be found in Borsky A, Savitz L, Bindman A, Mossburg S, Thompson L. AHRQ Series on Improving Translational Products by the AHRQ EPC Learning Health Systems Panel. Jt Comm J Qual Patient Saf. 2019 Nov;45(11):772-778.

LHS Contributions to Tool Development and Implementation

AIR and the LHSs worked together to develop and implement the tools. The role of the LHS panel members and other LHS representatives in cocreating and implementing the tools is described in the section that follows.

LHS Panel Participation in Tool Development and EPC Report Topic Selection

AIR engaged with the LHS panel and other LHS representatives in several ways to develop the tools and design a feasible plan for implementing the tools in the middle of the COVID-19 pandemic. AIR (1) convened panelists in person (before the COVID-19 pandemic) and virtually (during the COVID-19 pandemic) to help guide tool development, (2) conducted virtual cognitive and usability testing of the tools with panelists and other LHS representatives who were potential end users of the tools, and (3) held meetings with LHS panelists to discuss which topics and tools to select for implementation and plans for implementing the tools. LHS panel members reviewed potential EPC Program report topics to pilot in the Summary of Findings and Visual Dashboard tools. They selected two topics—Antipsychotics for the Prevention and Treatment of Delirium and Treatment of Depression in Children and Adolescents.[7,8] Based on collective feedback from LHS panelists and representatives, AIR developed and refined the

Summary of Findings tool for the two topics and the SRC developed and refined the Visual Dashboard for the two topics. The result was four tools—a Summary of Findings tool and a Visual Dashboard for each topic. Appendix A provides more detail on the role of the LHS panel in pre-implementation period activities.

Participation in Tool Implementation

Six LHSs agreed to implement and assist with evaluating the tools. Between January 2020 and August 2021, LHS panelists and implementation champions and teams from these six systems participated in the following implementation activities:

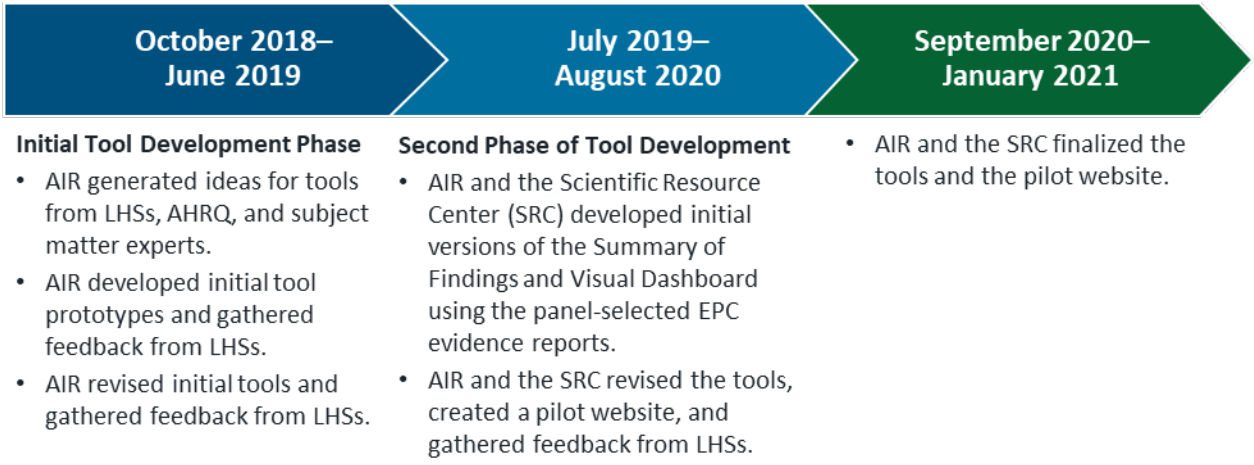
- Coaches from the AIR team met with LHSs to begin planning their implementation approach.
- After a suspension of panel involvement due to the COVID-19 pandemic (described below), AIR coaches held calls with panelists and implementation champions from each LHS to review and revise the planned implementation approach.
- LHS panel members and implementation champions attended a virtual meeting that served as a kickoff for the implementation of the tools. During the meeting, the AIR team and the SRC provided a demonstration of the pilot website and the tools, and the AIR team reviewed the plans and timeline for the implementation and evaluation.
- AIR coaches conducted planning calls and virtual site visits with the LHS implementation teams to finalize implementation approaches and begin using the tools. Six LHSs implemented the tools in various departments and clinics in their health systems. Although the timeline for implementation varied in each LHS, all LHSs concluded implementation by the end of July 2021.

More detail on the LHSs' involvement in implementation and evaluation activities is described later in the Tool Implementation section and in the Evaluation of Tool Implementation section of this report.

Tool and Website Development

This section provides an overview of the tool development and testing process and describes the final tools and the tool website that was piloted in the implementation. Figure 1 presents the timeline for development of the tools and integration into the pilot website. Appendix B includes abbreviated versions of reports and memos that provide detail on the tool development and testing process.

Figure 1. Tool and website development timeline



AHRQ = Agency for Healthcare Research and Quality; AIR = American Institutes for Research; LHS = learning health system

Initial Phase of Tool Development

During the initial phase of tool development (described in more detail in Appendix B), AIR gathered information and feedback from LHSs, AHRQ, and subject matter experts to generate and revise initial tool prototypes. AIR gathered information from

- Previous AHRQ qualitative work[9]
- EPC Program reports from pilot products[10-17]
- A Web-based needs assessment of the LHS panel member organizations
- Panel members during December 2018 and January 2019 panel meetings
- Experts outside of the project who were focused on the facilitation of evidence translation in LHSs and who provided information on related AHRQ products and the use and development of digital knowledge objects

AIR analyzed LHS panel feedback from the assessment and the panel meeting to generate ideas for tools and for criteria to evaluate the potential tool ideas. Half of the panel members said their organizations use AHRQ EPC evidence reports and noted several barriers and facilitators to using these reports. Panelists also reported that LHSs actively and routinely search for evidence to improve practice and are confident in their ability to do so using a wide variety of sources. According to the panel,

- Clinical guidelines are the most useful sources of evidence.
- LHSs primarily use medical literature databases and electronic health records (EHRs) to access evidence.
- LHSs most commonly access systematic reviews through the Cochrane Database of Systematic Reviews.

Based on our analysis of the data and AHRQ suggestions, we identified key criteria for tool elements (Box 2). We then developed prototypes of three tools: (1) a Population Comparison tool; (2) an LHS Stakeholder Summaries tool; and (3) an Evidence Snapshot tool focusing on interventions and outcomes (described in Table 3). After developing the initial tools, we gathered feedback from panel members about the tools' usefulness, as well as barriers and facilitators,

feasibility and investment required for product development, and the potential development of similar products through other AHRQ-funded initiatives. Most panel members had a relatively clear understanding of the LHS Stakeholder Summaries tool and the Evidence Snapshot tool. In general, the panel members understood the intent of each tool, the potential end users, and how the tools could be used within an LHS. Panel members made several concrete suggestions for changes to the function, format, structure, and content of both tools. In addition, testing helped identify elements of the tools that were unclear and that would benefit from further explanation or development.

Box 2. Key criteria for tool elements

- Data summary using tables
- Visual elements like graphs or charts are included
- Text is short, concise, or minimal
- Layered information with drill-down capacity
- Shareability (tool can be easily shared)
- Multi-use audience or purpose
- Clarifies the decisional dilemma within the evidence report
- Provides information on context
- Universality, tool is useful across a range of EPC reports

Table 3. Description of initial tools

Tool	Intended Users	Description
Population Comparison tool	EHR implementation teams	Provides the ability to quickly and easily view information on the populations and settings of the research presented in a systematic review and assesses the applicability of the EPC Program report to the LHS patient population.
LHS Stakeholder Summaries tool	Hospital administrators, quality department leaders, EHR implementation teams, and clinicians	Allows users to customize the content of a report document, tailoring the information to meet the needs of diverse LHS stakeholders who use evidence summaries.
Evidence Snapshot tool	Bedside clinicians	Provides an "At-a-Glance" view that summarizes information about the interventions from the evidence report.

EHR = electronic health record; EPC = Evidence-based Practice Center; LHS = learning health system.

We did not move forward with the Population Comparison tool because it might be a component of a separate tool that was being developed by the SRC, the Visual Dashboard. In addition, because of limitations in the underlying evidence, we determined that it would not be feasible to develop a product that addresses the LHS panel's stated needs based on most EPC systematic reviews. These limitations included the availability and quality of data, the methodological challenges of aggregating data, and the lack of uniformity or standardization in how these data, if present, are defined and reported across studies. Appendix B provides detail on the development and testing of the Population Comparison tool (later called the Populations and Settings tool).

Based on LHS panelist feedback on how to adjust the function, format, structure, and content of the tools, AIR revised the LHS Stakeholder Summaries tool and Evidence Snapshot tool. When reviewing the revised tools, panel members saw potential value in combining the two tools into a single tool that would enable health system administrators to triage—that is, distribute the evidence report to relevant stakeholders. This interactive "triage tool," which was later renamed the Summary of Findings tool, would allow decision makers to

- Quickly understand the relevance of the intervention/treatment to their organizations
- Share the high-level key information with relevant stakeholders, such as a chief financial officer (CFO) or chief executive officer (CEO)
- Explore and share links to the data with relevant stakeholders to determine whether to implement the intervention/treatment

Panel members also noted the value of developing interconnected tools that would allow users to access varying levels of detail regarding the content of the evidence report, based on their needs.

Second Phase of Tool Development

In June 2019–August 2020, AIR and the SRC developed what would become the final versions of the Summary of Findings and Visual Dashboard tools. AIR and the SRC refined the tools following cognitive testing and usability testing with LHS staff and then integrated the two tools into a pilot website.

AHRQ's plan is to eventually place the tools on a redesigned version of the public EPC Program website. Health system users with different needs would be able to select one or both tools depending on the types of information and level of detail from the systematic reviews they preferred. AIR and the SRC developed prototypes of the tools based on a test case (noninvasive nonpharmacological treatment for chronic pain). AIR and the SRC refined the tools by populating them with data from two EPC Program evidence reports selected by the LHS panelists: (1) Antipsychotics for the Prevention and Treatment of Delirium and (2) Treatment of Depression in Children and Adolescents (Appendix C provides a summary of each EPC report). AIR and the SRC then integrated the tools into a pilot website for the LHSs to use during the tool implementation and evaluation periods.

Descriptions of the Final Versions of the Tools

The following sections provide more detail about the final versions of the Summary of Findings and Visual Dashboard tools as well as screenshots of the tools.

Summary of Findings Tool

The Summary of Findings tool is designed for decision makers such as health system leaders, payers, and policymakers. The tool allows stakeholders to quickly obtain an overview of summary information and data from an AHRQ EPC evidence report, decide if they need more detailed information from the full report or other tools, and help them make decisions on implementing the evidence. LHS leaders may extract and share high-level information from the tool with other colleagues.

As shown in Figure 2 and Figure 3, the Summary of Findings tool allows users to select from five tabs to view EPC report data: (1) Summary of Findings; (2) Key Review Questions; (3) Related Review Findings and Clinical Guidelines; (4) Clinical and Policy Implications; and

(5) Caveats, Applicability & Limitations. The related review findings are from other EPC reports. From the Summary of Findings tab (the tool's landing page), users are able to click on a list of outcomes to view detailed EPC report data in a tabular format. Users can choose to view the outcome data by evidence report question (e.g., benefits and harms of a set of similar treatment or prevention interventions) and for a specific population (e.g., adolescents with dysthymia, adolescents with major depression). Once an outcome is selected, a table unfolds that displays key data points on a variety of interventions from studies reviewed by the EPC. The table shows the critical outcome, the intervention and comparator, the number of studies, the findings, and the strength of the evidence. The table provides a link to the Visual Dashboard if applicable. These and other features allow users to

- Quickly see the findings and the strength of the evidence
- Obtain information such as intervention definitions or expanded explanations
- Sort by column and hide comparisons with no evidence
- Access the EPC program report questions, findings from related EPC reports, professional clinical guidelines, and clinical and policy implications

Figure 2. Screenshot of the Summary of Findings tool for the Antipsychotics for the Prevention and Treatment of Delirium evidence report

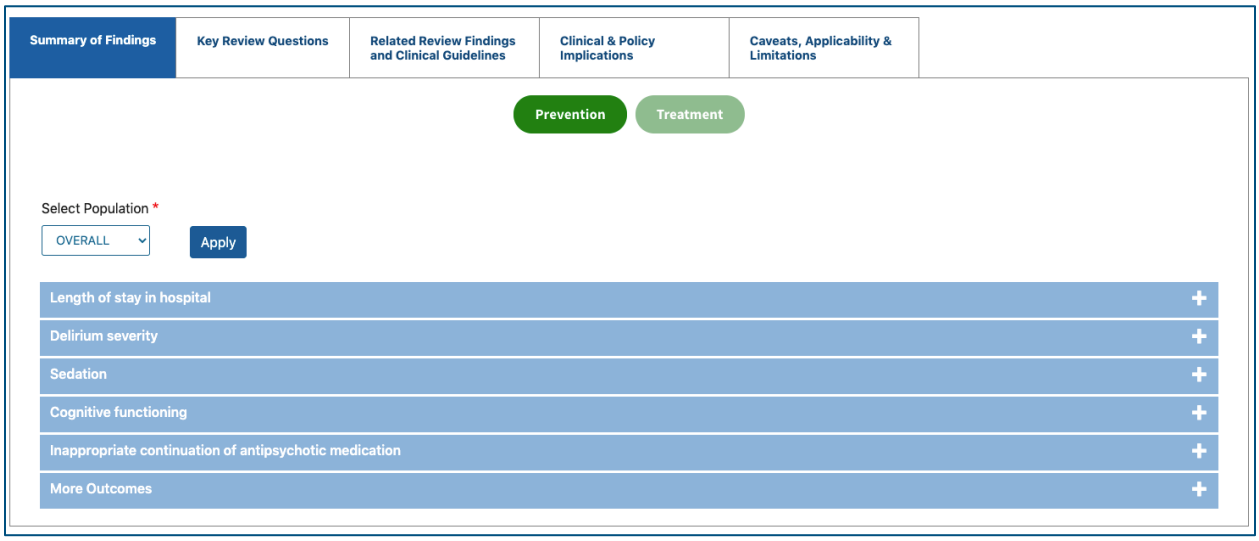
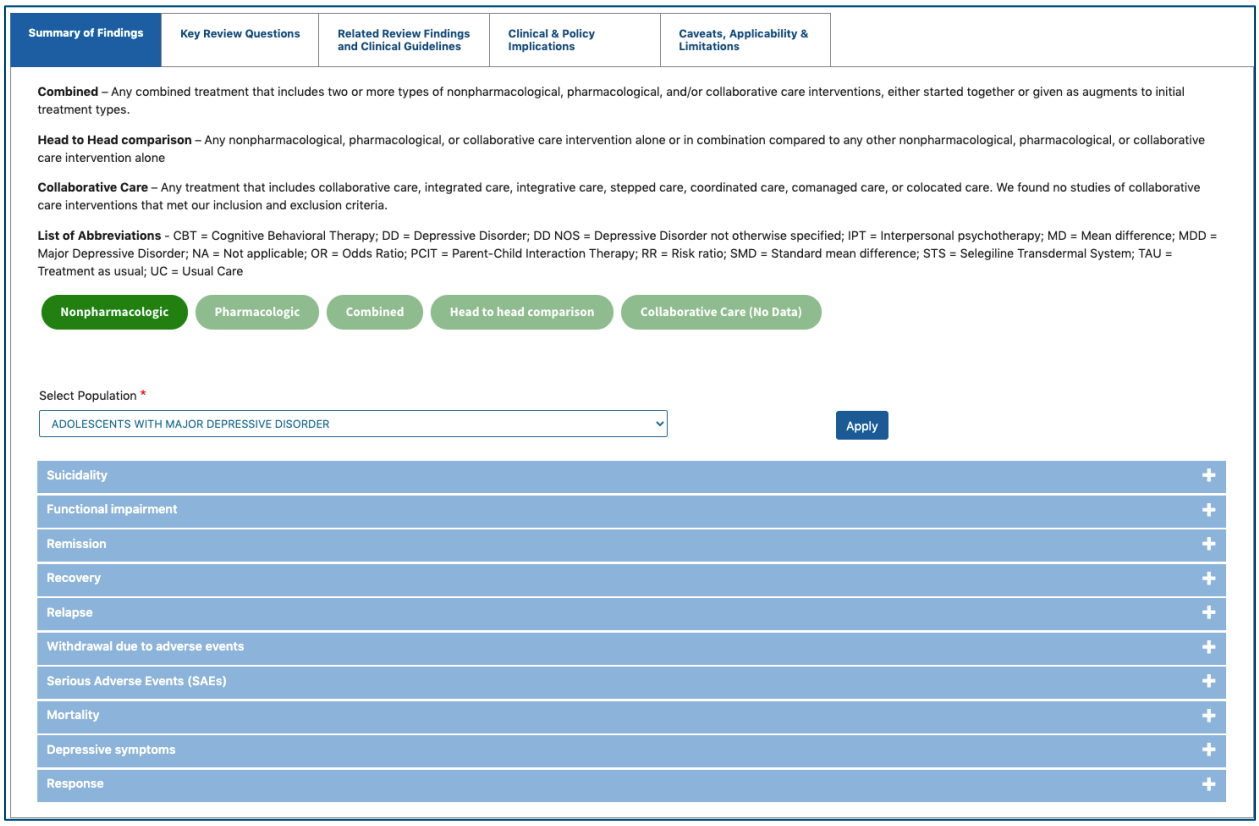


Figure 3. Screenshot of the Summary of Findings tool for the Treatment of Depression in Children and Adolescents evidence report



Visual Dashboard Tool

The Visual Dashboard is a dynamic and interactive tool targeted toward all users of the AHRQ EPC website, including health system leaders, clinicians, researchers, and policymakers. The tool, shown in Figure 4 and Figure 5, permits users to quickly grasp the implications of statistical data from studies that were included in the EPC evidence report. Tabs allow users to view the data three different ways based on parameters of interest: (1) aggregate data combining data from studies with the same intervention, comparator, population, and outcome (Summary tab); (2) individual study data (Studies tab); and (3) type of outcome and intervention (e.g., nonpharmacological therapies, pharmacological therapies) (All Outcomes tab). For reports with quantitative data appropriate for meta-analysis, forest plots show the magnitude and direction of effect, confidence intervals, and the strength of the evidence for studies with the same intervention (e.g., drug, psychotherapy), comparator (e.g., different drug, placebo), and outcome (e.g., functional status, symptoms, serious adverse outcome). Qualitative study results are visualized with bubble charts. In each case, emphasis is placed on confidence in the findings.

By hovering over a forest plot bar, users can see the number of studies, total number of participants, the outcome statistic (relative risk or standardized mean difference), and link to the PubMed abstracts. Studies limited to qualitative assessments are visualized with bubble charts. In each case, emphasis is placed on confidence in the findings. All visualizations—even filtered views—can be shared with colleagues through PDFs or personalized URLs.

Figure 4. Screenshot of the Visual Dashboard tool for the Antipsychotics for the Prevention and Treatment of Delirium evidence report

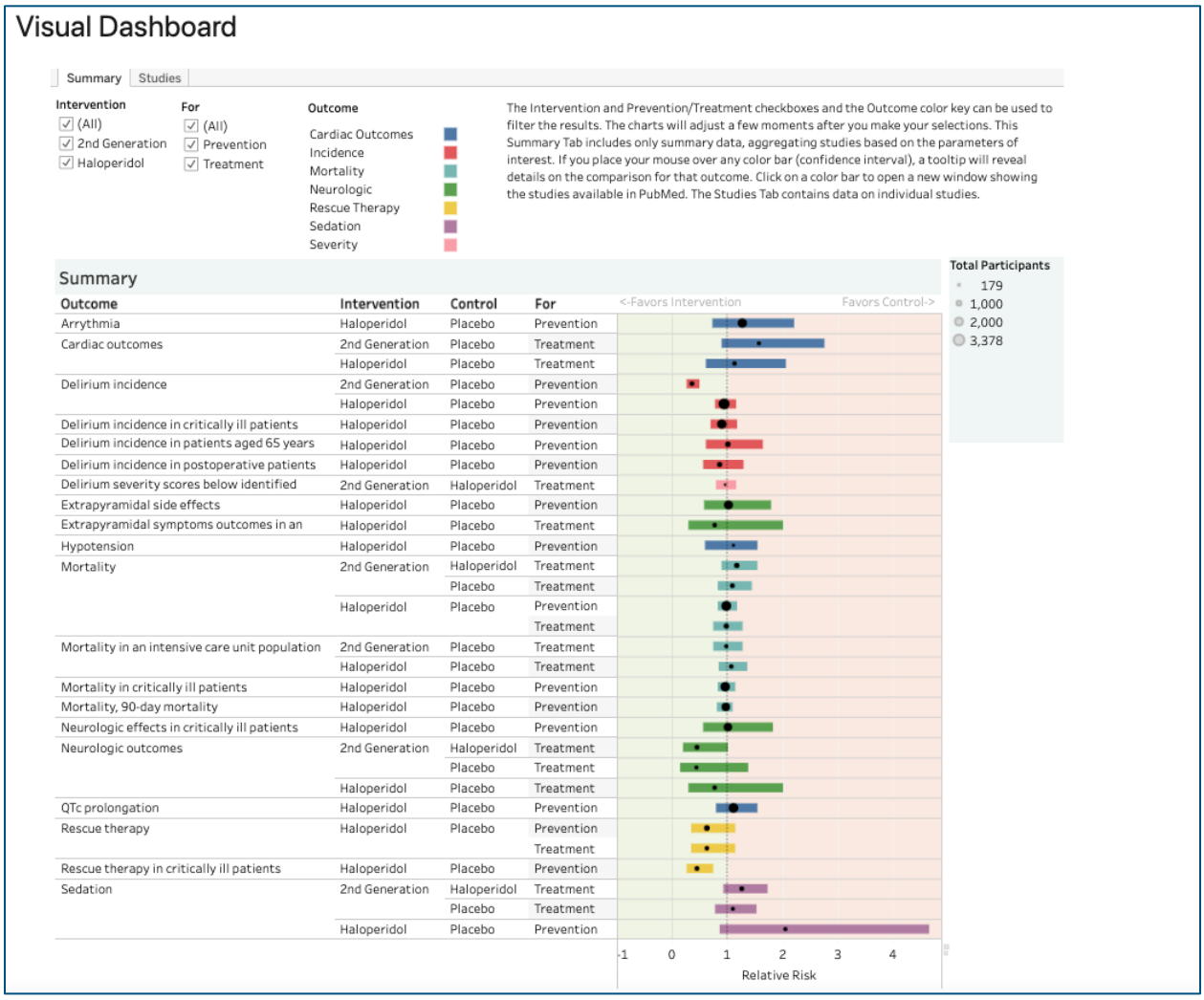
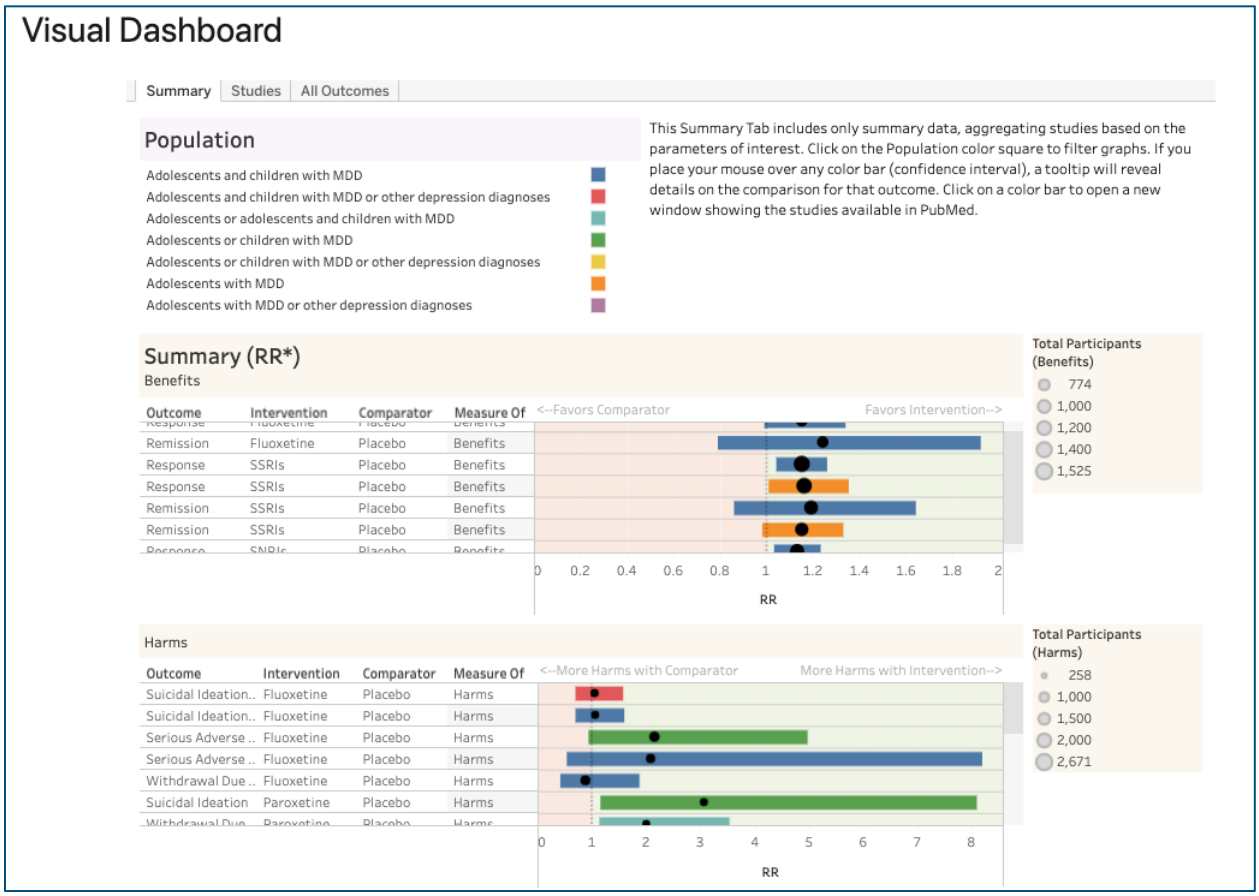


Figure 5. Screenshot of the Visual Dashboard tool for the Treatment of Depression in Children and Adolescents evidence report



LHS Pilot Website

In late 2020, AIR and the SRC worked with AHRQ to integrate the Summary of Findings and Visual Dashboard tools into a website where their use could be piloted with the participating LHSs. The website, shown in Figure 6 and Figure 7, has five tabs at the top: (1) Report Home, which has a description of the report, main findings, and the Summary of Findings tool; (2) Structured Abstract (presented in HTML); (3) Visual Dashboard (linked to the tool); (4) Evidence Summary, which allows users to select sections of an evidence report and create a downloadable PDF for reference or distribution; and (5) Full Report, which provides access to the complete EPC Program report.

Figure 6. Screenshot of the AHRQ pilot website for the Antipsychotics for the Prevention and Treatment of Delirium evidence report

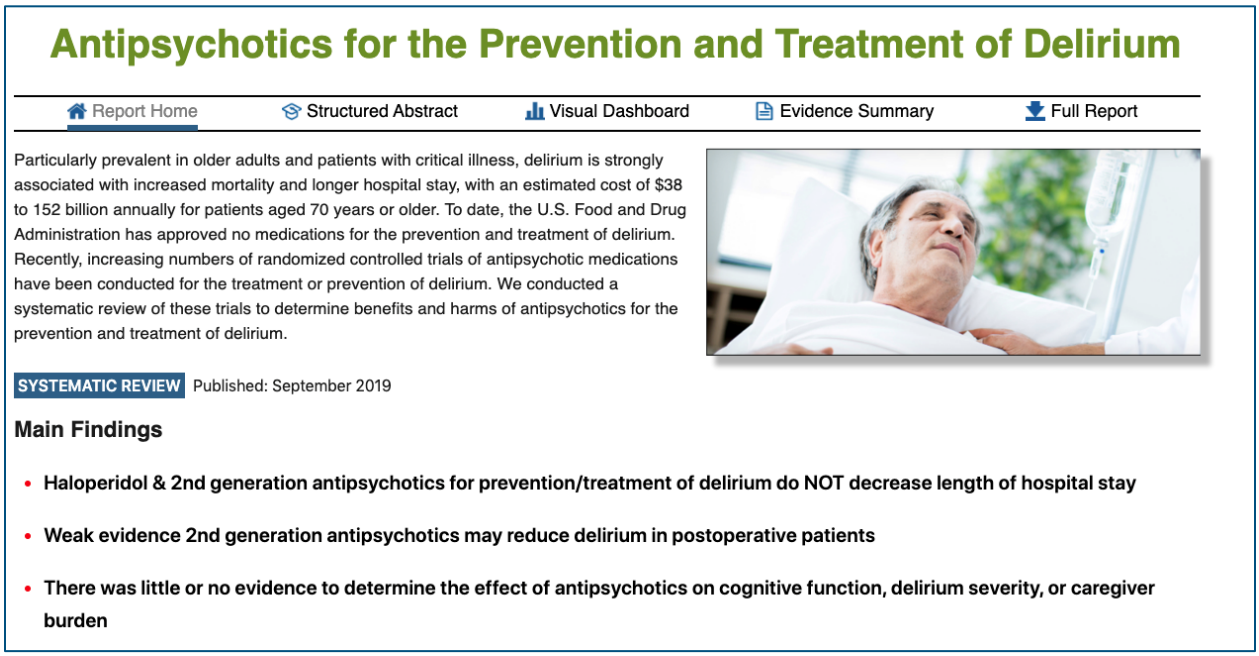


Figure 7. Screenshot of the AHRQ pilot website for the Treatment of Depression in Children and Adolescents evidence report

Overview of Implementation and Evaluation of the Tools

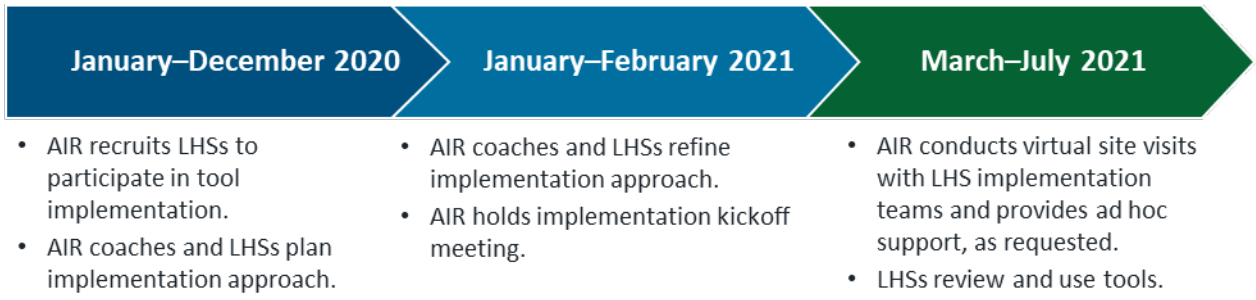
Six LHSs implemented the tools in spring and early summer 2021. Each LHS selected tools and topics based on alignment with their system's priorities. We defined implementation as use of the tools—specifically, reviewing and considering the tools and their content as part of the health system's usual process to support decision making. We intentionally allowed variation in how LHSs implemented the tools within their individual health systems. In the lead up to the implementation period, AIR coaches worked with the LHSs to develop implementation approaches using a planning tool (an implementation playbook template). The LHSs developed plans that included the target audience, the clinical site(s) or group(s) that would review and use the tools, a discussion of how the tools would be shared with the target audience, and the expected length of the implementation period. At the start of implementation, the coaches held virtual site visits with the LHS implementation teams to review and discuss initial reactions to the tools. The coaches also provided support, as needed, throughout the implementation period.

In summer 2021, AIR conducted interviews with a diverse group of 27 LHS organizational and clinical leaders and clinicians who were among those chosen by LHS implementation champions to interact with the tools. The purpose of the interviews was to understand their experiences with the tools, their impressions of the tools, and how well the tools fulfilled their need for accessing evidence. We also learned how well the tools overcame barriers to LHS use of the EPC reports and barriers to applying the evidence from the EPC reports. Through the findings from the evaluation interviews and implementation discussions, we identified ways to further refine the tools and drafted recommendations for AHRQ to consider when developing EPC Program resources.

Tool Implementation

This section describes the implementation process. We begin by describing the six learning health systems (LHSs) from the LHS panel that committed to implement the tools and their goals for participating in tool implementation. We share the approaches they used to implement the tools and how the American Institutes for Research (AIR) team supported the LHSs as they prepared for and carried out the implementation. Finally, we describe challenges the AIR team and LHSs faced prior to and during implementation. Figure 8 presents the timeline for the implementation process.

Figure 8. Tool implementation timeline



AIR = American Institutes for Research; LHS = learning health system

Commitment of LHSs To Participate in Tool Implementation

Six LHSs committed to implement the tools between March and July 2021 (Table 4). Five of the 11 original LHS represented on the LHS panel did not participate in tool implementation because they were either no longer participating in the project (three LHSs) or had competing priorities including managing their system response to the COVID-19 pandemic (two LHSs).

The six participating LHSs were located across the United States and included

- Three integrated nonprofit healthcare systems
- An integrated regional not-for-profit managed care health system
- An urban public safety-net institution
- A regional healthcare network

Table 4. LHSs participating in tool implementation

System	Geographic Reach	System Type and Services Offered
Denver Health Medical Center	Colorado—urban and rural	• Integrated academic safety-net health system • 1 acute care hospital/Level 1 trauma center; 11 Federally Qualified Community Health Centers; 18 school-based health centers; a 100-bed non-medical detoxification facility; a health maintenance organization; Rocky Mountain Poison and Drug Safety; and the Public Health Institute at Denver Health • Affiliate relationship with the University of Colorado School of Medicine

System	Geographic Reach	System Type and Services Offered
Hawaii Pacific Health	Hawaii and Pacific Region—urban, suburban, and rural	• Nonprofit healthcare system and Hawaii's largest healthcare provider • 4 hospitals; 1 medical group with more than 70 locations • Pediatrics, obstetrics, gynecology, and family medicine residency programs for the University of Hawaii
Intermountain Healthcare	Utah and Idaho—rural and urban	• Integrated nonprofit health system • 24 hospitals, including 5 critical access hospitals and 1 children's hospital; medical group with more than 2,400 physicians and advanced practice clinicians at about 160 clinics • Affiliate relationship with the University of Utah School of Medicine
Kaiser Permanente Northwest	Oregon and Washington—rural and urban	• Integrated nonprofit health system including dental • 2 hospitals; 57 medical, dental, and administrative facilities
Lehigh Valley Health Network	Eastern Pennsylvania—urban, suburban, and rural	• Includes an Accountable Care Organization • 10 hospitals; 1 children's hospital; 29 health centers; 163 owned physician practices through the Lehigh Valley Physician Group
Northwell Health	New York—urban	• Nonprofit health system • 24 hospitals; 3 skilled nursing facilities; 52 urgent care/walk-in clinics; more than 830 outpatient facilities • School of medicine at Hofstra/Northwell

Overview of Participating LHSs' Implementation Goals and Approach

Coaches from the AIR team met with leaders of each LHS to discuss the system's implementation goals, plan the implementation, and draft playbooks documenting each LHS's implementation plan. All LHSs sought to increase the review and use of evidence in care processes. One LHS also wanted to increase staff awareness of the Agency for Healthcare Research and Quality (AHRQ) and the Evidence-based Practice Center (EPC) Program.

Implementation leadership. LHS panelists either served as implementation champions in their respective LHSs or supported another individual or individuals as implementation champions, according to the nature of the topic. Panelists who held primarily administrative or hospital leadership roles often recruited clinical leaders as implementation champions. Panelists understood clinicians would be better able to champion the tools at the frontlines of patient care. The champions' clinical specialties were aligned with the topic that their associated LHSs selected. For the childhood depression topic, champions were behavioral health specialists and pediatricians; for the delirium topic, champions were hospitalists. Each champion served as a liaison between their health system and the AIR team and oversaw and supported use of the tools in their system. In addition, they identified leaders and clinicians to participate in evaluation interviews.

Implementation goals and approach. LHSs varied in their implementation approaches. Some LHSs chose to review the tools within a multidisciplinary workgroup setting. The focus of the implementation workgroups was to discuss (1) how the tools might be used in practice, and (2) whether the evidence within the tools represented a significant difference from their current

practice. Other LHSs chose to roll out use of the tools in inpatient and outpatient settings to obtain a practical sense of the utility of the tools. LHSs determined the workgroup composition and implementation setting based on the EPC report topic they chose to implement. As shown in Table 5, five LHSs chose to implement the childhood depression tools—one in a pediatric workgroup; one in school-based health centers and pediatric and behavioral health settings; and three in pediatric and behavioral health settings. Three LHSs chose to implement the delirium tools—two in hospital medicine settings and one in family and hospital medicine settings.

Table 5. LHS implementation approaches

Topic	LHS	Implementation Goals	Implementation Approach
Treatment of Depression in Children and Adolescents	**Denver Health Medical Center**	• Learn about and develop a process to incorporate the evidence. • Create more awareness about the EPC Program and how AHRQ supports the development of evidence reports.	• Visual Dashboard tool implemented in school-based health centers (SBHCs), the outpatient behavioral health department, and pediatric care clinics, and reviewed by o SBHC clinicians and social workers. o Psychology trainees and outpatient behavioral health staff (clinicians, social workers, psychologists, psychiatrists, nurse practitioners, and others working with children and adolescents with behavioral health disorders). o Pediatric care clinic psychiatrist and pediatricians.
	Hawaii Pacific Health	• Learn if (1) there is an easier or better way to present evidence to workgroups formed to review evidence related to a specific clinical topic and (2) how, if at all, an evidence report by another organization affects their system's existing processes to review and act on evidence.	• Both tools reviewed by a workgroup that was formed to review the evidence related to childhood and adolescent depression, comprised of pediatricians, psychiatrists, and psychologists.
	Intermountain Healthcare	• Learn how to help clinical groups develop and implement evidence-based practices to address childhood depression, complete screening, and develop evidence-based strategies to lessen the risk of suicide.	• Both tools implemented in a few outpatient pediatric behavioral clinics and pediatric community-based care clinics and reviewed by the mental health integration team (pediatricians, psychiatrists, psychologists, social workers).
Antipsychotics for the Prevention and Treatment of Delirium	**Kaiser Permanente Northwest**	• Learn how to get evidence to frontline clinicians.	• Both tools implemented in the hospital medicine group at one hospital among hospital medicine physicians.

Topic	LHS	Implementation Goals	Implementation Approach
Both Topics	**Lehigh Valley Health Network**	• Support and inform decisions related to providing resources to diagnose and treat pediatric patients with depression and mitigate challenges to accessing resources for mental health as they relate to pediatric patients. • Understand how the tools could enhance any foundation for care pathways on delirium.	• Both childhood depression tools implemented at the family health center and the behavioral medicine clinic with faculty and residents. • Both delirium tools implemented with family medicine faculty, family medicine residents, and hospitalists.
	Northwell Health	• Help better understand how to implement standardized approaches to care to reduce variability in outcomes.	• Both childhood depression tools implemented in pediatric behavioral health and collaborative care settings among psychiatrists. • Both delirium tools implemented in one hospital and reviewed and used by hospitalists and one pharmacist.

AHRQ = Agency for Healthcare Research and Quality; EPC = Evidence-based Practice Center; LHS = learning health system

Implementation Support Activities

Prior to and throughout the implementation period, the AIR team supported the LHSs in developing their approaches for implementing the tools. As detailed in this section, AIR coaches held multiple meetings with the LHS panelists and implementation teams to assist them in selecting tools and topics, developing and revising implementation playbooks, and providing ongoing support. Because of the COVID-19 pandemic, AIR provided all support virtually.

Startup Support

Starting with the October 2019 LHS panel meeting and continuing through phone discussions with panelists and other stakeholders in November 2020 and January 2021, AIR coaches provided guidance to LHS panelists on (1) achieving system consensus on selecting the EPC report topic(s) and (2) selecting at least one of the tools for implementation. Coaches provided a detailed description of each EPC report topic to assist panelists in identifying tool topics that were strategically aligned with their system needs. We used the Consolidated Framework for Implementation Research (CFIR)[18] to guide discussions about the factors that are likely to influence implementation success across LHS target settings. Appendix D discusses this framework and how we applied it during the startup support period.

Developing Implementation Approaches

Because organizational structure and learning capacity varied among the LHSs, we worked with LHS panelists to plan the implementation approach for each system's specific context. Following the initial meetings, we documented information relevant to the planning in a playbook to establish a mutual understanding of how the selected tool(s) would be implemented (see Appendix E for a playbook template). The playbook included information about the following:

- The process to review and implement evidence
- Product selection
- The implementation goals

- The current practice guidelines
- The implementation team
- The target audiences for implementation
- The implementation process and timeline

In January 2020, we continued working on more detailed planning for implementation with each LHS by meeting with the LHS panelists or their designees to understand their systems' evidence-seeking infrastructures and processes and how the tools might fit within those existing practices. To develop each LHS's implementation approach, we asked a series of questions about past resource experience and any plans for the Summary of Findings and Visual Dashboard tools (Table 6). We collected information about each health system's use of current evidence during these meetings to understand the implementation context. We asked similar questions as part of the evaluation interviews to understand tool user context and to learn how users felt the tools compared with other evidence resources they used. We describe the details of LHSs' evidence use in the Key Findings section of this report.

Each LHS designated and specified a local implementation team and champion; they also identified their system's target users based on the tool(s) and topic(s). We encouraged champions to ensure opportunities for potential users to provide input into their implementation plan, and to work with local leaders to ensure their buy-in to the planned approach. In late 2020 and early 2021, we reviewed the playbooks with each LHS implementation team as a starting point for completing and finalizing the implementation plans.

Table 6. Discussion questions about current evidence use and plans for tool implementation

Current Evidence Use	Plans for Tools
• Does your system have a formal or informal group that is responsible for bringing evidence forward for consideration and application to care delivery? • Have you or has your system used information from systematic reviews and EPC Program resources in the past? • Do you or does your system use resources based on systematic reviews and EPC Program resources like the one(s) you have selected to test? • What was your experience with those evidence resources? • Who were the evidence resource users? • What systemwide action steps might be taken following an evidence review? • How did the format and content of the resource influence the approach to implementation?	• Who are the intended target users for the selected report/topic? • What are the roles of the people introducing the tool(s) to the LHS? • What are the roles of the people who are targeted to use the tool(s)? • When and how will the tool(s) be introduced to the implementation team and end users? • What background information might be relevant to the selection of evidence report topic(s) and tool(s)?

EPC = Evidence-based Practice Center; LHS = learning health system

Ongoing Implementation Support

To launch the implementation period, we held a virtual kickoff meeting, followed by individual coaching sessions (virtual site visits) to educate and support each LHS's implementation. Toward the end of the implementation period in June 2021, we held a panel meeting during which panelists, implementation champions, and team members discussed their use of the tools. In the following section, we provide more detail on the support we provided throughout the implementation period, which concluded at the end of July 2021.

Implementation Kickoff Meeting

In February 2021, AIR held a meeting with LHS panelists and implementation champions and team members to officially launch the implementation period. During the meeting, we provided a live demonstration of the LHS pilot website and the Summary of Findings and Visual Dashboard tools. We also let LHS representatives know that we would provide them with desktop and pocket user guides (included in Appendix F) to help them access the website and learn how to use the tools. Then, the AIR implementation and evaluation teams reviewed key elements of the implementation and evaluation plan. After this broad overview, LHS representatives introduced their implementation teams and shared their initial plans for using the tools.

Virtual Site Visits

In March–May 2021, coaches held individual meetings with the champions and their teams, during which they again introduced and demonstrated the tools. The goals of the meeting were to (1) support awareness and training on use of the tools, and (2) refine the implementation playbook. Prior to the session, LHSs outlined their support needs by requesting (1) a project description with topic and tool overview, (2) an indepth tool navigation session with time for questions and answers, and/or (3) a high-level overview for executive leadership. These individual sessions allowed coaches to engage with LHS implementation champions and teams, providing time to introduce and demonstrate the tools as requested. After the initial site visit, coaches distributed the desktop and pocket user guides to LHSs to support users in learning to access and navigate the tools.

We followed up with additional coaching calls, as needed, to (1) provide additional information, assistance, guidance, and support and (2) monitor progress and discuss solutions to any challenges that occurred during implementation. Coaches also held ad hoc meetings with LHS implementation teams to monitor progress and discuss solutions to challenges that occurred. We offered to hold additional meetings across all LHS implementation teams (e.g., Community of Practice meetings); however, LHSs were not interested in attending these meetings.

Panel Meeting on Tool Implementation Experiences

We facilitated an implementation team meeting in June 2021, during which LHS panelists and implementation champions and team members discussed their experiences using the tools. Overall, the LHS representatives saw the tools as good education tools and appreciated how the information from the EPC Program reports was presented in the tools. During the meeting, LHSs broke into groups by topic (delirium or childhood depression) to participate in facilitated discussions about the tools.

In the childhood depression tool discussion, representatives from Denver Health, Hawaii Pacific Health, Intermountain, and Northwell Health provided feedback on (1) comparisons of the AHRQ tools to UpToDate®, an evidence-based clinical decision support tool; (2) the statistical presentation of information in the tools; and (3) the provision of continuing medical education (CME) credits to encourage use of the tools.

In the delirium tool discussion, representatives from Kaiser Permanente Northwest (KPNW), Lehigh Valley Health Network (LVHN), and Northwell Health described the challenges they had in using the tools, including (1) finding a central location for the tools so that they could be easily accessed and (2) the difficulty of using the tools at the point of care. KPNW was exploring

how to integrate the tools into an order set, but ultimately posted the tools on an intranet site for ease of use. LVHN was unable to find a central location to store the tools and relied on email to share the link to the tools.

Challenges Encountered Prior to and During the Implementation Period

Beginning in March 2020, ongoing events related to the COVID-19 pandemic affected the plans for implementation and evaluation. LHS panel members were engaged in their systems' efforts to address the health crisis. Under direction from AHRQ and in response to LHSs' needs and input about whether and when they could continue to participate in the project, AIR stopped all activities involving the panelists until November 2020, when LHS panelists and implementation teams were better able to engage in the project. We used this time (March–November 2020) to further refine the Summary of Findings tool. To maintain relationships with the LHSs, we sent brief, monthly updates with information about the project and links to relevant AHRQ meetings and reports, including those related to COVID-19. We converted in-person activities (e.g., site visits, panel meetings) to virtual activities and shortened the implementation time period. Prior to and during the implementation period, we experienced delays in LHS engagement as a result of (1) the availability of LHS panelists to serve as implementation champions during the COVID-19 pandemic, (2) personnel changes, and (3) scheduling virtual site visits with LHS implementation teams.

- ***Availability of LHS panelists to serve as implementation champions during the COVID-19 pandemic.*** Many of the LHS panel members initially planned to be implementation champions. Due to COVID-19-related surges in patient volume, LHS panel members, particularly those in administrative or hospital leadership roles, needed to focus their time on their health systems' efforts to address the COVID-19 crisis. Several panel members contended with competing health system priorities throughout the COVID-19 pandemic and chose to support clinical staff who were recruited to be champions.
- ***Personnel changes.*** A few LHSs experienced personnel changes (as would be expected with any organization, even outside of the pandemic) over the course of the 3-year project, necessitating changes in implementation champions. One such LHS was unable to find a replacement who could shepherd tool implementation toward completion; pandemic-related staff challenges also may have played a role in the inability to find a replacement. Ultimately, this LHS elected not to participate in tool implementation.
- ***Site visit scheduling issues.*** In light of the pandemic and the limited bandwidth of the LHS implementation teams, it was often challenging to schedule the virtual site visits. Coaches from the AIR team made themselves available and were flexible in adjusting to the needs of implementation champions and held ad hoc meetings to provide additional information, assistance, guidance, and support as requested.

Evaluation of Tool Implementation

The American Institutes for Research (AIR) conducted an evaluation of the learning health systems' (LHSs') implementation of the tools in July and August 2021. The following section describes the approach and methods we used in the evaluation and details our key findings.

Evaluation Approach and Methods

The process evaluation aimed to understand the LHSs' experiences in implementing the tools and how well each tool overcame barriers to uptake of the Evidence-based Practice Center (EPC) reports. The goals of the evaluation were to

- Understand how to help LHSs use findings from Agency for Healthcare Research and Quality (AHRQ) evidence reports
- Learn how well the tools have overcome the barriers to EPC uptake
- Identify ways to further refine the tools
- Gain insights into LHSs' experiences implementing the tools
- Develop recommendations for AHRQ to consider when developing future EPC Program resources

As described in more detail in the following section, AIR collected qualitative data during the implementation and evaluation period and analyzed website use data from the implementation period. Members of the evaluation team attended meetings that implementation coaches held with LHSs; the team also analyzed the transcripts from these meetings. They also reviewed implementation playbooks for each LHS. Evaluation team members conducted interviews with LHS leadership and clinical staff who reviewed and used the tools during the implementation period; the team also analyzed transcripts from these interviews. We also analyzed pilot website utilization metrics from the implementation period.

Research Questions

During the implementation and evaluation period, we focused on the following research questions:

- How have the tools been incorporated in the system's evidence review process?
- What are the experiences of the LHS leadership and clinical staff in implementing their chosen tools?
- What other evidence use resources are LHSs accessing following exposure to the selected tools?
- What changes occur at the LHSs as a result of what is learned from the tools and other sources that the LHSs access or develop based on these tools?
- What contextual factors shape the adoption, implementation, and sustainability of the tools, the tool content, and the related changes that occur as the result of tool use?
- What are the barriers to and facilitators of use of the tools and application of the evidence to make changes?
- What are the opportunities to improve the tools?
- What can other health systems learn from the LHSs' implementation of the tools?

Evaluation Framework

The refined Consolidated Framework for Implementation Research (CFIR) model (Appendix D) provided a framework for the evaluation. The framework includes four elements of implementation: tool usability, tool use, tool adoption, and evidence adoption. Within each of these elements, we identified relevant domains from the refined CFIR model, as shown in Table 7.

Table 7. Implementation elements and associated CFIR domains and definitions

Implementation Element	CFIR Domains	Definition
Usability	• Advantage • Acceptability • Compatibility • Feasibility	• How easily LHS staff could use tool features, such as how easy the tool was to navigate, efficiency of locating information, ease of use after returning to the tool later, and how well they like the tool. • *Note:* The evaluation focused on ease of navigation; earlier cognitive interviews focused on the other elements of usability.
Use	• Appropriateness • Fidelity	• Extent to which LHS staff were actively engaged in reviewing the tool and considering how the content applied to the LHS patient population and current practices.
Tool adoption	• Adoption • Reach	• The tool's intended use compared with its actual use. • Extent to which the LHS leaders chose to share the tool(s) within their system for others to review and with whom.
Evidence adoption	• Actionability • Effectiveness	• Whether systematic changes have been implemented to support the adoption of evidence, such as policy changes or changes in the electronic health record system.

CFIR = Consolidated Framework for Implementation Research; LHS = learning health system

We also assessed how the implementation context and approach influenced tool uptake, based on information gathered during virtual planning meetings and site visits during the implementation period, as well as during LHS staff interviews after implementation ended. In particular, we considered the following:

- The LHS's infrastructure related to how they use evidence
- The role of the LHS lead who introduced the tool(s) to intended target users
- The relevance of selected tool(s) and topic(s) to LHS needs and priorities
- How tool format and context influenced implementation approach
- How well users believe the tool(s) informed action steps (e.g., plans related to quality improvement programmatic decisions and clinical care decisions)—specifically, how effectively the tool(s) clarified evidence so that clinicians could more effectively communicate evidence to patients for shared decision making, education, or other purposes

Data Collection and Analysis

AIR collected data from the LHSs during and after their implementation period. In the following section, we describe the data sources and our approach to data analysis.

Implementation Data Collection

Throughout the implementation period, we gathered information shared during virtual meetings that AIR coaches held with LHSs and used to compile the implementation playbooks and plan the implementation approach. We also gathered information shared during virtual site visit meetings in spring 2021 and during an LHS implementation team meeting held in June 2021. During these meetings, as implementation team members reviewed and confirmed topic and tool selection and each LHSs' implementation plan and approach, we captured and documented information on each LHS's evidence review process, contextual factors related to implementation of the tools, goals for the use of the tools, strategies to implement the tools, user experiences with and impressions of the tools, and successes and challenges related to tool implementation. Research assistants took notes during each meeting. We also transcribed recordings of each meeting. We created profiles to capture and document details on each LHSs' implementation approach, including the progression from planning to actual implementation.

Post-Implementation Data Collection

In addition to the data collected during the implementation period, the AIR team conducted 60-minute interviews in July and August 2021 with health system leaders and clinical staff who reviewed and used the tools during the implementation period. Because of the shortened implementation period, we altered our original evaluation plan. Instead of conducting two interviews—one during implementation and one after implementation—with LHS clinicians reviewing and using the tools, we interviewed clinicians once, following the implementation period. In addition, given that the pandemic was ongoing, and that, during the evaluation period, the United States was experiencing another surge in COVID-19 cases, we interviewed fewer people than originally planned. Even with this limitation, we were able to gather a variety of viewpoints and a wealth of information from a total of 27 administrators and clinicians across the six LHSs (Table 8). To identify the interview candidates, we asked each LHS implementation champion to identify three to five leaders and clinicians who reviewed and used the tools during the implementation period. We then worked with a liaison or directly with the interview candidates to schedule the interviews.

Table 8. Number and roles of interviewed staff for each learning health system

System	Number and Roles of Interviewed Staff
Denver Health Medical Center	• Two clinical directors
Hawaii Pacific Health	• One vice president • Four clinical directors
Intermountain Healthcare	• Two clinical directors • One clinical manager
Kaiser Permanente Northwest	• One clinical director • Two clinicians
Lehigh Valley Health Network	• Two clinical directors • One residency program director • Two clinicians
Northwell Health	• Three vice presidents • Three clinical directors • One clinical manager

Researchers used semistructured interview guides—approved by AIR's Institutional Review Board and the Federal Office of Management and Budget—to gather information during each 60-minute discussion with LHS leaders and staff. The interview questions were designed to separate feedback about the tools from feedback about the evidence. Prior to each interview, interviewers reviewed background data collected during the implementation phase. Research assistants took notes during the interviews, and we recorded and transcribed each interview. During the interviews, we collected information on any changes and updates to the implementation plans, how the tools were used and by whom, user experiences with and impressions of the tools, relevance of the tools to the LHSs, the costs and benefits of the tools, and whether the LHSs took any actions after using the tools—in terms of changes in clinical practices or decision making at an individual or systematic level—and, if so, what those actions were.

Throughout the data collection period, the evaluation team met to discuss and document the themes that emerged during the interview process and the insights that interviewers obtained from interacting with the LHS leaders and staff during the interviews. We analyzed the transcripts of the interviews to (1) more formally assess user impressions of and experiences with the tools and (2) capture recommendations for improving the tools. We used a priori and inductive methods and NVivo qualitative data analysis software to analyze the transcripts. We developed a list of codes using the modified CFIR model (Appendix D) as a guiding framework and referring to transcripts from meetings that implementation coaches held with LHSs as well as the implementation playbooks. The coding team ensured consistency in the way the codes were applied by agreeing on operational definitions of the revised code list. Two team members coded one transcript, making note of places where additions to, revisions to, or deletions to the codes were needed to better fit the data. To measure interrater agreement, we used Cohen's Kappa (until an agreement level of 0.80 was achieved between the two coders). We resolved any discrepancies in application of the codes by consensus.

We analyzed the coded data by tool type, evidence topic, and purpose for seeking out evidence, using the constant comparative method and considering the participant's job role.

Website Utilization Metrics

Using Google Analytics, we analyzed website utilization metrics on LHSs' use of the pilot website during the implementation period. Table 9 presents these metrics and their definitions.

Table 9. Website utilization metrics

Metric	Definition
User	A person who interacted with the LHS pilot site.
Sessions	Overall number of website visits. *Note:* If a user is inactive for 30 minutes or more, any future activity is attributed to a new session.
Sessions per user	The average number of times someone came to the LHS pilot site.
Page	Number of pages visited on the website. Each URL associated with a tool is considered a page. *Note:* The Visual Dashboard has two URLs (one URL per report). The Summary of Findings has more than 24 URLs (the URL changes when users choose filters; for example, for the Depression report, there are more than 90 URLs).
Pages per session	The average number of pages someone viewed during a session. Repeated views of a single page in a session are counted.
Average pageview duration	The average length of time someone spent per page.

LHS = learning health system

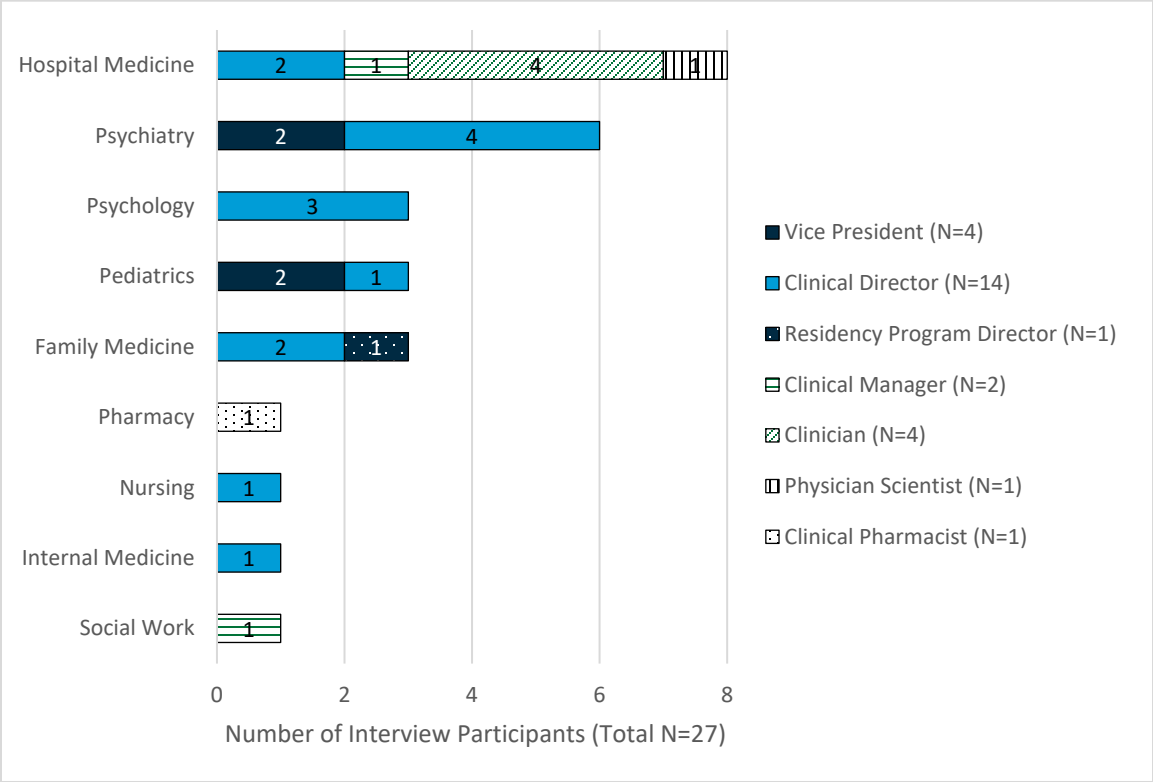
Key Findings

We begin this section by describing the characteristics of the interview participants and each LHS's evidence use structures and processes. We then report on the topics selected by the LHSs and how they approached implementation and provide a summary of website utilization during the implementation period. Finally, we describe the interview findings, focusing on: (1) participants' engagement with the tools, their use of other evidence resources, and their impressions of how those resources compare with the tools; and (2) participants' impressions of the tools and the information contained in the tools. We present reasons participants or the staff they oversee review the evidence, their feedback on the tools and the tool content, and whether what they reviewed in the tools might lead to practice changes.

Characteristics of Interview Participants

The 27 LHS leaders and staff to whom we spoke had varied roles and clinical specialties or licenses. As presented in Figure 9, we spoke with multiple hospitalists, psychiatrists, psychologists, family medicine physicians, and pediatricians, as well as an internal medicine physician, a pediatric nurse, a licensed clinical social worker (LCSW), and a clinical pharmacist. About three-quarters (21) of the participants held one or more administrative positions, such as vice president, medical or department director, quality director, training or residency program director, or clinical manager. The remaining six participants were clinical staff, comprised of four hospitalists, one hospitalist/physician scientist, and one clinical pharmacist. Most (21) of the 27 participants were asked by the implementation champion at their health system or another member of the implementation team to review and use the tools. Five participants were implementation champions at their health system, and one participant was both a panelist and an implementation champion.

Figure 9. Number of interview participants by clinical specialty/license and primary role



Implementation Context and Approach

In the following section, we describe how the six LHSs review and use evidence. We also discuss their implementation approach, including reasons for selecting the tools and topics, contextual factors that influenced their approach, and locations in which the tools were implemented. We also describe LHSs' interactions with the tools on the pilot website.

Use of Evidence at the LHSs

Evidence review process. The six LHSs use three different approaches to review and adopt the latest evidence on various clinical topics: (1) structured processes; (2) adaptation of national systemwide guidelines; and (3) committee discussions.

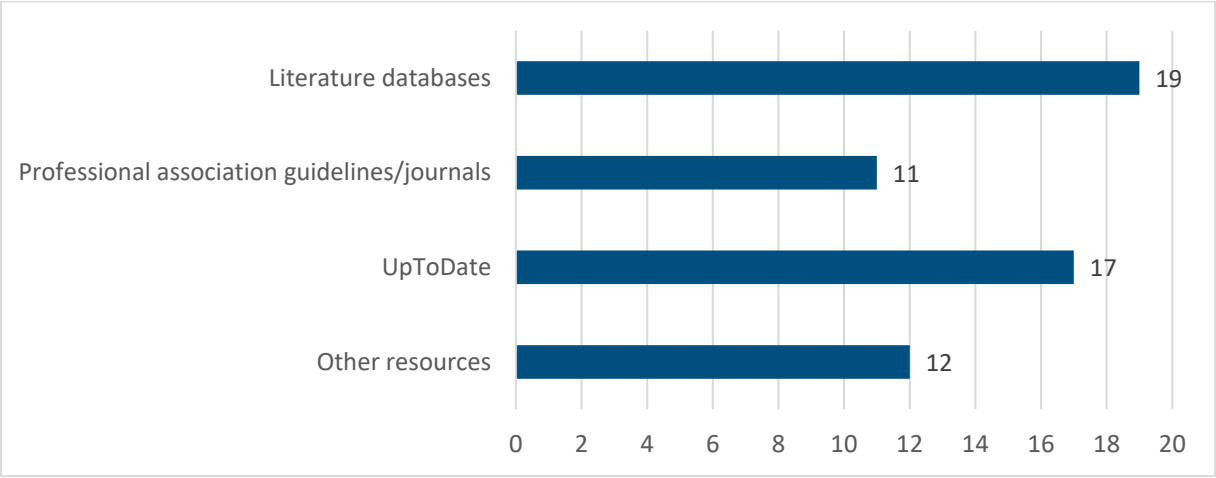
- ***Structured processes.*** Four LHSs—Hawaii Pacific Health, Intermountain, Lehigh Valley Health Network (LVHN), and Northwell Health—use a structured process to review and adopt evidence for clinical areas that are identified as priorities. For example, at Intermountain, each clinical program selects high-priority areas and then develops and revises a flexible implementation playbook, administers assessments to address practice gaps, conducts visits at potential pilot sites to access barriers and facilitators, and pilots the practice change. A residency program director at LVHN emphasized that the health system "is very invested in and making sure that we're doing everything we can do by evidence-based medicine. It's a common cultural practice."
- ***Adaptation of national systemwide guidelines.*** At Kaiser Permanente Northwest (KPNW), a national guidelines group creates clinical guidelines based on a review of

evidence-based practices; these guidelines are then adapted to the system's regional context.

- ***Committee discussions.*** At Denver Health, committees using the problem-solving and continuous improvement method Lean Six Sigma discuss the evidence. However, the system might not implement a specific initiative or rapid-cycle change based on that evidence. A clinical director at Denver Health commented, "From a boots-on-the-ground standpoint, the clinical staff largely are functioning independently and only occasionally are then becoming involved in discussions about specific evidence-based protocols and how to implement those."

Use of evidence-based tools other than those developed by AHRQ. The health system leaders and clinicians to whom we spoke reported that they use a variety of tools and resources to review the evidence on clinical topics. As shown in Figure 10, 70 percent (19) of the 27 participants reported that, to investigate clinical topics and develop clinical pathways, they used literature databases—such as PubMed, Google Scholar, and other database services available through their health system—and professional guidelines and journals. Almost as many participants (17) reported that they use UpToDate—an evidence-based clinical decision support resource—in patient encounters for quick answers to clinical questions. Some interview participants also used other evidence-based resources that were easily accessible through their mobile phones and electronic health records (EHRs), such as DynaMed®, Lexicomp®, and epocrates®. Several clinicians also reported that they learned about the evidence through system-developed clinical practice guidelines, grand rounds presentations, and program manuals.

Figure 10. Interview participants' use of evidence-based resources



Comparison of AHRQ tools to other evidence-based resources. Almost three-quarters (20) of the 27 interview participants thought the Summary of Findings and the Visual Dashboard were an improvement on resources they currently use. Consistent with feedback shared at a June 2021 panel meeting by LHS representatives who were using the tools, some participants (from two LHSs) thought the tools provided a good synopsis of the evidence and were more informative than resources such as PubMed and Google Scholar:

> *"Especially for the topic for antipsychotics for prevention and treatment of delirium, [the] main findings portion [of the tool] is succinct. It's very direct and it's very helpful just summarizing what we do know… This is good for large scale policies and culture shifts that we would want to ensure everyone is aware of."*
>
> —Clinical director, hospitalist

Some participants (from three LHSs) found the tools easier to navigate than other evidence-based resources such as UpToDate, PubMed, and journal articles:

> *"Visually, [the tool] looks really sharp and … is similar to our clinical decision-making tools and much easier to digest than UpToDate."*
>
> —Hospitalist

According to several clinical directors—from three LHSs—the tools provided more detailed information than they were able to access through resources that were accessible through their EHRs (e.g., DynaMed, UpToDate). Despite these benefits of the tools, during site visit meetings with AIR coaches and during a June 2021 panel meeting, LHS participants shared several disadvantages of the tools when compared with UpToDate, including that (1) the tools do not provide recommendations when the evidence is unclear, (2) they do not offer continuing medical education (CME) credits, and (3) the tools are not as useful at the point of care.

Several participants felt the tools were not as easy to understand or as useful as other evidence-based resources. One vice president found the tools to be "unwieldy," and a clinical director found it harder to understand the visual dashboard than UpToDate in that it was hard to interpret the evidence quickly at the time of a patient encounter. Another vice president felt that, although the tools were "scientifically complete," clinicians would be more likely to use UpToDate to determine how to proceed in certain clinical situations.

Awareness and perception of AHRQ resources. Among interview participants, there was a low level of awareness and use of the EPC Program reports prior to the implementation period. Some participants (from five LHSs) were aware of the AHRQ EPC Program and its resources prior to their involvement in tool implementation, but they had not often reviewed the resources. Several other participants (from three LHSs) reported that they became aware of the EPC reports only after they joined their system's tool implementation team. A few other participants (from two LHSs) remained unaware of the EPC Program and its resources, even after using the tools. Some participants (from four LHSs) reported that reviewing and using the tools had reinforced or increased their appreciation of the thoroughness of AHRQ resources.

Implementation Plan and Approach

Selection of tools and topics. When considering the topics to implement, five LHSs selected topics that matched their own clinical priorities, and one selected a topic (delirium) that could be implemented in one clinical setting (Table 10). Five LHSs—Hawaii Pacific Health, Intermountain, KPNW, LVHN, and Northwell Health—chose to implement both the Summary of Findings and the Visual Dashboard. One LHS—Denver Health—selected the Visual Dashboard; However, given that both tools were available on the pilot website, interviewees at this LHS said they reviewed and used both tools.

Table 10. Reasons LHSs selected specific tools and topics

Topic	LHS	Reason for Tool/Topic Selection
Treatment of Depression in Children and Adolescents	**Denver Health**	• Childhood depression is a top priority for the system, which operates 17 school-based health centers. • The Visual Dashboard (1) aligns with a strategic initiative on the use of evidence to reduce waste and (2) is a way to communicate information consistently across the system.
	Hawaii Pacific Health	• Childhood depression is a priority for the system, where they (1) systematically screen children ages 18 and older for depression, (2) measure and monitor outcomes related to childhood depression, and (3) have workgroups addressing the topic. • Review of both tools will help the system learn about the current evidence on how to treat children with depression.
	Intermountain Healthcare	• Addressing childhood depression aligns with the goals and key performance indicators of the system's executive leadership team and board of directors; the behavioral health clinic program has been screening for depression and is working on mitigating the risk of suicide; and the office of patient experience is focused on childhood depression. • Both tools will help collaborative care practices and specialty behavioral outpatient clinics learn how to help different clinical groups develop and implement evidence-based practices.
Antipsychotics for the Prevention and Treatment of Delirium	**KPNW**	• Both tools on the prevention and treatment of delirium can be implemented in one department (hospital medicine) among 30 clinicians, whereas the childhood depression tool would have had to be implemented in multiple departments, which did not seem feasible.
Both Topics	**LVHN**	• Both topics are relevant for the health system; the system implemented a pediatric depression pathway that focuses on using appropriate treatment and assessment for remission. • The LHS planned to get feedback from frontline clinicians on both tools.
	Northwell	• Delirium is a relevant topic because the system is implementing a systemwide effort to address delirium, focused largely on patients in the ICU and critical care; the system would like to expand the effort to other units where delirium tends to occur. • Treatment of childhood depression is relevant, as the system has a large behavioral health hospital and a children's hospital. • The LHS selected both tools to enable teams to determine which would be a good fit.

ICU = intensive care unit; LHS = learning health system.

The influence of the COVID-19 pandemic on LHSs' implementation approaches. LHSs' implementation plans took shape over the course of 6 months to a year, as implementation teams—led by health system vice presidents and clinical directors—developed an understanding of what the tools and the tool content offered. The COVID-19 pandemic prolonged the planning phase of the project. As COVID-19 took hold in their communities and taxed system capacity, the health system champions and teams were faced with (1) developing an implementation plan that could feasibly be carried out and (2) anticipating when the number of COVID-19 cases would drop so that leadership and staff could participate in implementation. The information that follows details how the pandemic impacted implementation capacity and created logistical challenges for implementing the tools in the health systems.

- ***Implementation capacity.*** In particular, because of the COVID-19-related delay in the implementation period, there was less time for implementation in the LHSs than originally planned. Five of the LHSs began implementing the tools in spring 2021 and one began implementation in summer 2021. Once the tools were shared beyond the implementation teams, the implementation period averaged 1–2 months, much shorter than the original 12 months AIR had envisioned for the implementation period. However, the surges in COVID-19 cases during this time—and resulting increase in health system activity—meant that clinicians often did not have time to review and use the tools more than once or twice. For example, the implementation champions at Intermountain initially planned to implement the tools at a couple primary care clinics that were working on improving their depression screening process by working with a team that integrated mental health providers into primary care settings. However, because of the pandemic—combined with the shorter implementation period and clinicians' other priorities—tool implementation was limited to a few clinics. According to one leader at Intermountain, the implementation team's original intentions "fell by the wayside" because people were busy. He said, "Despite our best intentions, we really never got [the tool] pushed out into primary care," as the LHS did not have a leader with the bandwidth to champion implementation of the tool in primary care.
- ***Logistical issues.*** At Hawaii Pacific Health, the LHS panelist—who was also the lead implementation champion—initially wanted to implement the childhood depression tool in a pediatric workgroup that would use the tools as a starting point for reviewing the evidence. When the LHS panelist had to prioritize the system's response to the COVID-19 pandemic and a new implementation champion was brought onboard, the new champion changed the focus of the approach to implement the tools in grand rounds. This approach proved to be problematic because there were logistical issues associated with scheduling the grand rounds. Hence, the original LHS panelist stepped back in and pulled together a workgroup to review the tool. The workgroup was comprised of staff who would have originally been involved, which was back in line with the original plan.

Selection of implementation sites. LHSs implemented the tools in departments where the EPC Program report was clinically relevant. The delirium topic was implemented in intensive care and geriatric settings and the pediatric depression topic was implemented in behavioral health settings and primary care sites treating children and adolescents. Implementation teams then considered locations where the tools would be of greatest interest to leadership and clinicians to increase the likelihood they would engage fully in the implementation. For example, the implementation champion at Northwell Health for the delirium topic engaged an interdisciplinary group of individuals who did clinical work or research focused on delirium at one of Northwell hospitals:

> *"We decided to target the hospital that I'm at just because I'm very aware of the different projects, such as a pilot and bringing together the leaders who clinically are involved in initiatives related to this topic."*
>
> —Clinical director, hospitalist

An implementation champion at Northwell Health for the childhood depression topic similarly focused the effort on a group of clinicians who were already invested in the topic—clinicians working with children and adolescents in behavioral health settings:

The implementation team decided on behavioral health settings "because in the psychiatric clinic, as well as the psychiatric inpatient service, I think that the faculty and the trainees are already very familiar with the evidence… this is what they do day to day."

—Vice president, psychiatrist

After selecting specific departments and clinical settings for implementation, implementation champions used different approaches for introducing the tools:

- Northwell Health and Hawaii Pacific Health convened stakeholder groups to review the tools.
- Denver Health initially formed an internal review committee comprised of nine clinicians to review the tool. To increase chances of participation in tool implementation across various departments (e.g., school-based health centers, outpatient behavioral health departments, pediatric care clinics), the implementation champions stressed the possible real-time benefit of the tools, given the increased need for treatment of depression and anxiety during the pandemic.
- Prior to rolling out the tools to outpatient pediatric behavioral health and community-based clinics, Intermountain Healthcare's implementation champions first introduced the tools to the pediatric behavioral health service line's practice council, which is comprised of 12–13 people representing psychology, social work, and psychiatry.
- LVHN used a similar approach, first introducing tools to faculty and residents in meetings, lectures, and educational rounds before rolling out the tools to other clinicians.
- In the wake of the COVID-19 pandemic and the surge in COVID-19 cases, the LHS panelist for KPNW—who also served as the implementation champion—expressed concern about provider capacity; as a result, implementation was limited to the hospital medicine department in one of KPNW's hospitals, where the implementation champion felt that physicians would be able to be engaged despite the COVID-19 surge. Links to the tools were included on the KPNW hospitalists' SharePoint site, which is used by hospital medicine department staff to access resources.

Table 11 presents the final locations in which the tools were implemented, as well as the clinician types who reviewed and used the tools.

Table 11. Final locations in which tools were implemented and clinicians who used the tools

LHS	Implementation Location (Clinician Type)
Denver Health	• School-based health centers (clinicians, licensed clinical social workers [LCSWs]) • Outpatient behavioral health department (psychology trainees, LCSWs, psychologists, psychiatrists, nurse practitioners, other clinicians) • Pediatric care clinics (psychiatrists, pediatricians)
Hawaii Pacific Health	• A pediatric workgroup (pediatricians, psychiatrists, psychologists)
Intermountain Healthcare	• Outpatient pediatric behavioral health and community-based clinics (pediatricians, psychiatrists, psychologists, LCSWs)
Kaiser Permanente Northwest	• One department at one hospital (hospital medicine physicians)

LHS	Implementation Location (Clinician Type)
Lehigh Valley Health Network	• Family health center and behavioral medicine clinic (faculty, residents) • Family and hospital medicine departments (faculty, residents, hospitalists)
Northwell	• Pediatric behavioral health and collaborative care settings (psychiatrists) • One department at one hospital (hospital medicine physicians, pharmacist)

Extent of Interaction With Tools

The website metrics provide a general sense of how many people (LHS leaders and staff, as well as the AIR project team and AHRQ staff) accessed and interacted with the Summary of Findings and Visual Dashboard tools from late March to the end of July 2021. Below, we provide an overview of these metrics. Appendix G provides more detail on the metrics, as well as limitations associated with interpreting these metrics.

- **Individuals accessed the tools on the website and returned to the website several times.** The website had 149 users and a total of 311 sessions (website visits). On average, users returned to the website about twice and viewed almost seven pages per session, spending about 1 minute 14 seconds on average viewing the website (with a range of 2 seconds to almost 15 minutes). The Summary of Findings tool for childhood and adolescent depression had a total of 609 pageviews and the Summary of Findings tool for delirium had 408 pageviews. The Visual Dashboard Tool for depression had 161 pageviews and the Visual Dashboard tool for delirium had 146 pageviews. However, the pageviews are not comparable between the tools because of the way data are generated from each tool's URLs.
- **Users bookmarked the website and shared direct page links with their colleagues.** The tool rollout introduced users to the landing page, which then linked to the report data by topic. Most users entered the website by first going to the landing page. With time, some users went directly to a specific tool and report topic instead of first going to the landing page.
- **Users spent a similar amount of time reviewing the Summary of Findings and Visual Dashboard tools.** The overall time spent on the Summary of Findings and Visual Dashboard tools appears to be comparable—around 2 to 3 minutes per visit, regardless of the tool or report topic.

LHSs' Experiences With the Tools

This section describes the findings from interviews with 27 LHS leaders and staff. The findings are divided into four major topics: engagement with tools, purpose for using the tools, impressions of the tools and their content, and impressions of the evidence. We use the following terminology to report the extent that findings were consistent across participants: few (1 or 2), several (3–5), some (6–12), half (13–15), and many (15–27). The terms should be interpreted loosely rather than as a count. During the interviews, we followed semistructured protocols whereby the line of questioning was not exactly the same for each participant. Our questions were influenced by participants' responses to prior questions and by limitations in the amount of time participants were available for an interview.

Participant Engagement With the Tools

Participants spent varying amounts of time using the tools. The exposure of a few participants (from one LHS) to the tools was limited to observing the tool demonstration and then navigating to the tool as they were interviewed for the evaluation. Other participants (from three LHSs) accessed the tool multiple times, seeking out answers to questions they had. Some participants (from five LHSs) reported spending between 30 minutes and 45 minutes initially reviewing the tools. One person explored the tools for 60–90 minutes, while another limited her use to 10–15 minutes.

> *"Initially ... it's [the Summary of Findings, which contains] ... a lot of information and I was kind of stuck on how to go about using it. ... So I just ... kept playing with it until I ... got a little more familiar with it and then I was able to find it [a] little bit easier. It took ... two or three times before I was able to get used to it."*
>
> —Hospitalist

Purpose for Using the Tools To Review the Evidence

Although both tools were designed to be used to inform systems change, when asked about the applicability of the two tools collectively, the participants reflected on how the tools might be used in a variety of situations in which reviewing the evidence from the EPC reports would be useful. Participants most consistently supported use of the tools for informing systems change and clinician training and, more generally, as a refresher on the evidence. The information that follows summarizes participants' perspectives on five ways the tools could be most useful. Exemplary quotations highlighting such use are provided in Table 12.

- ***Systems change.*** Several participants (from four LHSs) thought the tools could help in the development of clinical care pathways and decision support. As an example, one system leader noted that the network was focusing on reducing length of stay, which can be prolonged by delirium. He found the tools to be helpful in considering different antipsychotics and drug dosages. Another clinical leader felt the tools might be useful in developing the LHS's pediatric depression care process model.
- ***Clinician training.*** Several participants (from four LHSs) felt the tools could be used to teach medical students, residents, and fellows and to prepare for lectures. The tools provide trainees with easy access to a repository of journal articles and a summary of the evidence. In addition, the tools can be useful for an impromptu evidence review with trainees, such as during patient rounds or case discussions.

Participants also discussed using the tools to train primary care providers and as a point-of-care reference. Several participants (from four LHSs) felt that primary care providers may find the tools useful for learning about treatment options when specialists are unavailable. For example, a pediatrician practicing in a rural area might access the tools to learn about the evidence for treating depression when presented with a depressed adolescent.

- ***Shared decision making.*** A few participants (from two LHSs) felt the childhood and adolescent depression tools could help them inform parents about the effectiveness of antidepressants and cognitive behavioral therapy as part of a discussion of treatment options. One participant noted that he was unaware of some of the evidence on adolescent suicide risk and will now share what he learned with parents. Another

clinician noted that the tool could be useful for informing parents who have a medical background about depression treatment.

- ***Research.*** Several participants (from two LHSs) thought the tools might aid researchers in developing a research proposal.
- ***Clinical practice.*** Some participants (from three LHSs) and an implementation champion felt that using the tools at the point of care would not be practical because of the time it would take to find information relevant to decision making. The challenge stemmed from both the quantity of information in the tools and the lack of clear guidance supporting one treatment approach over another. In contrast, a few clinicians (from two LHSs) believed that the tools would make it easier to make treatment decisions. Another person noted that she would use the tools to influence colleagues whose antipsychotic prescribing practices were inconsistent with the evidence.

Table 12. Selected quotations: Purpose for using tools

Topic	Quotation
Systems change	*"[The tools] show in a very quick way [that] this is the evidence for why we're recommending this, which also means it's going to be a helpful tool to create those care process models because ... you can quickly look at the evidence."* —Clinical director, psychiatrist *"If the tool had been on the SharePoint site when the hospitalist team was developing an approach to managing delirium in the hospital, they would have used it."* —Clinical director, hospitalist *"For the leader, I think it's very effective to be able to leverage the data that clearly exists and to be able to reference it, lift it and just put it into some of our own documentation."* —Clinical director, hospitalist
Clinician training	*"[The tools] will sharpen and streamline that learning process, which will then therefore streamline the treatment."* —Clinical director and training director, psychologist
Shared decision making	*"The piece with families is important... I could see myself actually pulling this up to educate a family and showing them these studies."* —Vice president and clinical director, psychiatrist
Research	*"This [visual dashboard] is great for academic purposes, for researchers or people having to give presentations, this is great. I can't tell you how many weeks of work or maybe months of work to create something like that, but by numerous people."* —Physician scientist, hospitalist
Clinical practice	*"The tools contain a lot of information, and it isn't clear you can get a quick answer in reviewing all of the evidence…. The busy clinician … would be hard-pressed to really want to dig into the tools unless they had a specific question."* —Clinical director, nurse *"Clinicians won't be able to find the information they need quickly enough from the tools, particularly if they have patients who may cause harm if not treated quickly."* —Physician scientist, hospitalist

Impressions of the Tools and Their Content

This section describes findings about participants' overall impressions of the tools. Table 13, Table 14, and Table 15 include exemplary quotations to further illustrate the findings.

Overall Impressions of Both Tools

- ***Concise synthesis.*** Over half of participants (from all 6 LHSs) liked how the tools synthesized the evidence clearly and concisely. Some participants (from 4 LHSs) appreciated the amount of information the tools included and felt the tools were relevant to their work and patient population. Participants appreciated how the tools allowed them to view the overall results at a glance while, at the same time, they could use filters or the hover function to review more detailed information in aggregate or information specific to one study. Most found the tools were easier to navigate than literature databases and clinical tools such as UpToDate.
- ***Efficient.*** Several participants (from 3 LHSs) commented about how the tools will save staff time searching for publications in PubMed and accessing reports and studies. According to one participant, the tools will provide a clinical workgroup with "a good place to start" for an evidence review.
- ***Complementary.*** Almost half of participants (from 5 LHSs) reviewed both the Summary of Findings and Visual Dashboard tools and found that the tools work as a package and complemented each other. Participants' preferences for one tool over another were related to their comfort with interpreting graphics and statistics and their interest in detailed information versus summary information provided in tabular versus graphical format.

Table 13. Selected quotations: Impressions of both tools and their content

Topic	Quotations
Overall impressions	*"The tool is fabulous. It's so much better than having to wade through 1,145 pages. And it will be very useful when there is evidence that is valuable to guide practice… it's a very sophisticated, very useful, slick set of tools."* —Vice president and quality officer, pediatrician *"I really like these tools because it makes [the evidence] really clear. I really like the options on searching, organization, having the information and organized in a really helpful manner."* —Clinical director and training director, psychologist *"This is such a cool way to be able to quickly understand the evidence that saves hours and hours and hours of PubMed searching…. That is crucial for writing a care process model, creating clinical pathways, and providing ongoing education. The summary of findings is helpful to create an evidence-based care process model."* —Clinical director, psychiatrist *"As a system that wants to be cutting edge and state of the art, everything we do should be informed by current evidence so that everyone recognizes that we are up to date with the most effective and current practices. These tools are one more example of accomplishing that mission."* —Vice president and clinical director, psychiatrist

Impressions of the Summary of Findings

- ***Advantages.*** Nearly half of participants (from five LHSs) found the Summary of Findings tool to be concise and easy to scan and understand. Participants appreciated that the filters enabled them to quickly search by drug and treatment approach. A few participants (from two LHSs) commented on how the Summary of Findings was straightforward to use and intuitive.
- ***Challenges.*** Some participants (from four LHSs) who spoke from a point-of-care perspective felt that the Summary of Findings tool would overwhelm clinicians. Several

participants (from three LHSs) found the number of population subcategories in the Summary of Findings tool's drop-down menu to be excessive and a barrier for primary care providers who might be unsure about which diagnosis to select. The participants were referring to the Summary of Findings tool for childhood and adolescent depression, which contains 18 pediatric depression categories, divided by diagnosis and age (7 diagnostic categories for children and 11 for adolescents). These participants were concerned that pediatricians might review the tool and conclude that depression treatment is best managed by behavioral health providers. In addition, one clinical director who reviewed the Summary of Findings for childhood and adolescent depression said there were too many intervention categories to select from (e.g., pharmacologic, nonpharmacologic, combined, head-to-head comparison, collaborative care).

A clinician commented on being unsure of what to do when a patient fits more than one of the available filters (overall, age greater than 65 years, critically ill, palliative, postoperative) in the Summary of Findings tool for delirium. He used the example of a 65-year-old individual who is critically ill and has delirium.

Table 14. Selected quotations: Impressions of the Summary of Findings tool and its content

Topic	Quotations
Advantages	*"The ... verbal evidence summaries were comprehensive and very well written. I think it was a nice overview of what we know and what we don't know."* —Clinical director, hospitalist *"The summary findings, it definitely appealed to me because it just it was straightforward. I could read it quickly and get the gist of everything."* —Clinical director, hospitalist *"[The Summary of Findings tool provided] quick access to the information, glancing over, not spending too much time, but walking away with some information that you retain."* —Hospitalist
Challenges	*"I don't think that many of my primary care colleagues or even the people who we work with in the hospital … they are not going to always appreciate adolescents with the dysthymia versus major depression or some sort of combination, so I really worry that the minute that they see these distinctions, they're going to basically say, 'Call the child psychiatrist, call the child psychologist, let them figure this out.'"* —Clinical director, psychologist *"It took … two or three times before I was able to get used to [the Summary of Findings tool."* —Hospitalist *"Clinicians would like access to basic information to demonstrate a finding is trustworthy, but they wouldn't want to read all the studies. Clinicians prefer bullets points with statements showing a clear advantage of one type of treatment over another."* —Clinical director, family medicine physician

Impressions of the Visual Dashboard Tool

- ***Advantages.*** Many of the participants (from all 6 LHSs) liked the Visual Dashboard and commented on how they were able to quickly review the aggregated study and grasp research findings. Participants' comments centered both on the organization of results, the presentation of forest plots, and the hover feature. Participants viewed grouping the results by risks and harms, benefits, and outcomes as appropriate. The selection of bar chart colors made it easy for participants to distinguish between populations and treatments, and participants found the display of colors attractive. However, one person

pointed out that individuals who are color-blind would be unable to identify what each bar represented. Participants were pleased with how the hover feature showed the number of studies, population size, and statistical results, and also linked to study abstracts.

- ***Challenges.*** Some participants (from five LHSs) commented that it was difficult to interpret the statistics displayed in the Visual Dashboard. LHS representatives attending the June LHS implementation meeting also expressed concern that non-statisticians might have difficulty interpreting the forest plots because they might be unfamiliar with statistical terms and might be overwhelmed by the amount of information presented. Some participants had trouble locating the key to the forest plots and had trouble understanding the different sized bars and dots in the forest plots, and the color of the bars. One person pointed out that individuals who are color-blind would be unable to identify what each bar represented. Participants were confused by the placement of "favored intervention," which was on the right side of the graphic for relative risk studies but on the left side for studies reporting standardized mean difference.

Table 15. Selected quotations: Impressions of the Visual Dashboard and its content

Topic	Quotations
Advantages	"*It was very easy to have a glance to see where the bulk of the evidence was lying. It was fairly easy in that regard to make a decision about what I was going to do next."* —Clinical director and residency program director, family medicine physician *"The ability to hover over, click into, highlight, and emphasize, get to the actual articles, all of that ability to move quickly between sections or screens I think is very well done. The graphics, the whole presentation was nice."* —Vice president and quality officer, pediatrician
Challenges	*"The clinicians found the statistical information to be confusing and have told me that they don't really understand how that would be useful for them in their patient care. It doesn't seem to them like information that they understand."* —Clinical director and training director, psychologist *"The forest plots in the visual dashboard are 'not super intuitive.' It's the way it's presented; I'm having a hard time interpreting it. It's not clear to me the 'favors comparator,' 'favors intervention'—that's not a real clear terminology to me."* —Clinical director, family medicine physician *"Now that I'm looking at this dashboard, you do kind of see. Just scrolling over the bar, I didn't realize that that was an option before until just now. You know, you scroll over the bar on this plot and it does give you the summary. I guess I would probably be a little bit more helpful now that I know how it works. Like I kind of got a little bit overwhelmed by the graph, so I moved from that page."* —Hospitalist

The Influence of Evidence on Practice

This section describes participants' impressions of the adequacy of the tool content, EPC Program report data, and summaries of scientific literature. Participants spoke about the tool content in the context of making treatment decisions that could be informed by the evidence at the system level and when treating individual patients. Table 16 includes exemplary quotations to further illustrate the findings.

Adequacy of Evidence

Some participants (from 4 LHSs) noted that insufficient evidence or a lack of conclusive evidence on the two topics was disappointing. A department director saw the limited evidence as humbling because she thought it was more robust. Another department director commented that clinicians will be hesitant to share the evidence with families because the support for prescribing antidepressants in children is not "very good."

The adequacy of the evidence was also a discussion topic at the June 2021 implementation team meeting. LHS leaders and implementation leads discussed the utility of the tools given the evidence. From a practical sense, they noted that it was problematic to use the tools when the childhood and adolescent depression report shows that there was not enough strong evidence to support clinical practice. Despite the insufficient evidence, they observed that the Visual Dashboard presented clear trends in the data. One leader viewed the lack of evidence as a realization—not a challenge—and saw value in sharing the limitations of knowledge on the topic of use of antipsychotics for treatment of delirium. The group concluded that it was useful to have the evidence available in the tools, even in its limited state.

Practice Change

Participants had different perspectives on how the evidence in the tools would influence practice and how to interpret it for practice. Some participants (from 6 LHSs) felt the evidence for delirium and depression was already consistent with their clinical practice or their system's approach to treatment. A vice president commented that the likelihood of AHRQ-type reports changing practice is small because of the time lag between when studies are published and when the evidence reports are released. However, several participants (from 3 LHSs) said that the tools will help them to stay up to date on available evidence and communicate that their system is committed to practicing evidence-based care.

Despite the lack of robust evidence, reviewing the evidence influenced the thinking of a few clinicians (from 3 LHSs) about antipsychotic prescribing practices, but in opposite directions. One clinician noted that he would prescribe fewer antipsychotics after reviewing the evidence. A second clinician deduced "a touch" of second-generation antipsychotics at night makes sense even though the evidence is weak. A third clinician noted the evidence showing antipsychotics did not increase length of stay confirms his approach to prescribe antipsychotics sparingly. A system leader pointed out that there is a disconnect between the evidence and the reality of everyday practice. Another clinical leader noted that clinicians rely on their overall clinical experience when making treatment decisions as well as their knowledge of the patient being treated; the evidence is not the only consideration.

Table 16. Selected quotations: The influence of evidence on practice

Topic	Quotations
Adequacy of evidence	*"My overwhelming disappointment [is] that we still don't have really great, hard evidence about what works in depression."* —Clinical director, nurse *"[The delirium tool] made it very obvious how little research has been done in the various sort of patient-centered outcomes that would be good to answer… [it is] incredible how little actual research has been done with these medicines that are potentially harmful and used all the time."* —Clinical director, hospitalist

Topic	Quotations
Influence on practice	*"When I took a look at this and saw in the summary that there were very few areas that supported making a change in my clinical practice, I wasn't going to spend a whole lot more time drilling down into all of the different areas."* —Clinical director and residency program director, family medicine physician *"The limit [of the childhood depression tools] is that the main findings are [things] we … already know."* —Vice president and clinical director, psychiatrist *"Everyone has some sort of bout with delirium… Aside from knowing that I would not want to use antipsychotics and knowing that I shouldn't because there is no data, I still might have to use it because of safety concerns, because of resources…There's a disconnect … about how [the evidence] would be applicable to the frontline."* —Clinical director, hospitalist *"It's limited how helpful these tools are because you still are going back to your own personal experience with things. How did it work for your patients in the past and … what are elements in the patient's history, like a family history of a good response, bad response, comorbid issues, … you're basing your clinical decision making [the history] more than a tool, because, again, the tools [are limited by] the lack of robust evidence."* —Vice president and clinical director, psychiatrist

Limitations of the Implementation and Evaluation

When reviewing the findings from this evaluation, the following two limitations should be considered.

- Because of the need to focus resources on the response to the COVID-19 pandemic, LHSs implemented the tools over a 3-month period rather than the 12-month period originally planned. AHRQ wanted to be as flexible as possible with the LHSs during this time to retain LHS participation and engagement in light of these competing demands. Therefore, in some cases, the implementation teams were different than originally planned. Specifically, the tools and their content were tested in clinical environments for which they were not necessarily designed. Ideally, the implementation would have taken place with groups of clinical, operational, and quality leaders who would review and discuss the reports to inform changes or improvements in healthcare delivery, rather than in settings of direct patient care.
- The other limitation concerns the content of the reports. The LHSs collectively selected report topics for the implementation that aligned with organizational priorities. Unfortunately, the scientific literature on the topics selected—particularly in terms of guidance for clinical decision making—is largely inconclusive. The lack of robust and conclusive literature frustrated participants who were hoping to learn about recent research supporting the use of specific treatments to improve clinical practice.

Summary of the Evaluation's Key Findings

Clinical leaders found the Summary of Findings and Visual Dashboard tools to be efficient and useful sources of summarized evidence to (1) inform systems change, (2) educate trainees and clinicians, (3) inform research, and (4) support shared decision making with patients and families. Participants felt the tools improved on the literature databases and search engines—resources they typically rely on to access research reports. Clinical leaders, many of whom were unfamiliar with the EPC Program products, appreciated the thoroughness and quality of the

evidence reviews. They saw AHRQ as a trusted information source. Participants were hopeful that AHRQ would incorporate additional EPC Program reports into the tools.

Although the tools were not designed for bedside use, many participants shared feedback about the tools from the point-of-care perspective. Their comments demonstrated a need for a bedside tool that provides treatment recommendations that are linked to the evidence. Most participants felt that the Summary of Findings and Visual Dashboard tools were not practical for bedside use because of the complexity of the content and the time it would take to find information relevant to decision making.

In comparing the Summary of Findings and Visual Dashboard tools, participants found both tools to be valuable and complementary, although some favored one tool over the other. Participants' preferences were not driven by their job role, but rather by their proclivity for how information is displayed and the amount of detail provided. Most of the participants' suggestions for improving the tools were focused on making minor adjustments to formatting and clarifying the text or graphics.

Participants pointed out that improving tool accessibility by optimizing the content for use on mobile devices is necessary to facilitate health system uptake of the tools. Clinical leaders and clinicians tend to be mobile and thus rely on personal devices to access information on the spot. They routinely rely on specialized medical software applications to look up information during meetings and informal discussions, as well as at the point of care.

Another key finding highlights the need for training resources about tool navigation and interpretation of the statistical content in the tools. Participants who became skilled at using the tools invested time in learning how to locate information and interpret the graphics. LHS leaders and staff have varying levels of understanding of statistical data and seldom have the opportunity to apply this knowledge. Developing training resources to reduce the time and effort needed to become comfortable with the tools is an important next step to reducing a barrier to tool use.

In conclusion, the evaluation shows that LHSs find the Summary of Findings and Visual Dashboard tools to be useful resources for making the EPC Program reports more accessible to health system leaders. The tools have the potential to meet some, but not all, LHS evidence needs, while introducing health system leaders to AHRQ as a resource to help meet their information needs. The ability of the reports to support LHSs in improving the quality of care is limited by the strength and robustness of the evidence, as well as the relevance of the report topics to patient care challenges faced by LHSs. This project provides a model for how AHRQ can engage and collaborate successfully with LHSs to tailor products to system needs and to produce reports on topics of interest to health systems.

Recommendations and Considerations

This section presents recommendations and considerations to improve the tool format, organization, and content, including the underlying evidence. When asked for suggested changes or recommendations, most participants shared ideas to strengthen the tools and the)Evidence-based Practice Center (EPC evidence reports. The recommendations are based on participants' suggestions, as well as our interpretation of the overall interview data. The recommendations are organized into six categories:

1. Presentation of tool content and data
2. Tool access
3. Tool usability and uptake
4. Addition of resources for use at the point of care
5. Considerations for improving the timeliness of the evidence reports
6. Considerations for improving the evidence reports' relevance to health systems

For each recommendation we have assigned a label—short, middle, or long term—based on the expected time and resources required to implement the recommendation. Select quotations from participants about the recommendations appear at the end of this section.

Presentation of Tool Content and Data

Improving the presentation of the content and data will make it easier for users to find and interpret information that is most relevant to their needs. Recommendations include providing summary information that will help users see the big picture and the key takeaways.

- **Revise the labels of the tools on the website home page to make it easier to understand what information is available under each tab (short term).** Using terms familiar to learning health system (LHS) users, rename the tabs at the top of the tool (Report Home, Structured Abstract, Visual Dashboard, Evidence Summary) to more closely reflect the content under the tabs. The improvements will help users better understand what types of information are available and where they can be accessed.
- **Improve formatting of the findings and data (short term)**, as shown in Table 17. Improve the presentation of the text and the data in both tools, ultimately making it easier to find and interpret the data.
- **Add summaries to the Visual Dashboard (short term).** Add a bulleted summary of the key takeaways at the top of the Visual Dashboard.
- **Highlight study publication dates more prominently in the tools (short term).** Users would like to be able to quickly identify when studies were published so they can determine whether a study is recent or whether an older *landmark study* remains the most recent evidence.

Table 17. Recommendations to improve formatting of the findings and data

Summary of Findings	Visual Dashboard
• Reduce column width so that all table information can be seen at once without scrolling across the page. • Bold the key points under the Related Review Findings and Clinical Guidelines tab to make it easier to find the most important information about the evidence.	• Make the forest plot key more prominent so that it is easier to locate on the page. • Revise the forest plots so that the benefits and harms are consistently on the same side of the page. • Make the color of the population size dot in the key the same color as the dots in the forest plot (black or gray). • Increase the font size of the text in the charts to improve legibility.

- **Report findings for the overall population first before providing the option of seeing the results by subpopulations (middle term).** In both tools, report the findings for the overall population with the diagnosis (for example, children with a depression diagnosis). This should be done using both narrative—ideally in the form of bullets—and graphics (e.g., tables in the Summary of Findings tool, forest plots in the Visual Dashboard). This will allow users to see the big picture before they drill down to more detailed information.
- **Summarize the key points for practice with links to the evidence supporting the statement (long term).** The main findings are currently listed under the Report Summary tab. Adding a clickable link to evidence supporting a finding that is relevant to clinical practice would enable clinicians to quickly review the evidence of greatest relevance to their practice.
- **Explore how to further layer information based on key questions clinicians need answers to when treating a patient (long term).** Organize the tool content to match clinicians' thought processes when learning about the evidence surrounding a treatment for a particular patient. The information would be layered from the general population to patients with particular characteristics. Clinicians would be able to select age, comorbidities, and other relevant combinations of characteristics to learn about treatment considerations. This approach could be useful when LHSs are developing care pathways and at the point of care.

Tool Access

Improving access to the tools will help to increase visibility and uptake of the tools. Recommendations include making the tools available on mobile devices and electronic health record (her) systems and applying search engine optimization techniques.

- **Improve navigation from one tool to the other (short term).** Add hyperlinks on each page to enable users to move back and forth quickly and easily between the two tools.
- **Improve access to the tools through mobile devices (long term), EHRs, and smaller laptops (short term).** Most LHS leaders move from place to place during the day, to see patients or attend meetings. Increasing access to the tools through a mobile app or other electronic means would improve LHSs' use of the tools in general and at the point of care. Participants' specific suggestions included:
    - **Optimize the tools for mobile devices.** Health system leaders and providers routinely access information using medical applications on mobile phones. By

optimizing the tools for use on mobile devices, users can access the reports wherever they are.

- **Apply search engine optimization techniques** so the tools appear in search engine results and are ranked at the top of those results when users enter common search terms (for example, "treatment of adolescent or pediatric depression").
- **Encourage LHS to add links to the tools** in their EHR system or on their intranet site.

Tool Usability and Uptake

Improving the usability of the tools will help the tools to be more approachable and user-friendly. Recommendations include enhancing the functionality of the tools to provide more detailed information and providing training resources.

- **Enhance the functionality of the tools to provide more information about the studies included in the report and to be more user-friendly (short term),** as shown in Table 18.

Table 18. Recommendations to enhance tool functionality

Summary of Findings	Visual Dashboard
• Provide information about the studies by clicking on the strength of the evidence column in the tables. • Provide a summary of the findings for a particular intervention by clicking on that intervention.	• Revise the hover feature in the forest plots so that the boxes with detailed information about the studies remains open until the user chooses to close it. • Present the results by population.

- **Provide training resources to help people learn how to use the tools and interpret the data and other content (middle term).** These resources could be added to a new tab on the website for the tools with a clear, plain language label such as *Tool Training Resources*. Potential resources include the following:
  - **A video** demonstrating how to navigate the tools and use the various features to quickly find the most relevant information
  - **Clinical scenarios or vignettes** highlighting how to use the tool features and content to answer clinical practice questions
  - **A flowchart** to demonstrate how to use the tool for a particular patient or case
  - **A statistics primer** to help users understand statistical terms and interpret the data, with elements such as the following:
    - » **A click-through tutorial** that could enable users to access the information they are seeking without reviewing the entire tutorial
    - » **A hover function** incorporated into the tool that could enable users to hover their cursor over a statistical term and open a window with a definition of the term
- **Provide continuing medical education (CME) credits to incentivize physicians and other clinical leaders to use the tools (middle term).** The tools can be certified as CME so that clinicians can earn credits for time spent reviewing the tools and EPC Program reports.

Addition of Resources for Use at the Point of Care

Adding resources to help providers implement the evidence included in the reports will bridge the gap between research to practice, potentially facilitating behavior change and hardwiring evidence-based practices. Such resources include linking to clinician-friendly resources about treatments, such as clinical guidelines, and developing plain language resources for patients and families. These resources could be added to a new tab on the website for the tools with a clear, plain language label such as "Resources to Implement the Evidence" or "Resources to Treat Patients."

- **Link to actionable information to assist with implementation of the evidence (middle term).** Add links to resources that clinicians could use to help implement the evidence, such as links to clinical guidelines produced by professional societies, medication dosing information, or other related information about a diagnosis or treatment supported by the evidence.
- **Develop plain language summaries of the evidence reports or link to plain language resources for patients and families to support shared decision making (middle term).** Develop plain language resources, such as frequently asked questions, videos, or fact sheets that could be shared with patients and families to educate them about the evidence for the treatment or intervention. These resources could potentially be used to support shared decision making. They could also be added to a new tab on the website for the tools with a clear, plain language label such as "Resources for Patients and Families" or "Shared Decision-Making Resources."

Considerations for Improving the Timeliness of the Evidence Reports

Evidence reviews become quickly outdated as new studies are published. LHSs may not have a need for a particular evidence review or be aware of an EPC Program report until well after a report is published. The Agency for Healthcare Research and Quality (AHRQ) should consider ways to increase the timeliness of the information produced by the reports. Considerations include quickly populating tools with EPC Program report data, enhancing the communication plan announcing new reports, updating EPC Program reports of high interest to health systems, and providing updates on reports that are in progress.

- **Populate the tools with new report content as soon as possible** after EPC Program reports are published (short term).
- **Reassess the communication plan to make LHSs aware of new EPC Program reports and the populated tools as soon as they are released (short term).** Many of the health system leaders and clinicians were unaware of the EPC Program or its reports. Work with LHS leaders to create a system through which to notify LHS staff about new reports and to make the tools readily accessible to heath system leaders.
- **Update EPC Program reports of high interest to health systems (middle term).** Health systems' needs for a published report topic may arise 2 or more years after an EPC Program report is published, making the evidence dated. Consider updating reports on topics where new evidence could impact practice and on topics that are of ongoing high interest to LHS. Alternatively, selectively add addendums to reports when a new seminal article has been published.

- **Provide updates on in-progress evidence reports (middle term).** LHSs may be working on an evidence review to meet a system need at the same time an EPC is developing a report. Sharing information while a new evidence report is in progress can save LHSs time and resources. For example, consider posting the list of articles selected for an evidence report that is in progress. Share new clinically relevant evidence that has clinical practice implications as soon as possible rather than waiting until the full report is published. These updates will increase awareness of pending reports and assist LHSs in meeting their evidence review needs.

Considerations for Improving the Evidence Reports' Relevance to Health Systems

- **Proactively engage with health system leaders to identify EPC evidence report topics that are most relevant to their systems (middle term).** For LHS leaders to be motivated to use the tools to inform systems change, EPC evidence report topics must align with health systems' priorities and goals. Continue to draw on an LHS advisory group, panel, or committee to identify *high-value topics* that are of concern to health systems and therefore good candidates for dissemination.
- **Work with health system leaders to focus evidence review research questions so the reports provide maximal guidance relevant to practice (middle term).** Heath systems review evidence reports to find answers to clinical or system problems. They also may be familiar with the literature on a topic. LHS staff with topical expertise may have the knowledge to help focus the review on research questions of greatest relevance to health systems and to identify questions where the literature is sufficiently robust to provide answers.
- **Explore ways that AHRQ could facilitate the creation of a point-of-care tool that provides clinical guidance with links to the EPC report evidence that supports the guidance (long term).** To bridge the gap between evidence and practice, clinicians are in need of a mobile application similar to UpToDate that contains clear treatment recommendations linked to the evidence, such as is found in the EPC Program reports. AHRQ might consider working with the private sector, LHSs, or professional groups to support them in developing such a tool.

Selected Quotations Related to Participants' Suggestions for Improving the Tools

Selected quotations from interview participants about recommendations for each of the six categories are shown in Table 19.

Table 19. Selected quotations related to participants' suggestions for improving the tools

Suggestion Topic	Recommendation	Quotations
Tool Usability and Uptake	Highlight new evidence	*"New clinical findings relevant to practice should be highlighted in the summary so that people recognize that the reason they were unaware of the recommendation is that it is brand new."* —Vice president, psychiatrist

Suggestion Topic	Recommendation	Quotations
	Specify the specific drugs studied (when drug class is named) using hover feature	*"In the Summary of Findings tool, it would be nice to know specifically which ones [second generation antipsychotics] the tool is referring to … it would be nice to be able to hover over the class of drugs and know which ones in particular were studied."* —Clinical director, internal medicine physician
	Training resources	*"Case vignettes would help providers learn how to use the tools. The vignettes could include patient and family questions."* —Clinical director, psychiatrist *"The [statistics tutorial] could have a link to a click-through, concise tutorial (refresher) on how to interrupt the [statistical] evidence. Examples of recommended topics are research designs, definition of terms like confidence intervals and how to interpret data. In addition to links, hovers with information could be added."* —Clinical director, internal medicine physician
	Layer information based on key clinical questions	*"Create layered information based on key questions a PCP may ask. Present the evidence starting with the treatment options a provider would be considering (e.g., CBT for suicidal behavior period or depression). And then branch into specifics about the patient or the treatment to learn what is relevant for this particular situation. A branch may concern subpopulation—CBT for a depressed teenager or a depressed child."* —Clinical director, psychologist
	Mobile versions of tools	*"Is there a mobile version of this in plans either by just easily visible mobile or by app? … We often rely on smaller laptops or iPhones with EMR access. It makes it … more difficult to utilize this tool as effectively [if we have to access it through a computer]."* —Residency program director, family medicine physician *"Most clinicians use mobile devices to look up clinical information both at the bedside and during meetings... As examples, clinicians use apps created by the Infectious Disease Society of America and Vancouver Children's Hospital."* —Clinical director, nurse
Resources for Use at the Point of Care	Provide links to treatment information from the key findings	*"For the Summary of Findings tool, provide a one-sentence statement such as, 'Cognitive behavioral therapy, fluoxetine combined may reduce depression symptoms short term' or 'There is increased suicide rate, but the benefit outweighs the risk.' Ideally, the page would provide a link to drug dosing and side effects and a summary of supporting evidence. The text should be formatted into bullets with key information highlighted using bold and other techniques to make it easy to find information."* —Clinical director, family medicine physician

Suggestion Topic	Recommendation	Quotations
	Resources for patients and families	*"In child psychiatry when we are educating parents, they want to hear what the evidence is. They want to know that this is the first choice for their child…. [It] is helpful … to be able to support our family education or decision making … and explain it [the evidence] to families."* —Vice president, psychiatrist *"The tool would be enhanced by adding links to patient-friendly or family-friendly handouts including a FAQ for common caregiver questions, such as the adverse events associated with antidepressants."* —Clinical director, psychologist
Timeliness of the Evidence Reports	Updates on evidence reports in progress	*"Could a partial set of information … be available so that the reviews are not so dated when they finally get the bow tied around them ... even start off with ... the list of articles so that you also at least know which articles met the standard for review. And then as key questions get answered, more information is provided."* —Vice president, pediatrician
Relevance of the Evidence Reports to Health Systems	Add links to tools in the EHR	*"It [the tool] would have to be somehow integrated into the EHR because no one will go to our institution's website to search for this when they can just go to UpToDate. … In the EHR, it would have to be integrated in a way that it's easily found. Then there would have to be a campaign of informing physicians that this is available."* —Physician scientist, hospitalist
	Layer information based on key clinical questions	*"Create layered information based on key questions a PCP may ask. Present the evidence starting with the treatment options a provider would be considering (e.g., CBT for suicidal behavior period or depression). And then branch into specifics about the patient or the treatment to learn what is relevant for this particular situation. A branch may concern [a] subpopulation—CBT [cognitive behavioral therapy] for a depressed teenager or a depressed child."* —Clinical director, psychologist
	Create an UpToDate-like tool	"*Clinicians would like to have a Web-enabled tool, similar to UpToDate but a tool that improves on UpToDate by linking to the evidence. UpToDate is a popular source of information for clinicians because it skillfully summarizes information and makes it actionable for providers who are treating patients. The tool is organized by conditions and describes the preferred treatment, medication starting dose, and approach to tapering medication."* —Clinical director, nurse

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Appendix A. Composition and Role of the Learning Health System Panel

Composition of the Learning Health System Panel

Table A-1. Learning health systems engaged in the panel

System	Representative	Geographic Reach	System Type and Services Offered
Baylor Scott & White Health[a]	Andrew Masica, M.D., vice president and chief clinical effectiveness officer	North and Central Texas—rural and urban	• Nonprofit health system • 52 hospitals; more than 800 patient access points, including 159 primary care clinics, 554 specialty care clinics, 26 ambulatory surgery centers, and 235 satellite outpatient facilities
Dartmouth-Hitchcock Health[a]	Andreas H. Taenzer, M.D., M.S., professor of anesthesiology and pediatrics and the Dartmouth Institute	New Hampshire and Vermont—mostly rural	• Nonprofit health system • 5 hospitals; 1 children's hospital; 24 clinics
Denver Health Medical Center	Romana Hasnain-Wynia, Ph.D., chief research officer	Colorado—urban and rural	• Integrated academic safety-net health system • 1 acute care hospital/Level 1 trauma center; 11 Federally Qualified Community Health Centers; 18 school-based health centers; a 100-bed non-medical detoxification facility; a health maintenance organization; Rocky Mountain Poison and Drug Safety; and the Public Health Institute at Denver Health • Affiliate relationship with the University of Colorado School of Medicine
Hawaii Pacific Health	Melinda Ashton, M.D., executive vice president and chief quality officer	Hawaii and Pacific Region—urban, suburban, and rural	• Nonprofit healthcare system and Hawaii's largest healthcare provider • 4 hospitals; 1 medical group with more than 70 locations • Pediatrics, obstetrics, gynecology, and family medicine residency programs for the University of Hawaii
Intermountain Healthcare	Todd L. Allen, M.D., senior executive medical director	Utah and Idaho—rural and urban	• Integrated nonprofit health system • 24 hospitals, including 5 critical access hospitals and 1 children's hospital; medical group with more than 2,400 physicians and advanced practice clinicians at about 160 clinics • Affiliate relationship with the University of Utah School of Medicine
Kaiser Permanente Northwest	Leong Koh, M.D., vice president of quality, care, experience, and patient safety	Oregon and Washington—rural and urban	• Integrated nonprofit health system including dental • 2 hospitals; 57 medical, dental, and administrative facilities
Lehigh Valley Health Network	Brian Stello, M.D., vice chair of quality and research	Eastern Pennsylvania—urban, suburban, and rural	• Includes an Accountable Care Organization • 10 hospitals; 1 children's hospital; 29 health centers; 163 owned physician practices through the Lehigh Valley Physician Group

System	Representative	Geographic Reach	System Type and Services Offered
Mayo Clinic[a]	Nilay Shah, Ph.D., deputy director for research	Arizona, Florida, Iowa, Minnesota, and Wisconsin—rural and urban	• First and largest integrated, nonprofit group practice • 2 hospitals and 1 children's hospital in Minnesota; major campuses in Arizona and Florida; network of 99 clinics and hospitals in Iowa, Minnesota, and Wisconsin
Northwell Health	Mark P. Jarrett, M.D., senior vice president and chief quality officer	New York—urban	• Nonprofit health system • 24 hospitals; 3 skilled nursing facilities; 52 urgent care/walk-in clinics; more than 830 outpatient facilities • School of medicine at Hofstra/Northwell
Sutter Health[b]	Dorothy Hung, Ph.D., associate scientist	Northern California—rural and urban	• Nonprofit health system • 28 hospitals; 43 ambulatory surgery centers; 32 urgent care centers; 29 walk-in care centers; 21 physical therapy and rehabilitation centers; 13 behavioral health centers
University of California San Francisco (UCSF) Health[b]	Ralph Gonzalez, M.D., associate dean of clinical innovation at the School of Medicine	Northern California—urban	• Public health system • 3 hospitals; 2 children's hospitals; 142 specialty care clinics; 7 research and clinical care institutes; 1 Accountable Care Organization; 29 clinically integrated affiliate hospitals, health systems, and physician groups

[a] No longer participating in the project because of competing priorities and changes in leadership.
[b] Did not participate in tool implementation.

Engagement of the Panel in the Pre-Implementation Period

Panel Meetings

Throughout the 2-year pre-implementation period, the American Institutes for Research (AIR) and the Agency for Healthcare Research and Quality (AHRQ) convened the panelists to guide tool development so that the tools would be relevant and useful to the learning health systems (LHSs) in reviewing, interpreting, and applying evidence. In a virtual kickoff meeting in December 2018 and then through a short Web-based survey, AIR gathered information from panelists on how their systems review and use evidence and their systems' familiarity with the AHRQ Evidence-based Practice Center (EPC) Program. Subsequently, in an in-person meeting in January 2019, the panelists provided feedback on challenges to implementing evidence in health systems. They also provided feedback on the utility of a set of EPC translational products that were developed through pilot projects to increase health systems' use of evidence from systematic reviews. In January 2020, during an in-person meeting, we shared with panelists, and gathered their feedback on, drafts of potential tools that could present information from the EPC Program reports and lead to increased adoption of EPC evidence. We also collected information on potential topics for these tools, based on existing EPC Program reports, as well as input on our plans for implementing and evaluating the tools.

Meetings To Discuss Topic Selection and Implementation Plans

AIR periodically held discussions with LHS panelists and other stakeholders to ensure that we developed tools for the report topics they deemed to be the most relevant and to begin planning for implementation, including guiding LHSs in developing an implementation approach. In November and December 2019, AIR conducted phone calls with 9 of the 11 LHS panel members and LHS implementation team members to (1) determine which potential evidence topics were most relevant to their systems (to be included in the tools) and (2) to obtain input on designing feasible and meaningful implementation and evaluation of tools to enhance adoption of EPC evidence. In January 2020, AIR spoke with 8 of the 11 LHS panel members and LHS implementation team members to (1) share and discuss the final selection of two report topics—Antipsychotics for the Prevention and Treatment of Delirium and Treatment of Depression in Children and Adolescents—to pilot test; (2) discuss their selection of a tool—the Summary of Findings tool and/or the Visual Dashboard tool—based on their specific organizational structures; (3) gather information to create initial drafts of system-specific, tailored implementation playbooks; and (4) determine the most feasible implementation approach for each LHS.

Cognitive and Usability Testing of the Summary of Findings and Visual Dashboard Tools

Over the course of developing the Summary of Findings and Visual Dashboard tools, AIR conducted cognitive and usability testing with the LHS panelists or their designees to ensure that the tools presented information from EPC evidence reports in a way that would be useful and understandable to LHS stakeholders. AIR also conducted cognitive and usability testing of earlier iterations of the tools. Testing details and findings are provided in Appendix B.

In August 2019, after AIR and the Scientific Resource Center (SRC) developed prototypes of the Summary of Findings and Visual Dashboard tools based on a panel-selected EPC report (Noninvasive Nonpharmacological Treatment for Chronic Pain), AIR tested the tools with nine LHS panel members or other stakeholders (potential end users of the tools) identified by panel members. We conducted cognitive testing on the tools, focusing on how users interpreted and understood content within the tools. Based on feedback from the LHS panelists and stakeholders as well as feedback from the SRC and AHRQ/EPC stakeholders, AIR and the SRC developed the tools for one of the topics (Antipsychotics for the Prevention and Treatment of Delirium) selected by the panel for implementation.

In February and March 2020, we conducted usability testing on the revised tools, focusing on how users reacted to the tools, including their understanding of content and function. We interviewed nine panelists or designates about the Summary of Findings tool and seven panelists or designates about the Visual Dashboard tool. We gathered information on whether users could (1) navigate the tools with minimal prompting and (2) successfully navigate predetermined tasks and locate relevant content. We also gathered information on areas where users desired clarification or additional content that could improve user interpretation of information within the tools. AIR and the SRC used feedback from the usability testing and from the SRC, AHRQ, and EPC stakeholders to guide revisions to the tools. AIR and the SRC then integrated the tools into a website where their use could be piloted with the participating LHSs.

In August 2020, we conducted usability testing on this new website with eight LHS panelists or other stakeholders to gather information on (1) overall usability, (2) ease of navigation between the tools and content, (3) reaction to the layout and design of AHRQ's new evidence

report topic home page and the tools, and (4) understanding and interpretation of the information presented in the tools. Based on this information and further guidance from the SRC and AHRQ/EPC stakeholders, AIR and the SRC further revised and finalized the tools for the delirium topic and developed, revised, and finalized the tools for the childhood depression topic.

Learning Health System Panel Members' Topic Nominations

Learning health system (LHS) panel members submitted five topics that the Agency for Healthcare Research and Quality (AHRQ) selected for Evidence-based Practice Center (EPC) Program evidence reports. Table A-2 presents the topics, associated LHS partner(s), AHRQ and EPC leads, and their status, as of October 22, 2021.

Table A-2. Topics nominated by learning health system panel members and selected by AHRQ for evidence reports

Topic[a]	LHS Panel Meeting	LHS Partner(s)	AHRQ Lead	EPC Lead	Status
1. Strategies for Patient, Family, and Caregiver Engagement	January 2019	**Melinda Ashton, M.D.,** Hawaii Pacific Health **Romana Hasnain-Wynia, Ph.D.,** Denver Health	Elise Berliner	JHU	Report complete (August 2020)
2. Interventions To Decrease Hospital Length of Stay	June 2019	**Romana Hasnain-Wynia, Ph.D.**, Denver Health	Elise Berliner	ECRI	Report complete (September 2021)
3. Prehabilitation and Rehabilitation for Major Joint Replacement Surgery	June 2019	**Brian Stello, M.D.**, Lehigh Valley Health Network	David Niebuhr	Brown	Report complete (November 2021)
4. Telehealth During COVID-19	June 2019[b]	**Ralph Gonzales, M.D.**, UCSF **Dorothy Hung, Ph.D.**, formerly of Sutter Health	Lionel Banez	JHU	Review in progress
5. Diagnostic Errors in the Emergency Department	October 2019	**Mark P. Jarrett, M.D.**, Northwell Health	David Niebuhr	JHU	Final report submitted (awaiting publication)

AHRQ = Agency for Healthcare Research and Quality; EPC = Evidence-based Practice Center; JHU = Johns Hopkins University; LHS = learning health system.

[a] One LHS panel member served as a partner for an evidence report on a separate topic that had previously been submitted by someone outside of the panel—Management of High-Need, High-Cost Patients. Details on this report are in Table A-3.

[b] This topic was further refined following its submission to address an emerging need.

AHRQ asked LHS panel members to provide input on priority areas and in-progress evidence reports. Table A-3 presents the topics and associated LHS panel meeting, and specifies if the topic is a priority area or report.

Table A-3. Topics for AHRQ priority areas and EPC evidence reports for which learning health system panel members provided feedback

Topic	LHS Panel Meeting	Priority Area or Evidence Report
1. Integrating Palliative Care in Ambulatory Care of Noncancer Serious Chronic Illness	January 2019	Priority area; AHRQ is congressionally mandated to provide information on palliative care Evidence Report (JHU EPC)
2. Patient-Generated Health Data: Mapping the Evidence to Health Outcomes	June 2019	Evidence report (ECRI-Penn EPC)
3. **Challenges and Opportunities To Improve Care for Persons With Multiple Chronic Conditions in Ambulatory Settings**	June 2019	Priority area
4. Management of High-Need, High-Cost Patients*	June 2019	Evidence report (RTI EPC)

AHRQ = Agency for Healthcare Research and Quality; EPC = Evidence-based Practice Center; LHS = learning health system.
*Mark Jarrett, M.D., Northwell Health, served as a partner for this report.

Panel members also discussed and nominated five other topics that were not selected by AHRQ for an evidence report. Table A-4 presents the topics, nominator, and associated LHS panel meeting.

Table A-4. Topics submitted by learning health system panel members that were not prioritized for an evidence report

Topic	Description	Nominator(s)	LHS Panel Meeting
1. Care Transitions Following Hospital Admission	What interventions reduce 30- and 90-day mortality, readmission, and total healthcare utilization/cost?	Andrew Masica, M.D., Baylor Scott & White Health, and Brian Stello, M.D., Lehigh Valley Health Network	January 2019
2. Change Management for Clinicians	What interventions can be used to influence and change clinician and clinical staff behavior and help clinicians provide evidence-based care?	Andreas Taenzer, M.D., M.S., Dartmouth-Hitchcock Health	January 2019
3. Patient-Reported Outcome Measures	What evidence exists to demonstrate that patient-reported outcome measures provide actionable data for clinicians to help improve care outcomes?	Melinda Ashton, M.D., Hawaii Pacific Health	January 2019

Topic	Description	Nominator(s)	LHS Panel Meeting
4. **Bundled Payments (nominated following the June 2019 LHS Panel Meeting)**	What is the effect of bundled payment models on clinical outcomes, access to care, and costs, including which entities experience cost savings (for example, the Centers for Medicare & Medicaid Services, health systems)?	Andrew Masica, M.D., Baylor Scott & White Health	June 2019
5. **High-Cost, Low-Value Interventions**	Which strategies have been successfully deployed to get providers to stop using high-cost, low-value interventions as defined by the Choosing Wisely initiative (funded by the ABIM Foundation)?	Melinda Ashton, M.D., Hawaii Pacific Health, and Mark Jarrett, M.D., Northwell Health	June 2019

Appendix B. Abbreviated Reports and Memos About Tool Development

This appendix contains abbreviated versions of reports that detail tool development during the first 2 years of the project. It also includes memoranda that describe results from cognitive and usability testing of the tools and the pilot website. The first report, an abbreviated product mock-up and brief report, was completed in the base period of the project to document (1) the process to generate ideas from the learning health system (LHS) panel for potential tools; (2) the development of initial versions of the tools; and (3) feedback and recommendations on the tools from panelists. The second report, the Populations and Settings Report, was completed in the second year of the project to document (1) findings from LHSs regarding information on populations and settings in Evidence-based Practice Center (EPC) reports and (2) background on LHSs' needs for this information. The cognitive and usability testing memos provide high-level findings of testing the tools that were developed in the first 2 years of the project.

Abbreviated Product Mock-Up and Brief Report (May 27, 2019)

The Agency for Healthcare Research and Quality (AHRQ) recognizes that access to and usability of high-quality knowledge is a linchpin for making healthcare safer, of higher quality, more accessible, equitable, and affordable. The AHRQ Evidence-based Practice Center (EPC) Program wants to help learning health systems (LHSs) use the evidence from its reports to improve patient care. However, LHSs face several barriers—primarily related to the timeliness and relevance of the evidence—that limit their use of EPC systematic reviews. Specifically, these barriers include (a) length/volume of information; (b) (lack of) timeliness of the evidence; (c) limited generalizability of findings due to the homogeneity of populations studied in randomized controlled trials (RCTs); and (d) the absence of efforts to tie the findings to performance score cards (based on regulatory requirements, payment/penalty metrics, and/or national rankings) that often drive operational decisions. LHSs have also expressed concerns about the growing number of articles retracted from journals—specifically, that evidence reports are not updated to reflect these retracted studies. Finally, LHSs have noted that a major barrier is their inability to contribute real-world evidence to reviews.

AHRQ has contracted with the American Institutes for Research (AIR) and its partners to convene a panel of senior leaders from 11 LHSs to guide the EPC Program in developing and disseminating evidence reports and products that LHSs can use to improve patient care. The AIR team is collaborating with the panel to develop mock-ups for two "companion products" to address the usability barriers discussed above and help LHSs translate, share, and facilitate use of evidence from systematic reviews to improve care delivery and health outcomes. The next phase will include moving one product from mock-up into development; however, AHRQ may choose to develop two full products by exercising an optional task. After development, each LHS represented on the panel will implement one product, choosing from one developed by AIR or one developed through the EPC Program, and participate in evaluation activities. If AHRQ chooses to exercise an optional task to fund development of a second AIR product, the LHSs will be able to choose from three products (one of the two developed by AIR or one developed by the EPC Program). AHRQ hopes to have a roughly even number of health systems testing each of the selected products.

To close out the base period of the contract, this final memo provides an overview of AIR's two "mock-ups" for companion products, with an emphasis on the development and intent of the products. Specifically, the memo includes descriptions of

- The process for generating ideas for the companion products, including a needs assessment completed by the panel and panel meetings
- The development and application of decision criteria to identify an array of companion products
- The process to gather ongoing input from the panel and other key stakeholders on mock-ups of the companion products
- The two proposed companion products, including the purpose and intended audience(s)
- The results from cognitive testing
- The proposed implementation and evaluation plans, including anticipated challenges and proposed solutions

Final Mock-Up Products

In this section, we share a brief description of the two final mock-up products—the LHS Stakeholder Summaries tool and the Evidence Snapshot tool—we completed at the end of the base year contract period. These descriptions incorporate revisions from the panel members based on feedback and cognitive interviews obtained between February and May 2019. These final mock-up products will be shared with the LHS panel and EPC Directors at the June 2019 meeting. We will use feedback from the meeting to revise the mock-ups before moving forward with prototype development. Following this section, we review the process for arriving at these two products, including the method for generating ideas, developing mock-up products, decision factors for moving mock-ups forward, obtaining informal panel feedback, results from cognitive testing, and revisions to the products based on testing. We conclude with plans for the upcoming option period and recommendations.

Description of the LHS Stakeholder Summaries Tool

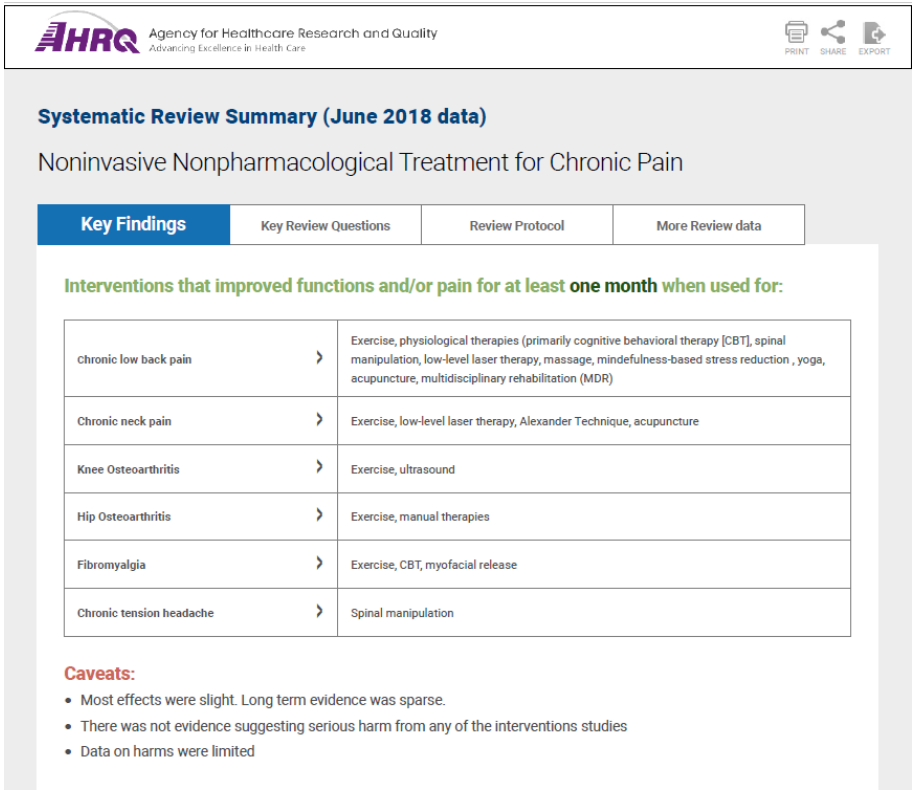
The LHS Stakeholder Summaries tool allows users to customize the content of a report document, tailoring the information to meet the needs of diverse stakeholders within an LHS who use evidence summaries. The LHS Stakeholder Summaries tool includes information from AHRQ EPC evidence reports and additional information such as patient education materials and have an alert when the AHRQ EPC evidence report has been updated. This product seeks to enable users to:

- Create summaries tailored to several key stakeholder perspectives within the LHS
- Generate their own summaries of an EPC report based on information they choose
- Provide quick access to additional external resources related to the evidence topic that end users require
- Receive alerts on new relevant information, such as an update of the evidence report or changes to the external resources associated with the evidence report

The target audience for this product includes hospital administrators, quality department leaders, electronic health record (EHR) implementation teams, and clinicians. This product will be Web-based; however, tailored summaries created by the user potentially could be printed for

hand-outs or made into PDF documents for electronic distribution within the LHS. Figure B-1 presents a screenshot of the revised version 3.0 of the LHS Stakeholder Summaries tool.

Figure B-1. LHS Stakeholder Summaries tool (version 3.0)



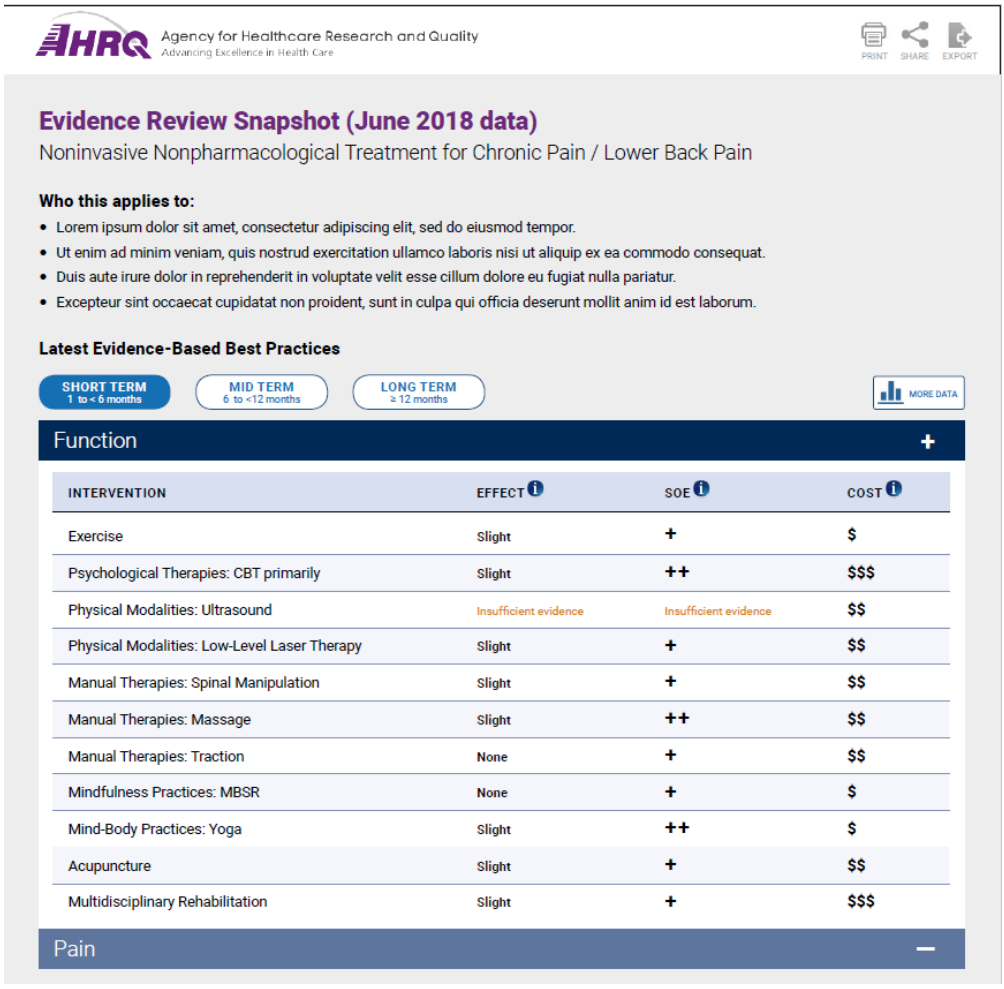
Description of the Evidence Snapshot Tool

This product provides an "At-a-Glance" view that summarizes information about the interventions from the evidence report. This will help implementers, educators, and providers apply the findings more quickly in a healthcare delivery setting. The product uses visual symbols to depict the relationship between interventions and outcomes, summarizing key points succinctly and visually. This product seeks to:

- Provide a summary of the evidence for use by clinicians at the point of care, with a goal of rapid assimilation and understanding by end users to facilitate use at the point of care
- Enable users to easily share this summary

The intended primary audience for this product is bedside clinicians. Key use of this product would be as a resource for a bedside clinician and care team members to understand the evidence, make decisions at the point of care, and potentially have a conversation with a patient about the evidence. This product will be Web-based; however, the product could be printed for hand-outs or made into PDF documents for electronic distribution within the LHS. Figure B-2 presents a screenshot of the revised version 2.0 of the Evidence Snapshot tool.

Figure B-2. Evidence Snapshot tool (version 2.0)



Process for Generating Product Ideas

To generate product ideas, AIR gathered information from a range of sources, including previous AHRQ qualitative work[1], EPC reports from the pilot products,[2-9] a Web-based needs assessment of the LHS panel member organizations, and comments from the panel members during the December and January meetings. The AHRQ report, "Understanding Health-Systems' Use of and Need for Evidence to Inform Decisionmaking," informed the development of items for the needs assessment. The Web-based needs assessment sought to gather information about how each LHS accessed and used evidence. We were interested in their general use of evidence as well as their use of EPC-specific evidence reports. We reviewed the EPC reports about the development and testing of pilot products to ensure product ideas for this project did not replicate previously tested products but instead built on findings generated from that work.

The AIR team also gathered information from several other individuals outside of the project focused on facilitation of evidence translation in LHSs. This included discussions with Ian Saldanha, MBBS, MD, PhD, Director of the Systematic Review Data Repository (SRDR), a Web-based repository of systematic review data funded by AHRQ. The EPCs currently store data from their systematic reviews in SRDR. The AIR team wanted to ensure that mock-up products would not overlap in functionality with ongoing plans to expand SRDR into SRDR 2.0,

an expanded platform intended to share digital evidence report date with end users developing clinical practice guidelines and clinical decision support tools. Also to avoid redundancy between other AHRQ funded products, we met with Ed Reid to review work of the Scientific Resource Center (SRC) in developing a companion project called NextGen. We also met with Charles Freidman, Ph.D., an expert in Learning Health Systems and health informatics at the University of Michigan, to obtain his perspective on use and development of digital knowledge objects and computable biomedical knowledge in the context of this work.

Process for Developing Mock-Up Products

AIR analyzed the data generated from the LHS panel (needs assessment and comments during the December and January meetings) to generate ideas for products and criteria to evaluate the potential product ideas. We received responses to the needs assessment from 8 of 11 panel members. During the January in-person panel meeting, we shared high-level findings and item-specific analysis with the panel members. From the needs assessment, we found that LHSs are actively and routinely searching for evidence to improve practice and are confident in their ability to do so using a wide range of sources of internal and external evidence. Further, our panel shared the following:

- Clinical guidelines are the most useful source of evidence.
- The top two sources LHSs use to access evidence are medical literature databases and electronic health records (EHRs).
- LHSs most commonly access systematic reviews through the Cochrane Database of Systematic Reviews.
- Half of the panel members reported that their organizations use AHRQ EPC evidence reports.

Following the January LHS panel meeting, the AIR team analyzed the multiple sources of feedback from panel members to identify barriers and facilitators of evidence use. Table B-1 provides a summary of these barriers and facilitators to widespread use of evidence in LHSs.

Table B-1. Key barriers and facilitators to LHS use of evidence reports

Barriers and Facilitators	Example of Barrier or Facilitator	Source
Barriers	Out-of-date reports; lack of timeliness of evidence	NA, DM
	Reports that don't include outcomes of interest	NA
	Unclear application to the LHS patient population; belief that external evidence doesn't apply to "their" patients	NA, JM
	Length/volume of information	DM, JM
	Lack of diversity within population studied in RCTs	DM
	Absence of effort to tie findings to performance score cards	DM
	Competing priorities with the LHS	JM
	Limited resources (personnel, time, and dollars)	JM
	Change requiring input from frontline staff, which may not be a common practice	JM

Barriers and Facilitators	Example of Barrier or Facilitator	Source
Facilitators	Being able to share a report within an organization using short summaries and key messages	NA, JM
	Accessing reports via academic and nonacademic search engines	NA
	Reports with short summaries and key messages	NA, JM
	Ability to benchmark with other organizations	NA
	Minimal time required to digest key information	JM
	Visualization of data	JM
	Tools that serve multiple purposes	JM
	Ability to interact with the data	JM

NA = needs assessment; DM = December meeting discussion; JM = January meeting discussion.

We identified key criteria to help pinpoint which potential companion products would best meet the needs of the LHS panel. These criteria were based on review of the meeting notes and needs assessment data as well as AHRQ suggestions. Criteria were a combination of product elements or functionality the panel found favorable as well as key needs the panel identified. AIR developed a short list of possible companion products (Table B-2), which we evaluated within the context of these criteria.

Table B-2. First-round list of proposed companion products

Product Name	Purpose	Key Components	Audience
LHS Stakeholder Summaries tool	Provide quick view of key factors LHSs use in decision making when assessing the applicability of review.	One-page table with summary of key elements, such as: • intervention/comparison • clinical outcomes • resources required for implementation • feasibility of implementation	Dual: implementation team and decision maker
Contextual Information Dashboard	Enables LHSs to look at evidence from similar health systems based on key contextual characteristics of interest.	Contextual drill down and outcome drill down (including LHS-focused outcomes, such as feasibility, acceptability, and required resources)	Implementation decision maker
Flow Diagrams	Provide visual guide to decision making.	Graphical flow chart depicting workflow and key decision points	Dual: implementation team and decision maker
Population Comparison tool	Creates a format for LHSs to merge their data with systematic review data.	Key components to be determined	Implementation team
Menu of Generic Decision Aids	Dual purpose: clinical decision support and shared decision making with patients	Several templates for decision aids that could be tailored based on the type of decisional dilemma faced	Dual: clinicians and patients

Product Name	Purpose	Key Components	Audience
Blueprint for Change (general and IT)	Provides generic support for how to implement change.	Distillation of key necessary components for change implementation; layered approach so that, as LHSs click through, they receive more information	LHS implementation team

IT = information technology; LHS = learning health system.

Following review of product ideas with Amanda Borsky, Dr.P.H., M.P.P., Health Scientist and Project Officer, and Stephanie Chang, M.D., M.P.H., Director, EPC Program, of AHRQ, we proceeded to move forward with mock-up development of two of our initial product ideas: the LHS Stakeholder Summaries tool and the Population Comparison tool.

As we were developing the mock-ups, we split the original idea for the Population Comparison tool product into two separate products based on the breadth of the scope and functionality of the product as it developed. The additional product became a Clinical Decision Support (CDS) tool, i.e., a tool that would notify clinicians caring for patients when an evidence report exists that appears to be directly applicable to their patients and enable them to access the review.

To ensure product development was in line with LHS panel member expectations, we invited them to provide feedback during live presentations of the mock-up products. We obtained comments on products from 9 of 11 panel members. Panel members saw a viable use for the LHS Stakeholder Summaries and Population Comparison tool products but felt their organizations were unlikely to use the CDS tool. Table B-3 provides select comments from panel feedback.

Table B-3. Selected comments from LHS panel feedback on initial mock-up products

Product	LHS Panel Member Responses
LHS Stakeholder Summaries tool	*"The only reason this would be less useful, at least at our organization, is because we have an internally developed product that looks somewhat like this."*
	"I can see a potential use for us. We have a medical librarian, and I suspect this would be a helpful tool for him as we ask him questions. I don't know that other users would necessarily use it, but I think he might."
	"I was going to say same as [other panel member]. We have a clinical librarian who might find this useful in serving this up for folks but not 100% sure how this is going to take up by frontline folks."
	"We don't have a formal organizational structure that would use this on a regular basis. It would be on ad hoc basis. How you would make this available at the right time for the right decision would require some work."
Population Comparison tool	*"I wonder if . . . it would be possible to estimate heterogenous treatment effects as part of the systematic review and then, rather than looking at population applicability, whether for specific subgroups there are specific treatment effects or in addition to this providing the treatment effects that may vary across patients enrolled in the trials that might be potentially valuable. The last piece, the variation of treatment effects on the clinician side, could be especially valuable."*
	"Thinking about bringing in both characteristics and effects of the treatments might be good to look at specific subgroups that might have differential benefits."
	"*If the answers were that this tool looks at . . . relating to my own practice. Would use if we could have that differential of the effects on the population that I'm looking at. I think it's very practical if it answers that question of the effects on who I'm dealing on in front of me."*

Product	LHS Panel Member Responses
	"I like what [panel members] are saying. Don't think I would use it as proposed, although we could aggregate up populations and know what our population is relative to the research population. I would rather know more about the research population because that is more helpful to me as far as applicability."
	"This doesn't seem like a compelling use at our org. When those decisions get made about comparing populations, we already know what our population looks like. So, using a tool to get that info wouldn't be much of a relative advantage. What you want to know is whether the evidence or study you're looking at has a population breakdown that you can use to compare with your own. Usually it's just a matter of looking at paper and know what your own characteristics are."
	"Then it would provide more of a subgroup analysis. I do think that's more of the question that gets raised. I'm not sure you still need the comparison between the groups but just the evidence review."
	"I agree. I don't think my organization would use the tool in the way that you previously showed because we tend to know our population. In terms of treatment effects for subgroups, we would want to know if treatment effects are greater if certain enhanced intervention has had an impact on the treatment effect. I don't know if your tool would get at that or if we would still have to look directly at the evidence."
CDS tool	"*The tricky part of this is trying to link the review to the patient context. Clarifying the decision the clinician has in front of them to the evidence review the question is trying to answer and how well they go together. At a high level, in principle it could have a lot of value; it's just making sure it aligns with the point-of-care question that needs to be answered."*
	"*I don't think we would be interested in something like this. Already struggling with how to create CDS, and one additional source would not be something we would want to struggle with. Very complex area and really difficult, and I'm not sure that this would offer a complete solution. And if it's not a complete solution, it's not going to be of interest."*
	"There already exists a bunch of requests for alerts that have not been implemented because we are trying to control the number of alerts. So, it's a pretty high bar at our organization. We have a very limited number of alerts that go out. You'd have to have some pretty strong evidence that this has an advantage over what people already do. It'll be a tough sell."
	"*We've been looking into the issue of fatigue of alerts and how it's related to the larger issue of burnout and clinician use of EHRs. We're very mindful of the number of alerts we embed. There's such a recognition of alert fatigue."*

CDS = clinical decision support; EHR = electronic health record; LHS = learning health system.

Of the nine panel members who participated in feedback, five ranked the products in order of preference from most to least useful. The Population Comparison tool was ranked the most useful product, very closely followed by the LHS Stakeholder Summaries tool. In line with the qualitative comments we received, the CDS tool was universally ranked the least useful product.

Feedback for the Population Comparison tool suggested revisions to the scope and purpose of the product that we believed had potential to overlap with a companion product in development by the Scientific Resource Center (SRC), NextGen. NextGen is a data visualization tool that is based on an EPC pilot product developing and testing alternative dissemination formats for EPC reports.**Error! Bookmark not defined.**[8] To explore potential overlap, AIR met with a member of the NextGen team. This meeting validated our concerns that there was potential for significant overlap because the NextGen team indicated they were planning to incorporate a population drill-down tool into NextGen. Dr. Borsky at AHRQ requested that we hold revisions to the Population Comparison tool until she could check in with AHRQ and the NextGen team. She recommended that AIR regroup to identify another product option for mock-up and inclusion in this report. Ultimately, Dr. Borsky informed the AIR team that we should move

forward with the Population Comparison tool revisions and obtain feedback from the panel to determine if they felt this product warranted continued development.

To identify a new product, the AIR team revisited the needs assessment findings, LHS panel discussion notes, and other information we had gathered about use of evidence by LHSs. We held internal brainstorming sessions to identify new product ideas, including a Practice Guideline Alignment, Evidence Snapshot tool, and a Contextual Information Template (Table B-4). Placed within the context of our decision matrix for further comparison and evaluation, we presented these new product ideas to Dr. Borsky. With AHRQ's input, we decided to move the Evidence Snapshot tool into mock-up development to share with the panel alongside revised iterations of the Population Comparison tool and LHS Stakeholder Summaries tool products.

Table B-4. Second-round list of proposed companion products

Product Name	Purpose	Key Components	Intended Audience
Evidence Snapshot tool	Present a visual depiction of evidence focusing specifically on interventions and outcomes.	Incorporate aspects of infographics, decision aids, and drill-down functionality. Create a dynamic user-friendly synthesis that highlights the key implications clinicians are most interested in understanding.	Clinicians and decision makers
Practice Guideline Alignment	Helps clinicians situate the evidence with existing clinical practice guidelines.	Provides context for how the evidence report aligns with existing clinical practice guidelines.	Clinicians and guideline developers
Contextual Information Template	Develops a process whereby the EPC reviews incorporate contextual information desired by LHSs.	Provides supplemental contextual information for existing EPC reports. Provides a methods guide and template for EPCs to use for future reports requiring this type of expanded review.	EPC reviewers and LHS decision makers

EPC = Evidence-based Practice Center; LHS = learning health system.

Description of the Proposed Mock-Up Products

Here we present the three mock-up products that were shared with LHS panel members on April 8, 2019, and a brief summary of panel responses. These products include revisions to the mock-ups for the first two products presented to the panel (LHS Stakeholder Summaries and Population Comparison tools) and the new product idea (Evidence Snapshot tool). Table B-5 provides a summary of core product characteristics and requirements for each of the three mock-up products. We plan to leverage existing data sources, such as SRDR 2.0, to populate content within the products. Depending on the level and type of data structuring that is available in SRDR 2.0, clinical content will be extracted from the systematic review with a goal of minimal human reformatting. Product development during Option Period 1 will

- Delineate user-defined content within each product
- Determine which structured content can be pre-populated from existing data sources, such as SRDR 2.0, with minimal reformatting
- Determine which unstructured content can be pulled from the current evidence reports with reformatting or adjustment to the current EPC process
- Determine the extent to which this unstructured data will require EPC staff to review and edit

- Identify changes to EPC data management processes, such as adding data collection tables, to facilitate electronic retrieval of additional content for population of data within products
- Determine which content is unavailable because it is beyond the current scope of an EPC report and would require additional effort and resources from EPCs to include

Table B-5. Comparison of product core characteristics and requirements

Core Characteristics and Requirements	LHS Stakeholder Summaries Tool	Population Comparison Tool	Evidence Snapshot Tool
Primary customers	LHS decision makers, implementation teams, librarians, and others performing environmental scans	Researchers and LHS implementation teams	Clinicians and clinical educators and LHS implementation teams
Secondary customers	AHRQ, EPCs, providers, patients, quality measure and CDS developers, individuals creating clinician and patient education materials, and care coordinators	AHRQ, EPCs, clinicians, and medical librarians	AHRQ, patients, healthcare organizations, and students
User interface type	EPC report homepage with tabs to create customized summaries	Web application with drill down for patient subgroups with interventions and outcomes	Combination of text and pictorial display of interventions and diagnostic evaluations that could be displayed as a Web page in addition to a printable format, such as a PDF
Hosting	NextGen, AHRQ website, or SRDR 2.0	NextGen, AHRQ website, or SRDR 2.0	NextGen, AHRQ website, or SRDR 2.0
Content data source	Primary: SRDR structured content Secondary: external resources (e.g., ECRI Guidelines Trust, PubMed, National Library of Medicine, ClinicalTrials.gov)	Primary: SRDR structured content Secondary: evidence reports using a natural language processing–enabled engine or additional human-parsed content	Primary: SRDR structured content Secondary: external resources (e.g., ECRI National Guidelines Trust and other guideline resources, patient and provider education resources, and medical calculators which clinicians use to easily calculate a range of medical scores and indices)
Technical requirements	Library of metadata categories and menus for tagging evidence and reports, Web-based user interface, and interface to back-end sites	Library of metadata categories and menus for tagging evidence and reports, Web-based user interface, and interface to back-end sites	Library of metadata categories and menus for tagging evidence and reports, Web-based user interface, and interface to back-end sites

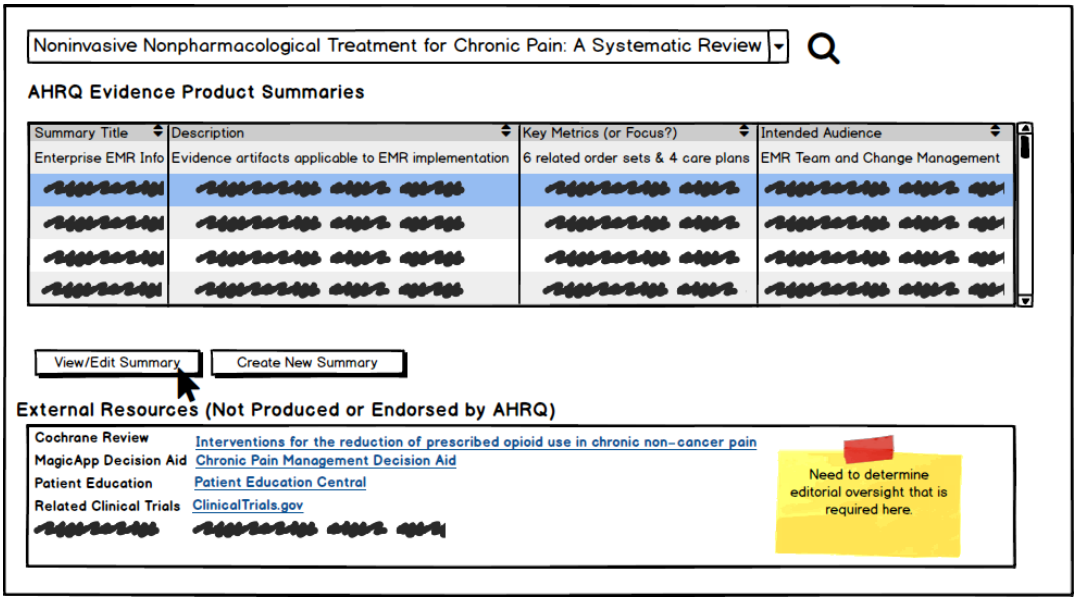
AHRQ = Agency for Healthcare Research and Quality; EPC = Evidence-based Practice Center; LHS = learning health system; SRDR = Systematic Review Data Repository.

LHS Stakeholder Summaries Tool (Version 2.0)[a]

Report summaries are designed to present evidence broadly. However, diverse groups of stakeholders who use summaries within an LHS are likely to prefer different kinds of data from a summary at different times. These diverse groups of stakeholders might include hospital administrators, quality department leaders, EHR implementation teams, and clinicians, and would be the targeted audience for this product. The current EPC format does not enable easy customization of the report or the evidence to meet these different needs. The EPC Program is currently developing a standard summary format based on knowledge gained from a pilot project that implemented a short summary,[4] as well as information from other sources and ideas generated by an internal EPC Usability Working Group. These revised EPC summaries represent an improvement over the current format; however, they are targeted toward a broad audience and are static in nature. The LHS Stakeholder Summaries tool would attempt to move beyond the static elements of this summary by pre-tailoring summaries to several key perspectives to be identified through LHS panel feedback and enabling users to customize their own report summaries. In addition, although the EPC standard summaries appropriately focus on research evidence, stakeholders have a need for additional resources, such as patient education materials. Collating these resources and presenting them in concert with a summary of the report would save time and resources for end users by reducing their need to independently seek out this information. In consideration of these factors, this product seeks to: (1) provide EPC created summaries tailored to several key stakeholder perspectives within the LHS, (2) enable users to generate their own summaries of an EPC report based on information they choose, and (3) provide quick access to additional external resources related to the evidence topic that end users require.

Figure B-3 provides a mock-up of the product homepage that a user would see with a table listing the targeted report summaries for a specific evidence report.

Figure B-3. LHS Stakeholder Summaries tool (version 2.0)



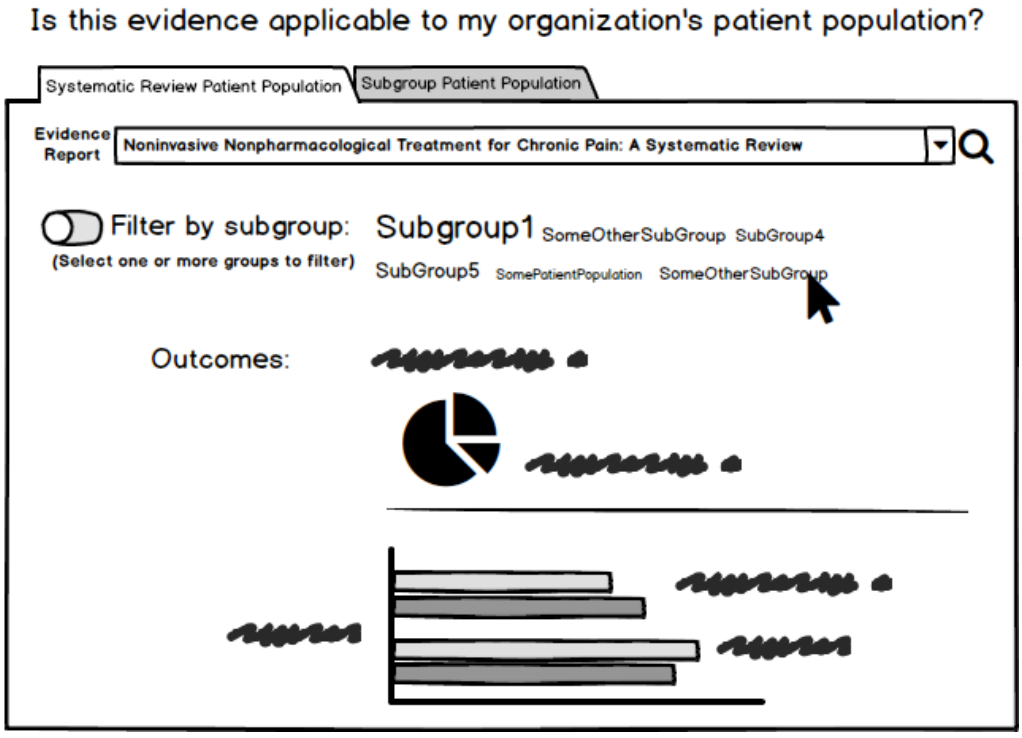
[a] Due to the iterative nature of mockup development, we are using a numbering system to track revisions.

Population Comparison Tool (Version 2.0)

A major challenge expressed by the LHS panel was assessing local applicability of evidence to the LHS patient population. Current EPC reports are designed to present evidence for a broad group of patients and settings and does not enable users to easily focus on a subset of the evidence for a specific application. The stakeholders using the reports, however, are likely to have more specific interests in the evidence, for example, wanting to know about evidence specific to more limited populations or certain settings. Providing a way to easily access data of subgroup analyses will enable users to assess applicability of evidence to a single patient or a specific population of patients. The primary intended audience for this product is decision makers within the LHS, specifically those in the quality leadership team and clinician leaders. This product seeks to (1) provide descriptive data of the population included in the evidence report; (2) enable users to filter the review population based on characteristics of the patient, setting, or location; and (3) enable users to export, save, and share this content.

Figure B-4 provides an example of the mock-up product display showing the overall evidence report population.

Figure B-4. Population Comparison tool (version 2.0)



Evidence Snapshot Tool (Version 1.0)[b]

Report summaries are comprehensive and designed to present evidence that might be useful to many types of professionals in different roles, but they are not designed for use at the point of care by stakeholders such as healthcare providers and other frontline professionals. These stakeholders have high demands on their time and limited time to review long reports to find an evidence-based clinical approach to patients and their conditions. The current EPC format does

[b] This product option was developed after the first round of panel feedback to the mock-up products; therefore, this version number is earlier than the two previous products because it has received less feedback from the panel.

not provide a quick view of the report or the evidence to meet this requirement. This product differs from the standard EPC summaries in that it would rely on infographics rather than text to present information as well as focusing on key takeaways for clinicians. It represents an "At-a-Glance" view that summarizes evidence-based interventions which might enable implementers, educators, and providers to facilitate use of evidence in a healthcare delivery setting. Bedside clinicians and care team members represent the primary intended audience for this product, with the potential to include patients and families depending on product development and specific content of each evidence report the product is based on. The succinct graphic nature of this product potentially lends itself to a tool that could be used at the point of care to facilitate conversations with patients and families. This product seeks to:

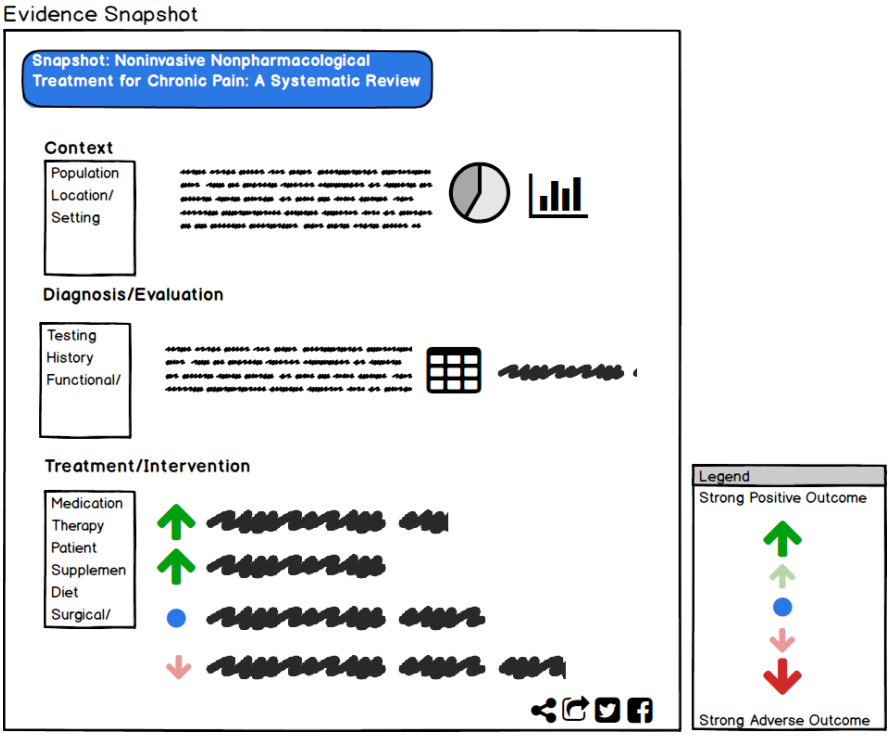
- Provide a patient care–centered summary of the evidence for use by clinicians at the point of care. This Evidence Snapshot tool would rely on infographics (rather than explanatory text) to depict report information, with a goal of rapid assimilation and understanding by end users to facilitate use at the point of care.
- Enable users to easily share this summary.

LHSs have indicated that contextual information, that is, expanded details about the intervention (setting, components, frequency and duration of intervention, etc.), would be helpful to them when evaluating reports for applicability and during implementation within their health system. Given this, as part of product development, we will explore

- What contextual information is present within current evidence reports. To do this, we will work with LHSs to identify a subset of current reviews to be targeted for data extraction.
- If contextual data are identified within these reviews, the team will determine the process for extraction and display within the product.
- If not present, the team will evaluate feasibility and the process for locating and tagging additional contextual data for inclusion in future evidence reports.

Figure B-5 shows an example of the mock-up for the Evidence Snapshot tool with graphic content for the snapshot of the evidence report.

Figure B-5. Evidence Snapshot tool (version 1.0)



LHS Panel Feedback on Revisions and New Products

We sent brief descriptions of the mock-ups to the panel members via email along with a form asking for their feedback. Six panel members returned feedback forms. We asked panel members both to rank the products usefulness against each other, and rate them for usefulness individually. Table B-6 lists the number of panel members ranking each product by first, second, and third choice. In addition to ranking the three products by usefulness, we asked panel members to rate the usefulness of each product individually on a scale of 1 to 5, with higher scores indicating more usefulness. The average usefulness rating for each product is provided in Table B-6 as well.

Table B-6. LHS panel members' overall product usefulness ranks

Product	First Choice	Second Choice	Third Choice	Usefulness Score
Evidence Snapshot tool	3	2	1	4.1
Population Comparison tool	2	1	3	3.3
LHS Stakeholder Summaries tool	1	3	2	3.6

LHS = learning health system.

Select qualitative responses from panel members are displayed in Tables B-7, B-8, and B-9. These responses highlight features and functionality within the products that panel members viewed as appealing as well as suggest some challenges for implementation either within their health system or more broadly.

Table B-7. LHS panel member responses to the LHS Stakeholder Summaries tool

Positive Features	Potential Barriers or Challenges
*"It seems that it might be a bridge between simply having a list of titles to **enabling a quick and more complete understanding** of the articles included."* *"There is also an interesting feature that proposes to share modified and amended evidence reviews done by others. **I think that might be a useful feature if it catches on."*** *"I like that, within reason, it can be tailored to different stakeholders within an LHS. **I like the focus on providing tools for implementing an intervention rather than just describing it."*** *"If [the LHS Stakeholder Summaries tool] accomplishes the reliable inventory of evidence status, it would ease the steps of implementation by providing the needed evidence. **This presents a tremendous amount of work for LHS and would reduce time and effort for actual implementation."***	*"It will **take years of dedicated work** to be recognized as the ideal one-stop shopping resource and to build trust in the product along with continuous updates and monitoring of the literature."* *"But it will be **difficult to extrapolate general results** to individuals who are seeking treatment absent an evidence table of benefits and harms. Thus, at this level, it may help frame and will be referred to, but it **may not be an essential component of in-the-moment workflows."***

LHS = learning health system.

Table B-8. LHS panel member responses to the Population Comparison tool

Positive Features	Potential Barriers or Challenges
***"This one is great—because it is customizable**. Our health system, for instance, serves multiple communities with different patient populations—this tool would make the evidence much more applicable to different sites."* *"I do think that selecting by criteria (filters) is a **unique feature that is currently not available**. While the [LHS Stakeholder Summaries tool] can be replicated (by putting hours into it), the [Population Comparison Tool] is harder to reproduce."*	*"The challenge I see is that t**here may not be enough information in systematic reviews or evidence syntheses that addresses specific subgroups**. Unless Evidence Reports specifically drill down on subgroup analyses, **this tool sounds like a winner on paper but much more challenging in terms of usefulness**."* *"It is more useful to be able to 'customize' or select to my/our populations, but **this is an effort fraught with difficulty**. The programmer of the [Population Comparison Tool] may know about the population that the study(ies) describe, but it is **more difficult for the [Population Comparison Tool] programmers to truly match that with a population different from the studies**. I think this would be pretty interesting though, and it begins to approach a more applied decision-making option."* *"There are few studies that actually correspond well to our unique population, so **we would likely not find a lot of fit."***

LHS = learning health system.

Table B-9. LHS panel member responses to the Evidence Snapshot tool

Positive Features	Potential Barriers or Challenges
*"I can envision that something like this could be **pushed out via email or added to a regular monthly newsletter as a feature**. It could also **spark interest among those who are assigned EMR improvement work**."* *"This really looks like it might be a **great way for a curator of knowledge** in a clinical setting to **quickly send around the most current evidence** on a topic that someone else has selected as important."* *"Every extra thing for the clinician is hard, **but being able to save a summary for future review or reading would be a very nice feature**."* *"**I love the idea** of making a **quick and easy tool** that **speaks to a broad audience highlighting the key components** of an evidence synthesis."*	*"Many of these are **available by professional societies**, a good number **in the form of apps for smartphones**."* *"I think this is **something the professional guidelines should produce** (and in some instances have) for evidence. One-page implementation summaries are very important **but go beyond evidence and are more of how-to style**. These **are institution specific and should be generated locally**."*

LHS = learning health system.

To make a recommendation to AHRQ about which mock-up products to move into cognitive testing, the AIR team considered the above feedback from the panel members while concurrently weighing additional decision factors. These included barriers and facilitators identified by the panel, feasibility and investment required for product development, and the potential development of similar products through other AHRQ-funded initiatives.

Preparing for Cognitive Testing

In light of the feedback from the panel, in consideration of factors outlined below, and after discussion with AHRQ, AIR moved forward with cognitive testing of the **LHS Stakeholder Summaries and the Evidence Snapshot tools** between May 13 and May 20, 2019, via 11 virtual, one-on-one interviews with LHS stakeholder panel members.

Decision Factors Impacting Mock-Up Product Selection

During the base year of the project, there were several points where the AIR team, in discussions with AHRQ, selected ideas or mock-up products to move into the next phase of development. Outlining all of the factors that were considered is beyond the scope of this brief report; however, below we highlight a few main issues. To date, the primary challenge encountered by the AIR team has been to develop products that meet LHSs' needs, are operationally feasible to implement, and do not duplicate previous or current AHRQ-funded work.

As mentioned previously, panel responses to the first-round mock-ups shared by AIR seemed to indicate functionality that was potentially too similar to extant EPC efforts to refine evidence products, notably the EPCs' work on the NextGen product. Similarly, panel feedback has consistently shown a preference for short summaries. To avoid duplicating the EPCs' revisions to the current summary format, AIR is exploring additional aspects or qualities of summaries that could better serve the needs of LHSs.

It can be technically challenging and costly to develop products that can be easily integrated into multiple EHRs. The AIR team is hesitant to take on a tool that would require interoperability across EHR systems. Further, AHRQ is funding another initiative—CDS Connect—to help address some of these challenges.

After we received initial panel response to the mock-up products, the AIR team needed to identify which mock-ups to cognitively test. Here we discuss some of the major factors we considered. The main concern for the LHS Stakeholder Summaries tool was the ability to identify roles within an LHS that would benefit from a tailored summary and differentiating the content for these roles. During one early feedback session, a panel member suggested that we consider EHR implementation team–targeted summaries. With this start, we felt that we could use cognitive testing to evaluate this suggestion and identify further roles.

Regarding the Population Comparison tool, our team felt that the evidence reports may lack data for subgroup population analysis, making it challenging to move forward with product development. This is a reflection of the research upon which the evidence reports are based, not a reflection of the systematic review process that would be amenable to revision. Qualitative feedback from the panel members noted similar concerns.

We also considered that population comparison is a potential future component of the NextGen tool, although development of this component is not planned for the near future. Considering that this could eventually be developed through a separate funding mechanism, there is some value to pursuing development of two novel products through this project. In light of these considerations and in discussion with AHRQ, AIR moved forward with cognitive testing of the LHS Stakeholder Summaries and the Evidence Snapshot tools.

Plan for Cognitive Testing

The AIR team will develop and refine products to improve LHSs' uptake of findings from AHRQ EPC evidence reports. We will iteratively refine the products through cognitive and usability testing with LHS panelists and end users to identify (a) misunderstandings about the product (e.g., intended use, content); (b) potential barriers to use; (c) strategies and opportunities for integrating the product into current processes; and (d) needed implementation supports. The testing assessed:

- Whether users understand the content and purpose of the draft products
- Whether users find the draft products useful within the context of their current processes
- Who users envision as the products' intended end users
- Perceived barriers to adoption of the draft products and strategies for removing, avoiding, or minimizing the impact of these perceived barriers
- Recommendations for product improvements in content, language, and design
- Suggestions for new content or features that would improve usefulness for the user

The interviews included a balance of participant-led exploration and structured interview questions. The testing team used a "think-aloud" approach with respondents, asking probing questions to gain a deeper understanding of respondents' thoughts. We used Web-based software that allows for screen mirroring and participants to scroll through the mock-up screenshots, so that the interviewer and note taker can see what the participant is viewing. Two experienced interviewers conducted testing, and a note taker documented the interviews. Interviews were audio recorded as backup to the notes in the case of gaps or difficulties in capturing data during the interview.

Cognitive Testing Feedback

Overall, we found that most panel members had a relatively clear understanding of the products based on the mock-ups presented. In general, the panel members understood the intent of each product, the potential end user(s), and how the product could be used within a LHS. During cognitive testing, panel members made several concrete suggestions for changes to the function, format, structure, and content within both products. In addition, testing helped identify areas in the products that were unclear and that would benefit from further explanation or development. However, there was not always consensus in the feedback that we received from the panel members. In the following sections, for each tested product mock-up, we provide a high-level summary of the panel members' feedback from cognitive testing, review the revisions that we have already made, and indicate those we plan to incorporate into revised mock-ups moving forward. In these sections, we use the following language to quantify responses: a *couple* (2 panel members), *a few* (three panel members), *less than half* (between three and five panel members), *most or more than half* (between six and 10 panel members) and *all* includes all 11 panel members. We also suggest areas that require additional feedback from the panel to better refine the products.

Cognitive Testing Feedback: LHS Stakeholder Summaries Tool

During testing of the LHS Stakeholder Summaries tool, panel members felt that this tool was not likely to be used at the point of care. Rather, most panel members saw the primary user of this tool as a quality leader who would edit, create, and distribute reports within the organization as needed. While most panel members thought the ability to create and modify custom reports was a critical function, some panel members expressed concern that creating custom reports from scratch would be too burdensome for end users. With this feedback in mind, we have refined the tool's design concepts to minimize clicks, streamline function, and reduce visual clutter. Even for users who expressed doubt about using the functions to create and edit reports, they indicated that other aspects of this tool, such as the tailored summaries, collated relevant external content, and alert notifications, provide substantial value.

Panel members generally agreed that having several summaries tailored to key audiences within a LHS is a novel and useful concept. Key audiences whom panel members suggested would benefit from a tailored summary include clinicians, researchers, educators, and quality improvement team members or department leaders. We found that it was difficult for panel members to articulate what content would differentiate these perspectives without seeing the specific variation in the tailored summaries. For example, one panelist shared, "*This may require more work to think through what each group would benefit from seeing and revising and iterating. Presumably [it] would be different in subtle ways*." Moving forward, AIR will draft summaries as they would appear for two to three specific audiences of interest to further illustrate the product concept for subsequent feedback. A couple of panel members thought that operational departments such as nursing, respiratory therapy, pharmacy, or laboratory might benefit from tailored summaries. However, not all summaries would be applicable to these roles; therefore, we do not have immediate plans to develop summaries tailored to these professional roles.

Cognitive testing of the alert function (i.e., an alert that the evidence report has been updated, or that changes have been made to the external resources associated with the evidence report) enabled us to confirm that, in general, respondents viewed the ability to receive alerts positively, with the caveat that there was some concern about the potential for alert overload. Some panel members expressed concern about already overloaded email in-boxes. Panel members would like

to easily opt in and out of alerts to help manage this. Some panel members felt that alerts for changes to the external resources section would be less helpful than alerts of changes to the review itself. One panel member observed "*I don't know if, for my perspective, it is too much information, and I would say stick with [alerts to changes to the EPC evidence reviews only].*" As we move forward with product development, we will fine-tune the alert function—for example, by clarifying optimal frequency for alerts through ongoing testing.

Panel members rely on AHRQ as a high-quality and trustworthy source of information. Panel members felt that any links to external resources included in this tool should be "validated" to some extent to ensure that they are similarly trustworthy. Slightly more than half of the panel members thought including links to external content would be very useful, while slightly less than half were skeptical. One specific external resource that received mixed feedback was the inclusion of a link to medical specialty guidelines. While most panel members thought this was an important external resource, there was some concern that there could be instances in which the guidelines might not align with the evidence. For example, one panel member explained "*If the evidence and the guidelines say different things, that can be problematic. We have to work those things out as learning health systems*." To address this discordant feedback, we plan to explore this topic further with the panel during the June meeting. Discussion among the panel will provide valuable feedback, surface any as-yet unheard perspectives, and assist us in determining the optimal path forward for both the content and the function of this product.

Cognitive Testing Feedback: Evidence Snapshot Tool

Overall, we found that most panel members responded positively to the mock-ups for the Evidence Snapshot tool. Most panel members remarked that this tool would be most useful for bedside clinicians. A few suggested that, in its current conceptual format or with some revisions, a bedside clinician could use this product to engage a patient in a conversation. A few panel members suggested that while the conceptual mock-ups were in line with a tool that they would find useful, they wanted an example of the product that was based on an actual evidence report. Most panel members felt that it was important for the summary not to exceed one page.

Panel members identified areas within the Evidence Snapshot tool that they found to be unclear and suggested potential revisions. For example, while more than half responded that they liked the use of visual symbols to depict the relationship between interventions and outcomes, some questioned what the symbols represented. One panel member shared that "*more guidance about the legend might be helpful, because I'm not 100% sure what the blue dot symbol means. Does it mean there's not enough evidence or a neutral effect or something else?"* A few panel members suggested revisions to this aspect of the product that included using different symbols and clarifying whether symbols represented effect size of an intervention or strength of the evidence. As we revise the mock-ups, we plan to incorporate several options for potential symbols, clarify their representation, and include more information in the accompanying legend. We will return to the panel with these options to invite feedback on which option they find works best for visual interpretation of the data.

Summary of Planned Revisions to Mock-Up Products

After completion of cognitive testing, the AIR team regrouped to review results from testing and consider implications for revisions to the mock-up products. As we evaluated the comments from the panel members, we considered what aspects of the comments represented a change to content, format, or function of the mock-ups. We identified portions of the mock-ups that the

panel suggested were unclear so that we could revise the mock-ups for better clarity. Tables B-10 and B-11 indicates the complete and planned list of post-testing modifications to each of the mock-up products.

Table B-10. List of post-testing modifications for the LHS Stakeholder Summaries tool

Type of Modification	Example	Progress
Content	Added date of review to prominent place at the top	Complete
Content	Added a section at the top summarizing the purpose, key messages, and key questions	Complete
Content	Changed three key audience summary examples to: clinicians, QI teams, researchers	Complete
Content	Started example of Clinician Summary	Complete
Format	Removed the table of static summaries from the homepage	Complete
Function	Added a function to save summary to “My Library”	Complete
Function	Added notification checkbox for summary update	Complete
Function	Included indicators for required and optional fields within the summary editor screen	Complete

Table B-11. List of post-testing modifications for the Evidence Snapshot tool

Type of Modification	Example	Progress
Content	Added date to the top of the product	Complete
Content	Added content to the Evidence Snapshot tool relevant to the review, including • purpose, • context, and • columns and example text and graphics to the Interventions/ Treatments section	Complete
Format	Removed boxes from beneath Context, Diagnosis/Evaluation, and Treatment/Intervention sections	Complete
Format	Continuing to explore methods for minimizing text while maintaining ability of users to interpret the evidence presented	Ongoing
Format	Exploring additional options for graphic depictions of strength of evidence and effect size	Ongoing
Format	Exploring graphic depictions for diagnostics	Ongoing
Format	Determine color options and other 508 compliant considerations	Ongoing

We reviewed areas of mixed feedback from the panel. These represent an opportunity for clarification at the June 5–6, 2019, meeting. Examples of topics we plan to explore further with the panel include facilitated discussion of the following elements of the LHS Stakeholder Summaries tool:

- An external resources section focused on inclusion or exclusion of professional society guidelines
- Content alerts, including how often and types of alerts
- Ways to increase the potential for use of the creating and editing functions for the LHS Stakeholder Summaries tool

We also plan to facilitate a discussion of possible visual depictions of strength of evidence and effect size for use in the Evidence Snapshot tool. In relation to both products, we plan to discuss the possibility for concurrent versus sequential generation of the product relative to the evidence report.

Plans for Upcoming Option Periods

The AIR contract is nearing the conclusion of its first period of performance (i.e., the base contract), but additional work on product conceptualization, development, and testing carries into subsequent performance periods. At the June meeting, during Option Period 1, AIR will share revisions to the mock-up products based on cognitive testing with the LHS panel members and representatives of the EPCs. During this meeting, we will ask for feedback from these groups to identify any operational challenges for implementation as well as any changes to the EPC process for performing evidence reviews that might need to be made to accommodate the use of the products. As part of the option period funding, AHRQ has exercised an optional task to fund the development and testing of an additional product. In light of this, we plan to allow time for in-depth panel reaction to changes made as a result of cognitive testing and further discussion about developing both products. At this meeting, we will begin working with the panel and AHRQ to determine which evidence report(s) will be used as a test case for further development of the products.

During Option Period 2, AIR will work with the members of the LHS panel to test a product in their respective health systems. Panel members will serve as local implementation champions and will receive support and guidance to tailor the implementation to their local context and needs. AIR will perform a process evaluation to assess acceptability, adoption, appropriateness, feasibility, fidelity, implementation cost, penetration, and sustainability of the product. Process evaluation will be completed via interviews with health system stakeholders who are involved in the implementation. AIR will refine the implementation and evaluation plan based on LHS panel selection of mock-up products for further development.

Recommendations

As we complete the current option period, we have a number of recommendations for next steps in the upcoming option period to facilitate ongoing work on this project. We will continue to refine the mock-up products in response to cognitive testing with the panel members in preparation for the upcoming June 2019 panel meeting. At this meeting, we will obtain feedback about the revisions from both the panel members and EPC representatives in attendance. As indicated above, we will also facilitate a discussion among the panel members about aspects of the products that received both positive and negative responses during cognitive testing. This will allow us to make decisions about how to move forward with these aspects of the products.

As we look ahead to implementation and evaluation, we recognize the need to consider the use of a specific test case, or an evidence report that will serve as the blueprint for the mock-ups that will be implemented within the LHSs. We will begin discussions with the LHS panel members around selection of a test case at the June meeting. Once a test case has been identified, we will develop the products around the evidence report using iterative feedback from panel members and other potential users in their health system.

Finally, we also recommend obtaining further information from the panel members about display of population-level data and subgroup analysis data. As the NextGen product expands, there may be an opportunity to address this need expressed by the panel and obtaining information via this avenue will provide foundational information for the SRC.

Population and Settings Report (May 1, 2020)

Findings From Learning Health Systems Regarding Information on Populations and Settings in Evidence-based Practice Center Reports (Part One)

The Agency for Healthcare Research and Quality (AHRQ) has contracted with the American Institutes for Research (AIR) and its partners to convene a panel of senior leaders from 11 Learning Health Systems (LHSs) to guide the Evidence-based Practice Center (EPC) Program in developing and disseminating EPC Program reports and products that LHSs can use to improve patient care. During this work, the panel expressed a need to better understand the populations and settings in the source data for the EPC Program's evidence-based reports. The LHS panel members participated in a series of activities conducted by AIR throughout late 2018 and 2019 that helped to clarify the LHS needs for information related to populations and settings in EPC reports, and most specifically, in systematic reviews. The key findings of this progressive exploratory process with the LHS panelist included the following:

- Panel members identified the need to determine the applicability of evidence to the patient populations their organizations serve as key to understanding the value of the content of the review to their LHS. Panel members flagged this challenge as a barrier to searching for evidence and using EPC Program reports in LHSs.
- A major challenge faced by LHSs in implementing the evidence is clinician pushback. Clinicians need to understand how their patients are similar to or differ from those on whom the evidence is based to see value in considering the evidence in the review. While the inclusion of a narrow population of patients is a problem with research in general, especially single studies, the panel suggested that a product that can identify the specifics of populations and settings across the range of studies included in a review might prove helpful in addressing this issue, thereby improving usability of the reviews for LHSs.

In response to these needs and guided by feedback from the LHS panel members and AHRQ, AIR iteratively developed and tested a mock-up of a populations and settings product. The intended purpose of this product was to provide LHS stakeholders with a mechanism through which to (1) quickly and easily view information on the populations and settings of the research presented in a systematic review, and (2) quickly assess the applicability of the EPC Program systematic review to the LHS patient population(s). Through testing of the draft product, AHRQ and the AIR research team found that a product that addresses the LHS panel's stated needs currently is not feasible to produce based on most EPC systematic reviews given the limitations of the underlying evidence. These limitations include availability and quality of data, methodological challenges of aggregating data, and lack of uniformity or standardization in how these data, if present, are defined and reported across studies. Consequently, there is not a clear way to automate the population of information in the tool that would work across all or most reviews; the resulting operational and resource challenges associated with trying to implement such a tool are prohibitive and additionally may increase the likelihood of spurious or misleading findings. The conclusion was that, considering these limitations, it is simply not feasible for AHRQ to consider implementing the Populations and Settings tool at this time.

However, AHRQ highly values the input of the LHSs and would like to consider how this information might be realistically considered for inclusion in some way in future reviews. AIR has therefore prepared this report to present findings from solicited feedback sessions

(interviews, presentations, and cognitive testing) with LHS panel members for EPC consideration when planning for future reviews. Feedback from panel members was supplemented by reviews of relevant literature as well as reactions from EPC expert advisors and AHRQ. It is important to note that this report was prepared based solely what we heard from LHSs; AIR does not have a deep understanding of existing EPC procedures, operations, or resources, although we obtained input from EPC Directors and expert advisors along the way. Therefore, it is important that AHRQ and the EPCs evaluate the feasibility and appropriateness of these findings within the context of current EPC practices.

Methods

To obtain information about LHS needs for evidence, the AIR team solicited input from the panel members throughout late 2018 and 2019 through an assessment survey, emails, panel discussions during meetings, feedback during presentations of products, and cognitive testing. To ensure our work included the EPC perspective, AIR additionally sought expert input through consultation with Jennifer Lin, M.D., M.C.R., Director of the Kaiser Permanente Research Affiliates EPC, and Kathleen Lohr, Ph.D., M.Phil., M.A., RTI International–University of North Carolina EPC Director from 1997 through 2007.

AIR supplemented these data with a targeted review of the literature on health system needs for information about populations and settings constructs. To capture LHS needs more broadly, we focused on constructs, which are abstract characteristics, and which require refinement before they can be measured as variables. To understand the content for the tool, AIR (1) reviewed selected references for examples of populations and settings constructs; (2) discussed the approach, challenges, and findings with EPC experts Drs. Lohr and Lin; (3) developed a list of constructs; and (4) reviewed a sample of EPC Program reports.

Key Findings

Through this work, AIR learned about LHS needs with respect to populations and settings data in EPC Program systematic reviews and the feasibility of collecting and presenting populations and settings data in the reports. We have combined and synthesized findings related to LHS needs into Table B-12, which summarizes the needs identified by the LHS panel members and the challenges of addressing those needs. The challenges detailed in the exhibit include those identified by AIR as we attempted to create the Populations and Settings tool, as well as those conveyed by AHRQ and EPC Stakeholders. Additional detail on the methods and timing of these various activities to collect information on LHS needs can be found in the companion report, *Background on Learning Health Systems' Needs for Information on Populations and Settings in Evidence-based Practice Center Reports (Part Two)*.

Table B-12. Key findings about LHS information needs and primary challenges in meeting those needs

LHS Information Needs	Challenges in Addressing These Needs
Desire to understand heterogeneity of treatment effects.	Much of the primary literature does not address subpopulation analysis. Presenting findings for too many populations and settings constructs dilutes the data such that resulting findings often become insufficient. Making the data too granular decreases the ability to provide a synthesis of the available research.

LHS Information Needs	Challenges in Addressing These Needs
Desire to know the populations of the research studies included in the review so they can compare them with their own populations, both across studies and within individual research studies.	Summarizing the data elements in a numeric or tabular format may present challenges because of the variability in the way the data are reported across individual studies.
LHSs identified specific constructs that were relevant for understanding the applicability of the EPC report to their populations.	Across the EPC Program reports, it is unlikely that data are available for all the constructs that LHSs would like to see. A few data elements are widely available (such as age, race, and gender) and can be readily collected and reported. Others may be available only in specific systematic evidence reviews or not at all.
Desire to be able to filter individual studies based on specific applicability criteria.	Filtering might be misleading, and care needs to be taken that results are not interpreted out of context.

LHS = learning health system.

The challenges listed in Table B-10 are not exhaustive in terms of our findings but summarize some of the more significant feasibility concerns for the EPC Program to consider in meeting LHS needs. Abstracting information on populations and settings constructs from individual studies is difficult because in many cases, even descriptive data for the constructs desired by LHSs may not be available, much less subgroup analyses based on each construct. While the LHS may strongly desire to know that if there is heterogeneity of treatment effects being observed (which is not always the case), there may or may not be robust subgroup data to see for whom the treatment/intervention is working, and for whom it is not. In cases in which constructs are reported in individual studies, there are often inconsistencies across studies in their approach to reporting, making it complicated or infeasible to summarize them.

Given these challenges, in the next section we offer considerations to the EPC Program in meeting the needs of LHSs. These considerations are made with the understanding that some information needs may be met through other AHRQ resources, such as the Systematic Review Data Repository (SRDR) or the EHC website revisions currently being made by the SRC, referred to as NextGen. The EPCs currently store data from their systematic reviews in SRDR, a Web-based repository of systematic review data funded by AHRQ. The SRDR development team is currently building SRDR 2.0, which is being designed to share digital evidence report data with end users. Therefore, it may be that one or more of these considerations is already being addressed by the SRDR development team for inclusion in SRDR 2.0.

Considerations for Future EPC Methods and Reports

In this section, we provide AHRQ with considerations, based on these findings, for promoting usability of evidence by LHSs and for more effectively communicating the applicability of EPC Program systematic reviews. Table B-13 presents populations and settings constructs identified by the LHS panel. We have incorporated some minor changes suggested by Drs. Lin and Lohr to the terminology for clarity across systematic reviews (e.g., using condition instead of disease, and co-existing condition instead of comorbidities). Although some of these constructs may not currently be readily available—specifically, those related to social determinants of health—the field is expanding, and the constructs may become more available and more widely reported in the future.

Table B-13. List of populations and settings constructs

Population	Setting
• Demographic Characteristics o Age o Sex o Race o Ethnicity • Clinical Characteristics o Duration since diagnosis of condition o Prevalence of condition (for screening studies) o Severity of condition o Co-existing conditions • Other Characteristics o Social determinants of health constructs[a] o Insurance status[b] o Socioeconomic status o Language/Literacy	• Clinical setting • Payment or insurance structure[c] • Geographic setting[d]

[a] Examples include stable housing, access to food, crime rates, transportation, socioeconomic status, accessible healthcare, etc. See: https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health
[b] Insured/uninsured
[c] Includes private or public (Medicare/Medicaid) insurance, HMOs, ACOs, etc.
[d] Urban, suburban, rural, country, region, etc.

1. ***Clarify and define the "other characteristics" category.*** EPC experts noted that while LHSs desire information about these characteristics within the studied populations, clear definitions and a shared understanding of the application of these constructs and mapping them to specific variables is needed to move towards an ability to include them in a meaningful way in EPC reviews. Drs. Lin and Lohr felt that many of these constructs could be subject to interpretation and could therefore lead to variation in the way these data were collected and presented in reports. As a first step, further definition of some of the constructs related to the "other characteristics" as noted above, such as social determinants of health, would help to set the groundwork for a more standardized approach to including these constructs in reviews. Given the level of engagement we have observed with the LHS panel, it is possible that some of these panelists might be willing to participate in work with the EPC methods group to help further define and clarify these constructs, create taxonomies, and map them to report variables.
2. ***Develop, pilot, and integrate a standardized approach to including populations and settings data in EPC Program reports.*** Once defined, a standard process for determining the constructs that may be collected routinely and those that EPCs may consider including on a review-by-review basis can be considered and attempted on a pilot basis. Developing the construct taxonomies (determining how each construct is categorized and mapping to specific variables) would provide guidance for EPC staff as they collect data and ensure consistency for LHSs as they access EPC Program reports. Per Dr. Lohr, taxonomies would help clarify construct definitions for the EPCs and facilitate collection of data during systematic evidence reports. For example, depending on the level of detail required and the types of questions that were being explored, taxonomies for the "clinical setting" variable could include inpatient or outpatient settings. A more detailed taxonomy for this variable might include tertiary care, community care, and home care. These taxonomies could also be further defined, if warranted, with tertiary care including categories for community hospitals,

teaching hospitals, and specialty hospitals. The EPCs could use standardized categories where they might exist, such as those defined by the most recent U.S. census for race and ethnicity constructs. AIR suggests that the EPCs consider incorporating the LHS-generated construct list (Table B-11) into their current process for reviewing and selecting relevant variables when undertaking a review. This would help to ensure that reviews include constructs LHSs value and which are relevant to the key review questions. AHRQ could also consider separating the list of populations and settings constructs into two categories: those that will be relevant and will be extracted for every review, and those that will need to be evaluated on a case-by-case basis for inclusion.

3. ***Develop methods for summarizing populations and settings constructs.*** Summarizing these constructs across studies presents a challenge because individual studies often differ in the way in which they report the data—as quantitative or qualitative data. Varying approaches to reporting age offer an example. In some studies, age data may be reported as a single point estimate of a mean across the sample, while other studies may report age as a number or percent of participants across age categories. Combining these two approaches quantitatively across studies in a meaningful way is likely impossible. There may be a method to summarize the data based on inclusive categories, however. Development of taxonomies would facilitate standardization of reporting across systematic reviews and enable categorical summaries.
4. ***Continue to develop and support SRDR 2.0.*** The AIR team consistently heard from panel members that LHSs value easy access to study-level information. LHS panel members stated that using their own data in combination with review data is a powerful motivator for internal behavior change and adoption of evidence. It is important for an LHS to be able to integrate internal and external data to improve performance. Ideally, providing LHS users the ability to download EPC report or systematic review data in a usable format (e.g., comma delimited file; Microsoft Excel) that would allow them to directly compare those data to their own population data would be likely be valued. If this capability is not yet available, we recommend that AHRQ consider adding this functionality to SRDR 2.0. This capability would enable LHS staff to download and manipulate data in a format that they can present and share with clinicians, who could see how their data compare with systematic evidence report data.
5. ***Integrate SRDR 2.0 into the Effective Health Care (EHC) Program website.*** AHRQ is currently reorganizing the EHC website to highlight a suite of tools developed by the SRC which is called NextGen. The revised NextGen website is meant to increase the ability of users to engage with the EPC Program reports. The AIR team suggests that AHRQ include SRDR 2.0 in this suite of tools. By including SRDR 2.0 in the suite of tools, AHRQ will enable a broad range of users to access study-level data provided by SRDR 2.0.

Background on Learning Health Systems' Needs for Information on Populations and Settings in Evidence-based Practice Center Reports (Part Two)

The LHS panel members expressed a need for information on patient populations and settings in EPC Program reports. This report summarizes those information needs and the process undertaken to develop tools to meet those needs, including methods to collect input from the LHSs, AHRQ Leadership, EPC Directors, and other experts.

LHS Information Needs on Populations and Settings

The AIR team obtained information about LHS needs for evidence use from the LHS panel through an assessment survey, emails, and both one-on-one and panel meeting discussions. The LHS panel expressed a desire to better understand the specific populations and settings included in the source data for EPC Program reports. Specifically, the LHS panel shared that:

- Lack of clarity about how evidence is—or is not—applicable to their system's patient populations poses a barrier to both searching for evidence to inform care delivery and using EPC Program reports.
- Clinicians are sometimes reluctant to adopt changes in clinical practice based on evidence because they believe that "their patients" differ from those on whom the evidence is based. This belief decreases clinician confidence that an intervention will have a similar effect when implemented with "their patients."

AIR's Response to LHS Needs

In response to the expressed LHS panel needs, the AIR team drafted two tools for the panel's consideration in two phases: a Population Comparison tool (phase 1) and a Populations and Settings tool (phase 2). After the Population Comparison tool was drafted, it was shared with the panel for feedback and then ultimately set aside due to concerns about feasibility in combination with lower panel interest and ranking compared with other potential tools that were in development. However, during the June meeting, the panel continued to express a need for a tool to help them understand the populations and settings for an EPC Program report. In response to this need, AIR developed the Populations and Settings tool (phase 2). This section briefly describes the individual development of the Population Comparison tool and the Populations and Settings tool and summarizes the panel response to each.

Phase 1: Tool Development and Feedback

Population Comparison Tool

The Population Comparison tool was proposed to enable an LHS stakeholder to compare the LHS patient population with the patient population from an EPC Program report. The tool would help an LHS determine if the evidence applied to the system's patient population based on key characteristics such as age, sex, or race. As envisioned, the tool would require an LHS to upload aggregated, non-identifiable patient data to the tool. This upload would enable a side-by-side comparison of the LHS aggregate population data compared with the report population data. The main screen of the tool would be an overall summary; then users could drill down further into the data.

Box B-1 includes selected comments from the LHS panel about challenges using evidence due to lack of clinician buy-in and the desire for additional information about subgroups to understand how, if at all, the evidence applies to their patient population.

Box B-1. Selected LHS panel comments about applicability of evidence in relation to populations and settings

- *"Even if we have great evidence, the real challenge is many clinicians don't necessarily believe it applies to their patient population. We are always trying to evaluate whether the evidence applies to our patient population."*
- *"We hear in our organization that the evidence doesn't apply to our patient population."*
- *"It's one thing to have the evidence, but we need to know where it applies and where to fit it in."*
- *"I would love to [have] some way of looking at the evidence base to see if in this age group, in this patient population, which of [the interventions] have the most value. Rather than clicking the box and doing it because it's part of CPC+ or some other regulatory whatever, what actually makes a difference with patients and which types of patients."*
- *"If, when doing [an] EPC report, there are subgroups of interest where subgroups might be relevant to health systems—e.g., deliveries where women got prenatal care and those who had very little prenatal care. Maybe [this could go] in the appendix of the report. If we were to look at these two groups and see if there are any differences or similarities, I can start customizing this to my purposes."*

CPC+ = ; EPC = Evidence-based Practice Center; LHS = learning health system.

Feedback on the Population Comparison Tool

In March 2019, AIR hosted a live Web presentation of proposed tool ideas. The goal of this presentation was to share information with the panel members and provide an opportunity for them to ask questions and react to the ideas. AIR obtained comments on tools from 9 of 11 panel members. Comments from the panel focused on the need for:

- The tool to take heterogeneity of treatment effect into account. The panel felt it would be helpful to understand the ways in which certain subgroups experienced differential benefits. They felt this information would help them to better understand if and how the evidence applies to the patients served by their LHS.
- More information about the population upon which the research was based. However, the panel did not feel that they needed to upload health system data into a tool for them to make a comparison. They felt confident in their ability to look at the population-level data for the research and independently compare it to their LHS population.

After the April 2018 LHS panel meeting, AIR sent a brief description of the mock-up for the Population Comparison tool and the other two tool mock-ups to the panel members via email, along with a form asking for their feedback. Six panel members returned feedback forms. AIR asked panel members to rank the tools in order of usefulness and rate them individually for usefulness on a scale of 1 to 5, with higher scores indicating more usefulness. Table B-14 lists the number of panel members ranking each tool by first, second, and third choice as well as the average usefulness rating for each tool.

Table B-14. LHS panel members' overall tool usefulness ranks

Tool	First Choice	Second Choice	Third Choice	Usefulness Score
Evidence Snapshot tool	3	2	1	4.1
LHS Stakeholder Summaries tool	1	3	2	3.6
Population Comparison tool	2	1	3	3.3

LHS = learning health system.

Qualitative responses from panel members indicated that they liked the ability to filter and customize the Population Comparison tool. However, they felt it would be a challenge for tool developers to create a comparison because of the complexity of aligning the research population with an LHS population. The panel members also stated there would likely be a dearth of subgroup analysis data. This tool was not moved into mock-up production because of viability concerns related to the paucity of subgroup analysis data combined with the relatively low LHS rating and prioritization.

Phase 2: Tool Development and Feedback

Populations and Settings Tool

At the June 2019 panel meeting, the panel members expressed a continued interest in understanding the populations and settings contained in EPC Program reports.[c] AHRQ asked AIR to revisit the Population Comparison tool but with a dual focus on (1) providing access to the data, and (2) generating information from the panel about LHS needs for data on populations and settings. Guided by feedback from the LHS panel members, AIR iteratively developed and tested a mock-up of a Populations and Settings tool during summer and early fall 2019. We developed the Populations and Settings tool to provide LHS stakeholders with the ability to (1) quickly and easily view and digest information on the populations and settings of the research included in a systematic review, and (2) thereby quickly assess the applicability of the evidence in an EPC Program report to the patient populations of LHSs.

The Populations and Settings tool differed from the Population Comparison tool in several key takeaways. First, it did not include an upload of LHS data; this functionality of the previous tool made it more complicated to program and use, and the panel deemed the upload feature to be unnecessary. Second, given the concerns about the dearth of subgroup analysis data, the new tool was intended to focus on descriptive data for the populations and settings included in the EPC report. AIR felt that these modifications to the design of the tool (eliminating the upload and focusing on descriptive data only) would address the feasibility concerns of the Population Comparison tool.

Methodology

To develop the Populations and Settings tool, AIR focused on understanding what populations and settings data the LHSs would want and how these data should be displayed. The data and display are often interdependent as the nature of the data will often dictate appropriate types of displays. To more broadly capture LHS needs, we focused on constructs, defined as

[c] During the meeting, similarities between products in development by AIR and the SRC emerged. The need for a second distinct product combined with the continued need expressed by the LHSs led AHRQ to request that AIR re-evaluate the Population Comparison tool.

abstract characteristics of a concept, and which require refinement before they can be measured as variables. To understand the content and data displays, AIR (1) reviewed selected references for populations and settings constructs; (2) discussed the approach, challenges, and findings with EPC experts; (3) developed a list of constructs; and (4) reviewed a sample of EPC Program reports. AIR sought expert input through consultation with Jennifer Lin, M.D., M.C.R., Director of the Kaiser Permanente Research Affiliates EPC, and Kathy Lohr, Ph.D., M.Phil., M.A., RTI International–University of North Carolina EPC Director during 1997–2007.

Review of Literature

Many of the types of interventions that the LHS panel members are interested in evaluating or implementing fall into the category of complex interventions. Comments from the panel about subgroup analysis suggest that panel members may be seeking to understand potential mediation or moderation effects of populations and settings constructs. For this reason, AIR began with a review of selected literature, starting with the AHRQ series on complex intervention systematic reviews, papers 3 and 6.[10,11] Complex interventions are those that have multiple components, or complicated causal pathways such as mediators and/or moderators of effects.[10] The authors include suggested population and setting constructs that provide context to improve the clarity and usability of systematic reviews of complex interventions.

To further develop potential content for the tool, AIR reviewed additional reporting guidelines for research. The Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) statement provides guidance for reporting nonrandomized controlled trials.[12] This statement suggests reporting baseline demographic and clinical characteristics of study participants.[12] In the context of prevention research, the TREND guidelines suggest reporting baseline characteristics for each relevant study.[12] AIR also reviewed the Template for Intervention Description and Replication (TIDieR) guidelines for reporting details of interventions but did not find relevant information for populations and settings constructs.[13] The Template for Intervention Description and Replication for Public Health and Policy (TIDieR-PHP) extends reporting guidance for interventions focused on population health and policy. On the basis of the TIDieR-PHP, AIR evaluated some settings constructs, including type of location and geographical scope.[14]

EPC Expert Conversations

During tool development, AIR consulted with experts to provide feedback. AIR asked Lucy Savitz, Ph.D., M.B.A., Vice President of Health Research at Kaiser Permanente Northwest, to review the list of constructs. In addition, AIR discussed the challenges of the content with Dr. Lohr, who pointed to the potential qualitative nature of populations and settings data, the likely heterogeneity of data reporting across studies, and the location of the data (i.e., in the appendixes of the current EPC Program reports). Dr. Lohr suggested considering that end users might differ in how they prefer to view data. Specifically, Dr. Lohr suggested that some end users may prefer to see more precise, granular information than others. As an example, she explained that tables offer greater precision than graphs. She suggested that AIR consider ways that the tool could accommodate different preferences for viewing data.

AIR spoke with Dr. Lin to get her perspective as a current EPC Director. She noted that staff at the EPCs currently input data from their systematic reviews in the Systematic Review Data Repository (SRDR). Given that SRDR already stores systematic review data related to populations and settings, Dr. Lin suggested that AIR explore ways to export data from SRDR into the Populations and Settings tool instead of asking the EPCs to enter data in both the SRDR

and the Populations and Settings tool. In addition, Dr. Lin shared her considerations of the bigger challenges faced by the EPCs in disseminating evidence and information to end users. Finally, Dr. Lin suggested that the key to making EPC Program reports relevant to an LHS audience is to find a way to enable an LHS to combine its own data with the data from EPC Program reports.

Development of the Constructs

AIR created a broad list of potential constructs (Table B-13) that includes the category with which the construct is associated, the construct name, and descriptions of the potential nature of the data element that AIR anticipated finding. This list is pared down from our initial list of constructs; AIR excluded constructs from consideration because our researchers believe these constructs are rarely used or are too abstract to be useful to LHSs.

Using the list of constructs in Tables B-15 and B-16, AIR reviewed five EPC Program reports to understand how often constructs were reported across this sample of reports, location of constructs within the reports, data format for each construct, and any other challenges with extracting the data. AIR reviewed the following reports: (1) *Role of Immunotherapy in the Treatment of Asthma*, (2) *Adverse Effects of Pharmacological Treatments of Major Depression in Older Adults*, (3) *Telehealth for Acute and Chronic Care Consultations*, (4) *Noninvasive Nonpharmacological Treatment for Chronic Pain: A Systematic Review*, (5) *Attention Deficit Hyperactivity Disorder: Diagnosis and Treatment in Children and Adolescents*, and (6) *Mobile Applications for Self-Management of Diabetes*. AIR selected these reports because the panel had indicated interest in them during the June 2019 meeting.

Table B-15. Initial draft list of potential population constructs and associated descriptions†

Construct	Description
Condition severity	Disease-specific indicators
Comorbidity	Categorical data
Age	Numerical (mean, range)
Sex	Categorical data
Socioeconomic status	Categorical data
Race and ethnicity	Categorical data
Insurance status	Categorical data
Diet	To be determined*
Cultural factors	To be determined*
Literacy/Numeracy	To be determined*
Language	To be determined*
Cognition	To be determined*
Visual impairment	To be determined*
Caregiver support	To be determined*
Housing	To be determined*
Support network	To be determined*
Beliefs and attitudes about the intervention	Categorical data

* For the constructs listed as "to be determined," AIR waited until after the team had reviewed several reports to determine the frequency with which the constructs had been included to further define the way the data would be represented.
†A final list of constructs is available in the companion AIR report, *Findings on Including Information on Populations and Settings in Evidence-based Practice Center Reports (Part One).*

Table B-16. Initial draft list of potential settings constructs and associated descriptions*

Construct	Description
Clinical setting	Categorical data
Payment/Insurance structure	Categorical data
Clinic structure	Categorical data
Geography	Categorical data

*A final list of constructs is available in the companion AIR report, *Findings on Including Information on Populations and Settings in Evidence-based Practice Center Reports (Part One).*

AIR found that the EPC Program reports did not include many of the constructs identified in Table B-15 and Table B-16. All six reports included data related to age, and four included some data related to sex. AIR found the other constructs were either inconsistently included in the reports or not included at all. This result was anticipated, as the list of constructs that the AIR team created was meant to be broadly inclusive. AIR discussed this challenge with Amanda Borsky, Dr.P.H., M.P.P., Dissemination and Implementation Advisor at AHRQ and Contracting Officer's Representative for this project. With Dr. Borsky's input, AIR determined that the team should use mock data in the initial drafts of the Populations and Settings tool. Using mock data enabled us to test the tool with panel members, who would find it difficult to react to a tool without data. This approach was consistent with the established dual goal of developing innovative ways to present the information, as well as developing methods for the program going forward, including determining the constructs of greatest interest to the LHSs.

Description of the Populations and Settings Tool

The Populations and Settings tool uses a layered method to display information from the EPC Program report, starting with curated information that a user would most likely be interested in viewing and then allowing for user-selected expansion of details as needed. The mock-up tool contains four tabs:

1. An **Overview tab**, the landing page for the tool, first provides a summary of the evidence report population and setting data, including a brief, one-sentence description of the purpose of the review to provide context. Then the page presents aggregate population data tables—including the aggregated mean and range for population construct data from the review—and tables with aggregated setting data from the review.
2. A **Populations and Settings Data tab**, the core of the Populations and Settings tool, provides users with study-specific populations- and settings-level data. Populations data are organized into three categories: demographic data, clinical characteristics, and other characteristics. This tab enables users to display additional data elements, as desired, such as study outcome data or information about comorbid characteristics of the population, as available. Within each of the categories of data, users can choose to display or hide columns depending on the information they find most relevant to their LHS population.
3. An **Inclusion/Exclusion Criteria tab** includes the Population, Intervention, Comparator, Outcome, Timing, and Setting (PICOTS) table for the evidence report.
4. A **Key Messages tab** provides a high-level overview of the key messages from an evidence report and can serve as a quick reminder of overall review relevance.

Feedback on the Populations and Settings Tool

In late September 2019, AIR completed ten 30-minute virtual interviews with LHS panel members. During these interviews, AIR tested the Populations and Settings tool populated with mock data based on the EPC Program report *Mobile Applications for Self-Management of Diabetes*. The testing evaluated (1) how well the tool met the intended purpose (e.g., provided a high-level understanding with the ability to further query the data), and (2) whether the constructs helped participants understand the populations and settings included in the review. Testing also identified any additional population and setting constructs that LHSs would find valuable. Details on findings from this testing are included in AIR's report *Findings on and Recommendations for Including Information on Populations and Settings in Evidence-based Practice Center Reports.*

In an October 2019 meeting with LHS panel members, AIR presented findings from cognitive testing and discussed the populations and settings constructs, with the goal of helping to inform AHRQ's decisions on next steps with the Populations and Settings tool. During the meeting, AIR confirmed with panel members that the list of constructs accurately and completely represented those constructs that are most relevant to their ability to evaluate the populations and settings included in a systematic review.

Reporting Out Results of Phase 2 Testing

On October 10, 2019, the AIR team met in person with AHRQ leadership and the Scientific Review Center to demonstrate the mock-up of the Populations and Settings tool and present a summary of the results from cognitive testing of the tool. AHRQ leadership had some questions about additional information or features that could be added to the tool, including a request for more clarity about what patient populations were included, how studies were analyzed, and addition of subgroup analysis.

Following the October meeting, AHRQ asked AIR to explore how the EPC Program could address the needs of LHSs to understand the applicability an EPC report. Specifically, AHRQ asked that AIR explore options for summarizing the populations and settings of an EPC report and subsequent, summary-level data visualization. AHRQ suggested that further focus on study-level data would duplicate other AHRQ-funded projects. The SRDR team is expanding the SRDR platform into SRDR 2.0, which is intended to share digital evidence report data with a range of end users, including study level populations and settings data.

To inform our next steps, at the November 5, 2019, EPC Directors meeting, AIR presented the purpose of the Populations and Settings tool and the draft list of constructs. We asked the EPC Directors to provide feedback on the table of constructs, as well as to explore the way the constructs complemented existing guidance for the EPC when assessing applicability of medical interventions.[15] The ensuing discussion focused on how the EPC Directors operationalized the applicability guidance while conducting reviews, what challenges they encountered when using the guidance, and what barriers they foresaw in collecting, reporting, and summarizing the table of populations and settings constructs.

EPC Directors expressed a number of concerns about subgroup analysis and the availability of population-specific data in the EPC Program reports. More details about the feedback gathered from the EPC Directors are presented in AIR's companion report, *Findings on Including Information on Populations and Settings in Evidence-based Practice Center Reports (Part One)*.

Next Steps

After developing the Populations and Settings tool mock-up and reviewing feedback from the EPC Directors meeting, AHRQ concluded that most of the existing EPC Program reports would not provide adequate source data needed to populate the Populations and Settings tool. Furthermore, AHRQ and AIR agreed that additional work is necessary to address data availability, issues with aggregating data, and other methodological challenges.

In recognition of the challenges associated with developing the tool—given the lack of source data—AHRQ directed AIR to shift away from developing a tool that visualizes information to focusing on clarifying what constructs are of greatest interest and relevance to the LHS. AHRQ asked AIR to document the needs of LHSs for information related to the populations and settings data by writing a report describing the concept and development of the tool, a list of relevant constructs, LHS panel and AHRQ input, the results of cognitive testing, and providing recommendations and considerations for future EPC Program reports. AHRQ will provide this report to the EPC Methods Group for use as a resource in their work developing methods that can better incorporate this information in future EPC Reports. By advancing methods first, it may become feasible to develop the Populations and Settings tool in the future. It also might be possible for the EPC Program to update the applicability methods guidance to meet the needs of LHSs for information related to populations and settings data.

In December 2019, AIR returned to the literature for a focused exploration of populations and settings constructs that LHSs need to increase their understanding of evidence applicability to their setting and patient populations. On the basis of the focused literature review, AIR asked Drs. Lin and Lohr to review the list of constructs and provide feedback on (1) the likelihood of EPCs successfully collecting constructs during reviews, and (2) possible ideas for summarizing the constructs. In addition, AIR asked these experts if they were aware of literature that addressed populations and settings constructs specifically for health systems; however, Drs. Lin and Lohr stated they were unaware of any literature on that topic.

Cognitive and Usability Testing Memos for the Tools Developed in the First 2 Years of the Project

The following memos detail the high-level findings from cognitive and usability testing of the Summary of Findings tool (initially called the Triage Tool), the Populations and Settings tool, the Visual Dashboard tool, and the LHS pilot website.

High-Level Findings From Cognitive Testing of the Triage Tool (August 2019)

Overall

- Completed nine 30-minute interviews with LHS panel between August 5 and August 9.
- No major issues with the tool. LHS panel members reacted positively to the look and function of the tool, as well as the nested presentation of information.
- Panel members stated that they would have the basic information necessary to judge relevance of an evidence report with the existing tool and had no major suggestions for added content.
- From the additional content that was presented, panel members provided clear priorities and feedback about which content should be added to the tool. Please see "Additional Content" section for more details.
- Several panel members were not sure how the "More Data" button on the homepage was related to the tool and requested that it be more clearly integrated and labeled.
- A few panel members did not know what the title "Triage Tool" referred to before reading the Purpose description.

Key Findings

- All panel members felt this tab was critical to the tool.
- Panel members generally liked the language around effect size and strength of evidence, although a few panel members suggested revising the language in the description of effect size to be more plain language. Several panel members asked that "Size" be changed to "Effect Size".
- Some panel members did not notice the "More" buttons at the bottom of the tables and asked that the descriptions be moved.
- Panel members had positive reactions to the Intervention descriptions.

Key Review Questions

- All panel members felt this tab was critical to the tool.
- Several panel members were not confident about the acronym KQ at first glance.

Related Findings

- Most panel members felt this tab was critical to the tool.
- A couple of panel members stated they would not know what to expect in this section based on the title "Related Findings".

- A few panel members requested more information about who conducted the reviews linked in this section and clarify language about who "we" and "our" are referring to.

Clinical and Policy Implications

- Some panel members felt this tab was critical to include in the tool. Panel members were most interested in the "Clinical Implications" and "Implications for geographic areas with limited resources" subsections. Panel members had varying opinions regarding the usefulness of the "Policy Implications" section, but none suggested removing this information from the tool. A few panel members requested information about cost and insurance coverage in this section of the tool, which may have implications for hospital and/or health system policies.

Additional Content

- Clinical Guidelines:
  - Most panel members stated that this information would be helpful to include in the Triage Tool, and suggested adding it to the Related Findings tab
- Limitations to Applicability
  - Panel members identified the first three sample bullets as being important information to add to the Triage Tool, as a "More" button in the existing Limitations section. The remaining four bullets were not identified as critical information to include in the Triage Tool.
- Human Resources or personnel for implementation and Resources required to implement
  - Most panel members did not identify this information as critical to include in the Triage Tool. Some panel members had concerns about the feasibility of gathering and presenting this information for all of the interventions covered in the evidence report in a way that would be clear and helpful.

Other Findings

- When asked if the existing Triage Tool would provide sufficient information to assess the value proposition for themselves or their organization, panel members said that the tool provides a good starting point for making this value judgment. Panel members stated that the tool would help them assess the feasibility and evidence base for the interventions examined in the review, as well as any contextual information they may want to know. When asked what other information they would like to be added to this tool, panel members did not have any additional suggestions. Below are a few responses from panel members regarding this question:
  - *"To me, the value-based thing is if you go to the more information radio button, you want to invest your organization where the strength of evidence is highest and the effect is highest. You certainly don't want to be spending it where the effect and evidence is minimal. I think that in a sense, from a value-based strategy, is helpful."*
  - *"I think what you have is good enough and people can figure it out from there. A tool can't do everything, but this gives you information to make a decision from."*

- *"I think the value proposition is different from clinic to clinic. I think the people using this tool will understand the relative ways to use these things specific to their area. I think it would get me started."*

- Several panel members stated that they would use the Triage Tool as a starting point to assess value for their LHS, and then look for separate "how-to" based tool to help them implement relevant interventions. Suggestions for "how-to" information included:
  - An "Implementation Guide" for each intervention
  - Key contacts from the organizations that reported on the intervention
  - Information about whether interventions are reimbursable by insurance or payers

High-Level Findings From Cognitive Testing of the Populations and Settings Tool (September 2019)

Overall

- Completed ten 30-minute interviews with LHS panel members between September 23 and September 27.
- All of the panel members felt that in general, the tool provided them with the ability to understand and get a high-level overview of the review population and setting, but made suggestions to continue to tailor it and increase its usability.
- There was not consensus on who would be most likely to use the tool. Panel members suggested a broad audience of potential users that might include clinicians, clinical librarians, clinical leaders, learners, administrators, researchers, and patients.
- Users shared ways in which they might approach the data from the review, filtering different columns, and including or excluding others. There was not a single approach, suggesting that allowing users to manipulate the data based on individual preference offers high functionality for a range of users.
  - *"I think it's going to be dependent on the user to figure out what's going to be helpful. For this particular evidence review, I like what's listed in the "other" information in terms of patient characteristics that are not demographics. I certainly like the baseline data on patients under the clinical characteristics. And I think dependent on the demographics, people will filter that to use them in different ways."*

Overview

- Most panel members understood the purpose of the overview tab; however some found the text outside of the tables difficult to grasp quickly. They suggested reorganizing for clarity and conciseness.
- They responded positively to the tables. Data displays were seen as useful.
  - A few panel members felt that summary data were incomplete, and asked for sex, race/ethnicity, and comorbid conditions.
- A few people felt that the "Overview" was incomplete and should include information about take-home messages or results.

Populations and Settings Data

- LHS panel members appreciated having ready access to the data, so that they could explore it based on their preferences. Panel members expressed a variety of perspectives about relevance and applicability of variables.
- A few LHS panel members noted a lot of empty space in the columns and rows that made it hard to take-in the data, while others found no problem with the display.
- There were some suggestions to simplify the default data view, and allow users to add in information. They suggested that some users (researchers, diabetes program managers) would add many variables, while others (LHS Executives) would be unlikely to add any.
    - Having the study results shown in the default view was endorsed by most panel members. Many also felt that the information in the "other" and "comorbid conditions" should be initially hidden but available for a user to add.
- Panel members liked having access to the additional study information available in the "more" button underneath the application and author name. While the lateral navigation was not intuitive to all panel members, most considered it useful.
- Panel members identified where they needed more information, such as a definition, to better understand the data.

Ease of Use and Importance of Functions

- While some users quickly completed the testing tasks and felt that the tool was similar to other tools they have used, a few felt that some functions weren't immediately intuitive. For example, there was some confusion about how to hide columns, and what some icons did.
- Two panel members expressed confusion about whether filtering the population data would lead to a different outcome or change in the key messages.
- The ability to filter or sort the data within the tool was seen as an important aspect of the tool by all but one panel member.
    - *"It's important. I think that's what we are hoping to get in an evidence review. Somebody to set it up so we can filter it and get to what we are particularly interested in, which may not be presented in the final findings of the report. But the ability to say, 'Hey, I know what you thought was important, but what I care about is this and now I can find it.' The way this table is built, I can do that now."*

Additional Population and Setting Variables

- Only one additional variable was suggested by the panel, literacy levels. They responded positively the variables that were included.

Inclusion/Exclusion Criteria

- Most panel members felt this tab was important to the tool.
- Several panel members stated they would not know that this section was related to the overall review methods rather than individual studies. They suggested adding a sentence or two in the header to make this clear.

Key Messages

- All panel members liked the content of this tab and felt it was critical to include in the tool.
  - *"Personally, I really like it. I wouldn't add anything. It's succinct and clear for someone who doesn't have a lot of time to read it and use it."*
- Panel members felt that keeping the information in this tab short, similar to the four bullet points presented, was critical.

Other Findings

- Some panel members suggested that terms used within the tool might be challenging for those not well-versed in the research literature.
- One panel member wondered if it would be possible for EPCs to provide access to this type of data even before the full review is completed.
- Another panel member suggested that a more dynamic tool would be valuable. The panel member suggested that end-users enter data to keep a review up to date with someone validating the submission.
- Panel members had varying opinions as to the order of the tabs, with some feeling the order in the wireframe was appropriate and a few suggesting changes.
- Panel members shared enthusiasm for the way the project and this product are progressing
  - *"This looks so much like what we've been asking for."*
  - *"Yeah, I think it's great. It's wonderful to have it all right there."*
  - *"You're doing a great job."*

Testing Feedback Summary: Triage Tool (February 2020)

Introduction

AIR conducted nine virtual, one-on-one interviews with LHS stakeholder panel members or representatives of their choosing. These interviews took place between February 10th and February 28th. AIR used Web-based software that allows for screen mirroring so that the interviewer and note taker could see what the participant was clicking on and viewing.

The interviews included a balance of participant-led exploration and structured interview questions designed to address the following testing goals:

1. Determine whether users understand the content and purpose of the Triage Tool.
2. Determine whether users find the Triage Tool useful in current processes within health system practices.
3. Identify users' barriers to adoption of the Triage Tool and their suggestions for strategies to mitigate these barriers.
4. Obtain user input as to suggested improvements to the Triage Tool content, language and design.

While testing of this kind is usually considered exempt from approval, the AIR team followed guidelines outlined by AIR's internal Institutional Review Board (IRB) to recruit, provide informed consent, and interview participants (Table B-17).

Table B-17. Summary of interview participants for the Triage tool

Participant ID	LHS	Stakeholder Type	Title
1	Kaiser Permanente	Division or Department Chair; Service Line Leader; Quality leader	Senior Executive Consultant, Care Experience
2	Sutter Health	Frontline Clinician	Primary Care Physician
3	Baylor Scott & White	Clinical or Operational Leader	System Director for Nursing Clinical Excellence
4	Kaiser Permanente	Division or Department Chair; Service Line Leader; Quality leader	Senior Executive Nurse Consultant Quality & Service
5	Baylor Scott & White	Clinical or Operational Leader	Systems Director of Clinical & Patient Learning
6	Sutter Health	Frontline Clinician	Hospitalist
7	Lehigh Valley Health Network	Clinical or Operational Leader	Director, Hospital Medicine
8	UCSF	Division or Department Chair; Service Line Leader; Quality leader	Medical Director, UCSF Health ACE Unit
9	Hawaii Pacific Health	Clinical or Operational Leader	Director of Clinical Improvement

ACE = Acute Care for Elders; LHS = learning health system; UCSF = University of California San Francisco.

Overall Findings

- Participants had generally positive reactions to the Triage Tool and stated that it would be useful in presenting high level findings; less useful at the point of care (Table B-18).
  - *"It would help me look at a reputable body evidence that's already been summarized and I can back into it if I need to. I think that healthcare team members need bite sized information that they can trust and rely on."*
  - *"I wouldn't use at the point of care in my daily practice. I would probably use this to refresh myself. This looks like a tool that would help me refamiliarize with literature."*
- The name of the tool was confusing for a few participants, particularly for frontline clinicians who triage patients.
  - *"Having not known what this was in advance… Triage Tool to me sounds like an algorithm that would be a guideline for me to make a decision on how to prevent or treat delirium… I'm thinking summary of evidence instead of Triage Tool... In my work the word "triage" is very sensitive. The other way people might think of triage is when you're in the emergency department. This is not that. This is clinical decision making."*
  - *Overall, participants requested more information on the main page, fewer clicks to navigate to important information, and more plain language. Participants stressed*

that they would have limited time to read the tool and emphasized a need to reduce the amount of text and highlight important information up front.

- *"In general, I've learned that people are busy, so if you can tell them what you need to do and why and provide more information after. Unless the target audience has a lot of time to go through, you might want to put the meat up front."*
- *"As a doctor, you're really busy and you just want the answer. And then later, when you have some time or you want to do some teaching with the team to understand why I think that, then I'll sit down and go through these studies. At the moment, I just need the answer. What question are we asking and what is the answer."*

Table B-18. Overall suggested revisions for the Triage tool

Suggested Revisions Based on Testing	AIR Response to Suggested Revisions
Consider revising name of tool. Participant suggestions included: Evidence Summary Tool, Summary of Evidence, or Clinical Decision-Making Tool.	Revise name of tool. Of the suggestions from testing, AIR recommends using "Evidence Summary Tool", but defers to AHRQ.
One participant suggested adding the purpose of the tool to the main page so it is visible without an additional click.	Move the content of the Purpose popup to the top of the page (above the tabs, visible on all pages).
Where possible, shorten and simplify text throughout the tool to reduce time needed to interpret.	Specific recommendations about where to reduce the amount of text and increase plain language are noted below in Findings by Section.

AHRQ = Agency for Healthcare Research and Quality.

Findings by Section

Key Findings Tab

- Several participants requested a top-line summary of findings at the top of the Key Findings page above the table. Similarly, some participants requested that conclusions be added to the table to the right of Outcomes (Table B-19).
  - *"[The Key Findings Tab] is incredibly important. It'd be the first place I'd go if I came here, but like I said it takes me a while to find the answer. It needs to be upfront and highlighted and very clear when I have two seconds to find the answer to the question."*
  - *"But maybe a little more summary up top [hovering over the green text] like "we found this…and here's a little bit more." The only reason I'm saying this is because most papers have a little explanation of the key findings or approach before the table…I'm a fan of the quick information."*
- Participants were not always able to tell what population was included in the review and wanted to see this information earlier.
  - *"So I have an intervention that I'm looking at, I want to know if that intervention is applicable to my population and my patients. I want that front and center and as tight as possible."*
  - *"I would like to see the results and population in [the key findings table]. It's helpful to summarize the information in that first page. The key is that it would need to be clear about who the information would be applicable for."*

- When clicking into the Key Findings Table to view findings, participants were not aware of the purpose of the drop-down menu and were unsure how to navigate to relevant results. The default view is currently set to a population with no results available. Participants did not always notice the text reading "No results available" and thought the text below the line would provide results.
    - *"So I would put [the label] "Different Populations" here next to the drop down menu. Unless it's spelled out, I may not look right there. Common sense tells everyone that it's a drop-down menu, but if I'm in a rush I would keep going."*
    - *"This doesn't allow me to see quickly overall in which settings second generation are better. Now I need to go through each of the subsets… I have to be a detective to put this all together as opposed to having someone say to me that second generation antipsychotics have not been shown to be better than haloperidol or placebo, except palliative they do worse. I did all that clicking to get that take home message."*
- Some participants had difficulty finding and interpreting the meaning of the SOE symbols in the table.
    - *"I would want to look at the rating scale. The + to me, I'm not sure what the plus means. Is there going to be 4 +s or does that mean weak or good or bad. I think if I were looking at it, I would want you to say how many pluses because I didn't look at the small print."*
    - *"And then strength of evidence is a plus… oh you have the key below. So plus is low. When I first look at the plus, it looks like a good thing. If it was low SOE, I'd want to see something different, maybe a minus or down arrow."*
- Some participants noted that the language used to describe strength of evidence was "jargon" and requested that it be written in more plain language.
    - *"The low description is a little hard to understand. To me that sounds a little research-y for the common medical person who would want to read this."*
    - *"Who are your intended users? I ask specifically because this is written at a pretty high level and I understand if you're talking about physicians and advanced practice or people with advanced degrees, if you're looking at people in more direct clinical practice roles without doctoral [degrees], you might be able to word it a little bit more clearly."*
- When participants read the Applicability and Limitations sections, they found this information very important but had trouble finding the information when asked. One participant suggested including a menu at the top of the page, showing contents of the page and allowing the user to click to the relevant section. Another participant suggested moving the Applicability and Limitations information to a separate tab.
    - *"I wouldn't have seen applicability had you not scrolled down. From a usability perspective, it's helpful for your Web-based content to all be available on one screen without having to scroll."*

Table B-19. Suggested revisions for Key Findings tab

Suggested Revisions Based on Testing	AIR Response to Suggested Revisions
Consider adding a top-line summary of findings, including the relevant population, on the first page of the tool.	Key Messages will remain on the main report landing page. AIR will not add these to the Triage Tool but will coordinate with the SRC to ensure they are displayed on the new NextGen pages.
Several participants suggested adding conclusions to the key findings table or flagging to the user which outcomes have significant results.	Add indicator icon and text next to each outcome that denotes when results are available.
Several participants suggested adding a label to the population drop down box.	Add a label to the populations drop down box.
Add emphasis to "No results available" by making text larger or adding background color.	Make "No results available" text larger and add background color.
Several participants suggested adding the words "Low", "Moderate", or "High" or replacing the plus signs with these words.	Revise the Strength of Evidence to display text values "Low", "Moderate" and "High".
Several participants requested that the language used to describe Strength of Evidence be written in plain language and simplified.	Revise the strength of evidence definitions to make sure they are in plain language. Flag this during EPC review of the tool. We recommend that AHRQ consider developing standard plain language definitions for strength of evidence to be used consistently for all reports.
Revise tool to improve participant access to applicability and limitations information.	Move Applicability and Limitations information to a new navigation tab at the top of the page, for a single, consistent navigation methods throughout the Triage Tool.
Consider formatting changes that increase available information without requiring users to scroll down.	Reduce whitespace within the tool to more efficiently use space.

AHRQ = Agency for Healthcare Research and Quality; AIR = American Institutes for Research; EPC = Evidence-based Practice Center; SRC = Scientific Resource Center.

Related Review Findings and Clinical Guidelines

- Participants reacted positively to the Related Review Findings and Clinical Guidelines and thought the tool provided a good summary of the important points from the full report (Table B-20).
  - *"I like it. It's to the point. I think the summary text is fine."*
  - *"It pretty much gets to the point. I think you pulled down the important information there."*
- One participant requested more information about the time frame of the publication of related reviews.
  - *"I noticed that some articles include a note that after 3 years that it's not considered current and then considered under the archive section. So I was wondering if this section was within the last 3 years or last 5 years."*

Table B-20. Suggested Revisions for Related Review Findings and Clinical Guidelines tab

Suggested Revisions Based on Testing	AIR Response to Suggested Revisions
One participant suggested adding information about publication date of related reviews mentioned in this section	Add publication dates to the related review text.

Clinical and Policy Implications

- While participants felt the information in this tab was important, several participants requested that the text be shorter. When asked if the bolded information was correctly identified as the most important, participants generally agreed (Table B-21).
    - *"The summary text looks longer… I mean I trust the authors, if they're keeping the info it's important. I like that they bolded it. I'm probably going to look at the bolded text first. I'll go back if I need to."*

Table B-21. Suggested revisions for Clinical and Policy Implications tab

Suggested Revisions Based on Testing	AIR Response to Suggested Revisions
Consider including only bolded text or otherwise shortening bullet points	Shorten the Clinical and Policy Implications text. Include guidance for the EPCs in the user guide noting that text should be a shortened version of report text.

EPC = Evidence-based Practice Center.

Testing Feedback Summary: Visual Dashboard Tool (March 2020)

AIR conducted seven virtual, one-on-one interviews with Learning Health Systems (LHSs) stakeholder panel members or their designated representatives (Table B-22). Interview participants were asked to provide feedback about the Visual Dashboard, designed to provide users with an opportunity to see and interact with the details of an EPC report's meta-analytic results.

The interviews included a balance of participant-led exploration and structured interview questions designed to address the following testing goals:

1. Determine whether users understand the content and purpose of the visual dashboard.
2. Determine whether users think the visual dashboard would support current health systems practices.
3. Determine barriers to use of the visual dashboard and obtain user suggestions for strategies to mitigate these barriers.
4. Recommend possible improvements to the visual dashboard in content, language, and design.

These interviews took place March 9–13, 2020. AIR used web-based software that allowed for screen mirroring so that the interviewer and note taker could see what the participant was clicking on and viewing.

While this type of interview is considered exempt from approval, the AIR team followed guidelines outlined by AIR's internal Institutional Review Board (IRB) to recruit, provide informed consent for, and interview participants.

Table B-22. Summary of interview participants for the Visual Dashboard tool

Participant ID	LHS	Stakeholder Type	Title
1	Baylor Scott & White	Clinical or Operational Leader	System Director for Nursing Clinical Excellence
2	Kaiser Permanente	Division or Department Chair; Service Line Leader; Quality leader	Senior Executive Nurse Consultant Quality & Service
3	Inter-mountain	Frontline Clinician	
4	Sutter Health	Frontline Clinician	Hospitalist
5	Baylor Scott & White	Clinical or Operational Leader	Systems Director of Clinical & Patient Learning
6	Hawaii Pacific Health	Clinical or Operational Leader	Director of Clinical Improvement
7	Lehigh Valley Health Network	Frontline Clinician	Hospitalist

LHS = learning health system.

Overall Findings

- Several issues related to the use of Tableau[d] emerged. These included:
  - **Error messages**. During a number of interviews and on multiple occasions, Tableau generated an error message requiring that the user reset the view to the default screen.
  - **Click and hover-over functions were not working correctly**. Several times during testing when attempting to click on the author in the individual studies section, the participant and interviewer had difficulty getting the pop-up menu to open.
- Overall, participants described the tool as useful and noted that the tool includes helpful information. Users responded positively to the visual displays and ability to filter information in the tool. However, participants also described the tool as complex and challenging to navigate and requested additional instructions for using and interpreting the information in the tool. Participants also had several suggestions for improving legibility of the tool, which are noted in Table B-23.
  - *"It's a little bit of information overload, but it's appropriate…. I may or may not need all of this, but it's good I can tailor to what I need. But absolutely appropriate."*
  - *"I guess my overall reaction is that this might be a useful tool, but I just don't know how to navigate it.... There needs to be instructions…that say something like 'Here's a table. Here's what you do. Here's why you would use this table. What it's for.'"*
  - *"Either make it more intuitive or have very clear instructions. You'd have to play around with this [tool] to figure out all the stuff."*
- Participants identified potential users, such as researchers, business leaders, LHS users involved in creating clinical guidelines, educators, and students and provided examples for how these audiences might use the Visual Dashboard. Although several participants noted that clinicians might use the tool, in general, they did not think that clinicians would use it at the bedside.
  - *"People like me [Leader] working on trying to translate evidence into practice and find the best evidence…. I don't know how many physicians would go and find this information on their own; they would trust me to find that information for them and translate it."*

[d] Tableau is the data visualization software used to present the Visual Dashboard.

- *"This is for somebody trying to define a policy at their organization. They can see where the evidence is quickly."*
- *"I would never use this at the bedside table. I think I would maybe use this if I was teaching a class to medical students about the trials around antipsychotics for delirium. This is a good way to identify some of the trials, outcomes and primary sources. Yeah I would not use this at the bedside."*

Table B-23. Overall suggested revisions for Visual Dashboard tool

Suggested Revisions Based on Testing	SRC Response to Suggested Revisions
Where possible, shorten text so that full phrase is visible without requiring the user to hover to view it.	We agree and are working on this change.
Consider revising colors in the graphs and elsewhere to ensure they meet the needs of those who are color blind and are compliant with Section 508 and AHRQ publishing and communications guidelines.	Yes. This draft was done quickly. But we are aware of the requirements of 508 and will meet them.
Consider expanding instructions on how to use the tool and including information about the tool's purpose.	We are working on changes to the page that would include more explicit instruction.
Consider increasing color contrast and text size throughout the tool.	We are addressing readability within the constraints of a Web page.
Consider removing boxes on the right with outcome and population text.	We plan to reformulate these so that they are fewer and easier to read.

AHRQ = Agency for Healthcare Research and Quality; SRC = Scientific Resource Center.

Findings by Section

Introductory Text

- Most participants had a positive reaction to the inclusion of an introductory paragraph and bullet points highlighting what the evidence shows (Table B-24). Several participants had suggestions for how they might like to see the important information highlighted and for reducing the amount of text in the introduction. One participant requested the addition of population information in the introductory paragraph.
  - *"I thought the first paragraph has a lot of information. I would prefer to have it bulleted and not narrative written. I want to know if I'm in the right place to begin with. I probably would go right immediately to the two bullet points in the middle that say how haloperidol works. I would go there instead of the first paragraph. Most of the people looking at it will know this information. Those things are helpful but most of us don't read those things."*

Table B-24. Suggested revisions for introductory text for the Visual Dashboard tool

Suggested Revisions Based on Testing	SRC Response to Suggested Revisions
Consider shortening introductory paragraph or using bullets only.	Likely the page in situ would not include the introductory material, but rather instructions on using the tool. It was included here because there was no other context. Naturally, users would come to this page from another page that already provided context.

Suggested Revisions Based on Testing	SRC Response to Suggested Revisions
The underlined text may imply that bulleted text is clickable and links to more information. Consider removing the underlining and using bold formatting for emphasis.	We understand the concern and will limit underlined text to links.
Consider adding information about relevant population in the introductory text.	We plan on allowing viewing of the data by subpopulation and limiting the introductory text to instructions on use, as noted above.

SRC = Scientific Resource Center.

Summary Dashboard

- Most participants found the Summary Dashboard important in helping to understand the research studies included in the systematic review (Table B-25). Participants liked the variety of outcome data displayed in the tool and responded positively to the information displayed when a user hovered their mouse over the colored bar in the graph.
  - *"I think [the Summary dashboard is] very important—because many times I'm trying to compare study with study and specifically what's listed here, which is some cardiac, some mental health, and mortality and neuro. This allows me to slice the data from different perspectives."*
  - *"I like that I can hover over [the summary bars] and have more information [in pop-up boxes]. I like that I can see how many patients are studied so I can see if it's statistically significant to me—how many studies, relative risk, total incident—yeah, all of this is helpful information."*
- Several participants suggested that the section of the Summary Dashboard to the right of the screen titled "Outcomes" could be removed to provide more space for the graph. They noted that this section did not provide new information, was difficult to read, and its use was unclear. Participants also noted that it was difficult to compare the colors of the outcomes to the colors in the dashboard. Participants noted that when they hovered over the bar in the graph, the number of participants did not appear to match the corresponding icon from the section titled "Summary—Total Participants".
  - *"I like the colors, but they seem to take up a lot of space to identify a label…. And the outcomes are already listed on the table. Seems redundant here. Give me a little bit more space to view the data."*
  - *"I think these are supposed to be filters? And I'm trying to click on them to see if I can filter by population, but I don't think I can…. I'm also color blind, so the colors here don't help."*
- Although some participants felt comfortable interpreting and understand the terms in the tool, other participants had difficulty, or felt that other users might have difficulty understanding or interpreting those terms. Specific terms identified as difficult to understand or interpret were "relative risk", "incidence" (total, intervention, and control), and "favors intervention versus favors control".
  - *"Actually, I just got that backwards. [Notices the 'Favors intervention' and 'Favors control' arrows on the bottom] I guess that's useful. Maybe a little key that says if your bar is completely to the left of the dotted line, the intervention is correlated with the outcome or causes the outcome. That might be helpful."*

- During testing, a few usability issues were noticeable. The presence of the scroll bar was not apparent to participants, and several also had problems using the scroll bar. One participant noted that it wasn't clear what the presence of the black dots indicated. Another participant noted that it was difficult to read the outcomes because the text display wasn't long enough to include the full text of the outcome.
    - *"What's interesting is that I missed this here [summary table scroll bar]. Even though I saw the outcome drop down list, it was not apparent to me this is a scroll bar because it's grayed out. I didn't know I could scroll down. I thought it was a static list. The only reason I found it is that I inadvertently scrolled and now it makes sense."*
- Most participants felt they were able to interpret the graph; they had some level of previous experience reviewing information in similar displays. One asked for more explanation. Participants noted that they or other users might need additional context or information to fully interpret the graphs.
    - *"Because I'm not a statistician, depending on what studies I'm looking at, I sometimes still pull reference books to see what exactly they are reporting on and how I'm interpreting it. I might dig a little deeper on how the study was conducted because most studies have flaws. But this gives me a sense that experts have already looked at this and they are reporting on the overall risk."*
    - *"Anybody looking at this, they're going to have a whole realm of expertise. There are some doctors that are super good with computers and everyone is getting better over time, but I think if you want people to really use it, you would need to put some more explanation [of favors control/intervention, and what the numbers signify]."*
- Participants had different preferences about the data display in the default view, with a slight majority expressing preference for having all the filters selected. This difference didn't appear to be based on the participant role of Clinician or Leader. One user asked for additional filter options specifically including an option to filter by study participants.
    - *"I think it's better to have them checked…. It's better to have too much and click away. I would think most of us are familiar with having boxes pre-checked. If you didn't have them checked, you'd have a blank page and that would be more confusing."*
    - *"It depends on what I'm looking at it for honestly. I was thinking it'd be helpful to have them all un-checked and then have something … when you're doing PubMed, their filters are un-checked. Usually, you check it when you want it when you're doing a literature search."*

Table B-25. Suggested revisions for summary dashboard within the Visual Dashboard tool

Suggested Revisions Based on Testing	SRC Response to Suggested Revisions
Consider adding a key that defines research terms.	This point and the below overlap, and we agree that some generic text on the meaning of forest plots would be useful. We will develop this for use on all dashboard pages.
Consider adding information to assist users with interpreting graphs.	See above.

Suggested Revisions Based on Testing	SRC Response to Suggested Revisions
Consider revising or removing the section of the tool labeled “Summary—Total Participants”.	This is mislabeled. It should have read Total Incidence, but we agree these data are available in the tooltips, so it can be removed.
Consider removing or revising the section of the tool labelled “Outcomes”.	We are revising this section to be smaller and easier to navigate.
Consider including absolute risk instead of relative risk.	We’re subject to the terms of the report. The authors calculated relative risk.

SRC = Scientific Resource Center.

Studies Dashboard

- Most participants liked the way the studies table was displayed and generally understood the purpose of the table (Table B-26). One participant was not clear about the difference between the summary table and the studies table. Another participant didn’t like the way it was ordered and found the table “busy”.
  - *“I like this part…. This is what I compile my own tables for, so this would be a goldmine for me.”*
  - *“The summary table is the same, as far as I’m concerned. The only thing that is different is this information that goes into the this [studies] graph. The relative risk is the same and you still have the total participants, but my population set is different. The table above is based on outcome. So, population and setting for the bottom table.”*
  - *“It’s so cluttered that my eyes don’t want to review the information on the right. It looks like it’s ordered alphabetically, so my question is what do they want me to know first?... It would be much easier if I could organize by outcome, by clicking in the summary table.”*
- Most participants felt it was important to include the link to access more information about the studies included on the page—although it was not initially clear to all users how to access the links. Most participants found the link to the study by clicking on the author name. One participant noted that there was a discrepancy when clicking on an outcome. The pop-up indicated that there were ten items selected, but only five studies were listed in the graph. This participant also noted discrepancies between the number of studies listed in the graph and the number of studies displayed when the PubMed page opened.
  - *“It’s important [to have a link to more information for each study]…thinking from a clinical perspective, sometimes I want to drill down a little more, and this allows a clinical leader to drill down. Or maybe we propose certain guidelines, and sometimes questions come up that the summary doesn’t answer, and this would allow the clinical leader to drill down and dig deeper to see if the question can be answered.”*
- Some participants thought it would be useful to access data, but many had difficulty locating where to download data within the tool. One participant stated that they would be interested in seeing a link to download the data in the hover box. Some participants had difficulty interpreting the data once it was downloaded. These participants explained that some of the column headers were unclear.

- *"This is the kind of data that I would put together on my own. When I've done literature reviews, this is the kind of table that I would put together to collect the information from the different studies. I would actually use this… there are a couple of things in the heading and in the rows where I'm not really sure what it means. Like the column of '!' and this 'ATTR' abbreviation."*

Table B-26. Suggested revisions for the studies dashboard

Suggested Revisions Based on Testing	SRC Response to Suggested Revisions
Consider changing the wording from "Link to Study" to "Link to Studies" in cases where the link directs the user to more than one study.	We'll investigate whether this is possible within Tableau.
Consider adding instructions or user guide that directs users how to download information from studies.	We'll develop some standard guidance on downloading and sharing data.
Consider revising the labels for the data that is available to download as participants were unable to interpret the column names.	We'll investigate, but again we have to live within the limits of Tableau if we use this software for display.
Consider revising the location or increasing the visibility of the download button.	We might not be able to do this within Tableau, but we can make it part of the instructions so that it's easier to find.
Consider revising or removing the key for "Study—Total Participants".	Agree, as above.

SRC = Scientific Resource Center.

Testing Feedback Summary: LHS Pilot Website (August 2020)

Introduction

Between August 3 and 14, 2020, AIR conducted eight virtual, one-on-one interviews with Learning Health Systems (LHS) stakeholder panel members or their designated representatives (Table B-27). AIR researchers asked interview participants to provide feedback about AHRQ's new evidence report topic home page, including the Summary of Findings and Visual Dashboard tools.

The interviews included a balance of participant-led exploration and structured interview questions designed to address the following testing goals:

1. Overall usability
2. Ease of navigation between the tools and content
3. User reaction to the layout and design of the systematic review homepage and tools
4. Understanding and interpretation of the information presented

AIR used Web-based software that allowed for screen mirroring so that the interviewer and note taker could see what the participant was clicking on and viewing.

While this type of interview is not considered to be research and, thus, is exempted from oversight of the institutional review board (IRB), the AIR team followed guidelines outlined by AIR's internal IRB to recruit, provide information about the interviews, and obtain verbal consent from participants.

Table B-27. Summary of interview participants for the pilot website

Participant ID	LHS	Stakeholder Type
1	Lehigh Valley Health Network	Frontline Clinician
2	Sutter Health	Frontline Clinician
3	Northwell Health	Division or Department Chair; Service Line Leader; Quality Leader
4	Denver Health System	Division or Department Chair; Service Line Leader; Quality Leader
5	Lehigh Valley Health Network	Frontline Clinician
6	Kaiser Permanente	Division or Department Chair; Service Line Leader; Quality Leader
7	Kaiser Permanente	Division or Department Chair; Service Line Leader; Quality Leader
8	Sutter Health	Frontline Clinician

LHS = learning health system.

Below, we present results from these interviews with supporting quotes. Overall findings capture themes that arose in response to participants' experiences with the website as a whole, while findings by section are more specific to each part of the website. Each section of findings and supporting quotes is followed by a table that includes suggestions for revisions, and a column for response to the suggested revisions to be completed by AIR, the SRC, and AHRQ. The column for suggested revisions is based on a combination of recommendations made directly by participants as well as those recommendations based on AIR's analysis of comments.

Overall Findings

- ***Overall, participants described the website as useful and noted that the website includes helpful information*** (Table B-28). Participants said that this website was an improvement in terms of finding information from the systematic reviews, as compared with using the PDF's they had reviewed in the past.
    - *"I thought it was easy to use the site . . ., having looked through some of your older studies . . . [I]t takes me a long time to kind of get to the full, nitty gritty by having to search through your PDF, and using keywords, et cetera, just on my own. I think, [the website] is fantastic."*
- ***Most participants reported that it was relatively easy to scan the content of the Web page.*** They acknowledged that the site had a lot of detail; however, they felt that the detail was necessary; they had no suggestions for changing the level of detail on the site.
- "I think you're achieving a good balance between the need to know and the want to know. The need to know is those things in the main findings, and maybe the next level down is the want to know, what other people want. And I think it will take work, but there's no other way to do it."
- ***Participants' abilities to use the website varied.*** Some participants navigated quickly through the tool, while others moved more slowly and appeared to struggle to find things when prompted by testers. Because of time constraints during the interviews, AIR researchers moved through the testing items quickly; it is possible that, given more time, participants would have more successfully navigated the site.

- *"I think [the site] requires training; it requires . . . a guided tour of it in order to use it. . . . [O]nce you have that training data tour, I think it's useful."*

- ***Participants suggested improving consistency*** across the site in terms of text sizes, fonts, and colors.
  - *"I would assume that there's . . . a system standard for your formatting and your fonts on your website. So I think it's just like the gray on the light gray with the light gray background. That's hard to read."*
- ***Many participants had difficulty identifying the navigation bar*** on the homepage and did not understand that the words listed in the navigation bar represented links to other tools. Participants often skipped over the navigation bar and went directly to the Summary of Findings tabs. In Table B-29 we list participant suggestions to increase visibility of the navigation bar.
  - *"I'm thinking, maybe this part here [referring to the Navigation bar] maybe needs to be a bit bigger… sometimes, we have leaders that are not as… tech savvy. They may just think that this is just the header, and if they mouse coming this way, they'll miss [the link]."*
  - *"I might put report home to the left of structured abstract. Because people look to return to go back the easiest thing to do. You always look to the first thing."*
- ***Issues with using the site.*** When the participants made changes in the Summary of Findings table (e.g., selected a different population or chose to view "treatment"), the page would reload to the top of the Web page. Participants found this frustrating.
- ***Tailoring the evidence summary.*** Some participants thought that a tailored Evidence Summary and accompanying PDF would be useful. One participant suggested that they would be more likely to use such a feature if it was designed to be shared with a patient.

Table B-28. Suggested revisions for the website, including AIR and SRC response to revisions

Suggested Revisions Based on Testing*	AIR Response to Suggested Revisions	SRC Response to Suggested Revisions
Add a short walk-through or tutorial video of key aspects of the site for new users.	For the Summary of Findings tool, AIR can develop a brief tutorial that highlights use of selection icons at the top of the table.	Given the necessary overlap between the Summary of Findings tool and the modal visualizations, I think it would be best to jointly develop a script that encompasses this overlap. Then, we might develop a separate script for the visual dashboard alone. Lastly, we should be cognizant of hosting and 508 issues with video.
Use consistent text size and font throughout the site. Where possible, use similar color palettes.	AIR will coordinate with the SRC.	Agreed.

Suggested Revisions Based on Testing*	AIR Response to Suggested Revisions	SRC Response to Suggested Revisions
Increase the visibility of the navigation bar by: Using darker and larger text for the names of tools Placing the navigation bar more prominently on the page Highlighting the name of the tool that is currently on the screen Moving "report home" to the far left in the navigation bar	Not applicable to AIR.	SRC will update the nav bar to address these issues.

AHRQ = Agency for Healthcare Research and Quality; AIR = American Institutes for Research; SRC = Scientific Resource Center.
*Suggested revisions include those made directly by participants as well as those based on AIR analysis of comments.

Findings by Section

Summary of Findings Tool

- ***Using the filter options.*** Participants did not always realize what filter options were available on the page. They often noticed some filter options and not others. The filter options that stood out to participants varied by participant.
  - *"I think when you're looking at the filters, it's not really intuitive that this filter is a drop-down menu [patient population], this filter's the toggle button [prevention/treatment option], this filter is another toggle button [hide/show evidence]. And then, here, I will click on the outcome [row]. Yeah, it seems like a bit like every kind of filter is presenting in a different way."*
- ***Understanding outcomes.***
  - The outcomes in the Summary of Findings table were not immediately apparent to many participants. In Table B-29, we include suggestions made by participants to clarify that the words in the blue bars represent outcomes.
    - *"Only one outcome is expanded when you first view it, so I didn't even realize that the first row of outcome is "Length of Stay in Hospital." I feel like if you had all the rows minimized then you can quickly see all the outcome options and the more outcome [expanded list] too. Then I would have to actively choose."*
  - Several participants said the 'More Outcomes' table had too much detail. It was not clear to all participants that the "hide/show no evidence" toggle could be used to remove the portions of the table that did not have any evidence.
    - *"[The hide/show no evidence button] is helpful, but I had to become familiar with this website. If it's my first time using it, I might not be able to realize this [button] will apply to all of them. Would that be possible—to . . . put the 'show/ hide' down here [referring to under the blue outcome row/heading]? So I don't have to always go up here to click here."*
    - *"When we drop down into other outcomes, [they should] be . . . at least filtered by something. So even if it's just by outcomes, because that's the first thing there, at least, it's got some organization. When you look at it right now, [the more outcomes table isn't] apparently organized by anything."*

- Most participants did not notice the hyperlinked outcomes in the "More Outcomes" table. When participants clicked the hyperlink, they had a neutral response to the data that was displayed. Most participants were unable to quickly interpret how it was the same or different than the "See More Data" button.
  - » *"I don't know. I guess there's evidence for that and there's no evidence for some of them? On the other hand, . . ., if somebody doesn't know the site, I wouldn't know why [the link] is different than the [button] on the right."*

- ***Presenting the strength of evidence.*** Participants were divided on their preference for using circles versus words to represent the strength of evidence. Some participants found the circles to be clear and intuitive, while others found them confusing or expressed a general preference for words. Participants said the legend below the table was clear. At least one participant thought the three empty open circles were confusing. This person noted that at a glance, the three empty circles could be misinterpreted to mean high strength of evidence.
  - *"I can see someone seeing this [three empty circles] and going, 'Wow, the strength of evidence is really strong and favors the intervention,' whereas it's really the strength of evidence is strong around the fact that there is no difference."*
- ***Clicking the visual dashboard icon.*** When prompted, participants indicated that they had noticed the visual dashboard icon in the visual data column. However, they did not understand the difference between grey and black icons; this could have been because the first table of outcomes (Length of Stay) contained only grey icons. One participant expressed frustration that there was no explanation for why she could not click on the grey icon. After clicking on a black icon, most participants liked the display and found the information useful, although some participants found it difficult to quickly interpret the graph. A few participants asked for direct links to the studies from the visual dashboard icon or from the pop-up display.
  - *"I'm just thinking in terms of frustration levels in providers because it's like a thousand clicks to order Tylenol. It's the same thing here that you see [something] you think you can click on and you can't. . .. I don't know if you could do something like Tableau—when you hover over it [text], it says, 'Not available' automatically."*
- ***Using the "See More Data" button.***
  - Most participants did not independently select the "See More Data" button when navigating through the Summary of Findings tool. When prompted, participants thought that individuals would notice the button and said the button could provide more data to those who were interested in diving deeper.
    - » *"I didn't [notice the "See More Data" button], but it's easy to see if I was looking for something else."*
  - Most participants did not notice the hyperlinked outcomes in the "More Outcomes" table. The information displayed when participants clicked the hyperlink elicited a neutral response. Most were unable to quickly interpret how it was the same or different than the "See More Data" button.
    - » *"I don't know. I guess there's evidence for that and there's no evidence for some of them? On the other hand… …. if somebody doesn't know the site, I wouldn't know why [the link] is different than the [button] on the right"*

- When participants used either the hyperlink or the "See More Data" button, they didn't always understand that they were viewing a pre-filtered visual dashboard for only one outcome. At least one participant attempted to look at other outcomes in the visual dashboard on this pre-filtered page without success. When returning to the Summary of Findings, any previous selected filters in the Summary of Findings were then gone.
  - *"I'm a little bit confused…, it seems to me when we're on the previous page…. there were three tiles that showed almost like a 50% reduction [for another outcome], why aren't those showing up here? [interviewer explains] Oh. That's confusing."*

Table B-29. Suggested revisions for Summary of Findings tool, including AIR and SRC response to revisions

Suggested Revisions Based on Testing*	AIR Response to Suggested Revisions	SRC Response to Suggested Revisions
Consider methods to improve the clarity of filter options at top of table.	AIR suggests using a short user tutorial to introduce new users. AIR will also remove the box around the toggle for "No evidence" to decrease confusion around how to use this filter.	Conceptually, we have no problem with all of these below. We may have to adjust as we apply these changes, but these are a fine place to start.
Incorporate the word "outcomes" into the blue outcome bar.	AIR plans to implement this.	NA
Close all accordion tabs for the initial view of the table.	AIR plans to implement this.	NA
Add another column to the table that lists the outcomes.	AIR does not plan to implement this, as adding another column may overly complicate the table and we believe that the other changes above will help resolve this issue.	NA
Consider ways to help users manage the amount of detail in the "More Outcomes" table.	AIR suggests that we remove the data from this table. When users click on "More Outcomes" we will provide a brief description of additional outcomes and a link to the visual dashboard so users desiring deeper drill down can do so there.	Not all outcomes have visual presentation, given that not all were subject to meta-analysis. I assume we will only list the outcomes with visual data.
Consider methods to reduce possible confusion between insufficient evidence and strong evidence in the Strength of Evidence icons.	Instead of three empty circles, AIR will use the words "insufficient evidence".	NA
Consider ways to revise the grey and black Visual Dashboard icons to clarify when visualizations do and do not exist.	AIR will remove the grey icons and replace with 'Not Available'.	NA

Suggested Revisions Based on Testing*	AIR Response to Suggested Revisions	SRC Response to Suggested Revisions
Consider revising the "See More Data" button and the hyperlink functionality so that users can choose to remain in the Summary of Findings tool, or explore more in the Visual Dashboard, while retaining previous filters.	AIR suggests using a modal pop-up for the "See More Data" button display instead of taking users to a separate page in the visual dashboard.	My only concern is whether the modal can be adequately sized for this. I'm assuming that we can discover alternatives if this solution doesn't work, but this is a good starting place.

AHRQ = Agency for Healthcare Research and Quality; AIR = American Institutes for Research; NA = not applicable; SRC = Scientific Resource Center.
*Suggested revisions include those made directly by participants as well as those based on AIR analysis of comments.

Visual Dashboard Tool

- ***Navigating from the Visual Dashboard.*** When on the Visual Dashboard page, it was unclear to participants that this section of the site is called the Visual Dashboard. Participants requested adding a title to each page and ensuring the navigation bar indicate the user's current position on the website (Table B-30).
    - *"I think the [navigation bar] needs to have all the words all the time and it should show an indication that you're on it [the visual dashboard]—either, that it's larger or it looks like an actual tab from . . . a manila folder."*
- ***Using the filter options.*** Most participants reacted positively to the available filter options. Participants stated that it was intuitive for them to use checkboxes to filter information on the visual dashboard page. Participants were able to see all available filter options easily.
- ***Interpreting the bar chart.*** A couple of participants requested a reminder about the meaning of "relative risk," but most were generally able to interpret "favors intervention/ control".
    - *"I think I would include a footnote about what you mean by relative risk. 'Favors intervention' and 'favors control' is pretty easy. So you might want to just tell people about relative risks, add a little definition of what relative risks means."*
- ***Accessing studies.*** Some participants had trouble accessing individual studies and requested a more direct link to individual studies. One participant requested that clicking on year/author brings the user directly to the study.
    - *"I would have maybe another little thing over here, when you hover over [author and year], automatically when you hover over it, link it to study. So you don't have to click it to figure out the pop-up and then click the 'link to studies.' Because anybody [who] is going that deep is going to want to see the original study. . . . Ninety percent are never going to go this far down, but for that 10%, you want to make it easy for them."*
- ***Using consistent scales and dot sizes.*** Some participants requested more consistency across the site and within the tool to facilitate comparisons across the site and within each page. For example, two participants asked for there to be more consistency in the different scales and sizes of dots referenced in the summary and studies section.
    - *"So, in the top one, your dots have a different scale than the bottom line. That would be a really confusing thing for people. . . . You should make things one way*

throughout the site, like the dot size, so you can compare it across the page instead of having two different references."

- ***Using colors to represent outcomes and study population.*** A few participants had trouble differentiating colors in the outcomes and study population legends. They thought this could be an accessibility concern for users with low vision or colorblindness.
- ***Navigating to the report home page.*** Most participants had trouble navigating back to the Report Home when prompted. Some participants clicked on the AHRQ Home link, while others used the back button in their browser. Participants did not see or connect the Report Home link with the evidence report topic homepage.

Table B-30. Suggested revisions for the Visual Dashboard tool. including AIR and SRC response to revisions

Suggested Revisions Based on Testing*	SRC Response to Suggested Revisions
Add a title to the Visual Dashboard page.	We agree with all of these suggested revisions and will undertake to implement them.
Update the navigation bar to include a title for each page and indicate current position.	NA
Revise font size and color in the Visual Dashboard to include more contrast and a larger font.	NA
Add a short summary describing the concept of relative risk.	NA
Simplify the process for linking directly to individual studies.	NA
Use one scale to represent population size values on the page.	NA
Change color filters to checkbox filters.	NOTE: We are using a color-blind safe palette; however, we can rethink this, given that there are two palettes (summary and study) and that outcomes are available in the dropdown.

AHRQ = Agency for Healthcare Research and Quality; AIR = American Institutes for Research; NA = not applicable; SRC = Scientific Resource Center.
*Suggested revisions include those made directly by participants as well as those based on AIR analysis of comments.

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Appendix C. Summaries of the Two Evidence-based Practice Center Reports Selected for the Pilot of the Tools

The Summary of Findings and Visual Dashboard tools integrated on the pilot website were populated with data from two Evidence-based Practice Center (EPC) Program evidence reports selected by the learning health system (LHS) panelists: (1) Treatment of Depression in Children and Adolescents and (2) Antipsychotics for the Prevention and Treatment of Delirium. Tables C-1 and C-2 provide summaries of these reports.

Table C-1. Summary of the Treatment of Depression in Children and Adolescents evidence report

Report Title	Treatment of Depression in Children and Adolescents
Type	Systematic Review
Purpose	The purpose of the review is to examine the efficacy and comparative effectiveness of both benefits and harms of commonly used types of nonpharmacological and pharmacological treatments of child and adolescent depressive disorders.
Release date	April 10, 2020
Summary of scope	Addresses five key questions that examine: • Benefits and harms of nonpharmacological interventions • Benefits and harms of pharmacological interventions • Benefits and harms of combination interventions • Benefits and harms of collaborative care interventions • Comparative benefits and harms of treatments (pharmacological, nonpharmacological, combined, collaborative care interventions)
Key messages	• CBT, fluoxetine, escitalopram, and combined fluoxetine plus CBT may reduce depressive symptoms in the short term; clinical significance is unclear. • CBT may improve symptoms and functional status. CBT plus medications may help prevent relapse. • SSRIs as a class may improve response and functional status. • However, SSRIs may be associated with a higher risk of serious adverse events and with a higher risk of withdrawal. Paroxetine may be associated with a higher risk of suicidal ideation or behaviors. Evidence to judge the risk of suicidal ideation or behavior for SSRIs other than paroxetine is insufficient for major depressive disorder. However, this report excluded data on inpatients and those without depressive disorders whom the Food and Drug Administration included in finding an increased risk of suicidality for all antidepressants across all indications.

CBT = cognitive behavioral therapy; SSRI = selective serotonin reuptake inhibitor.

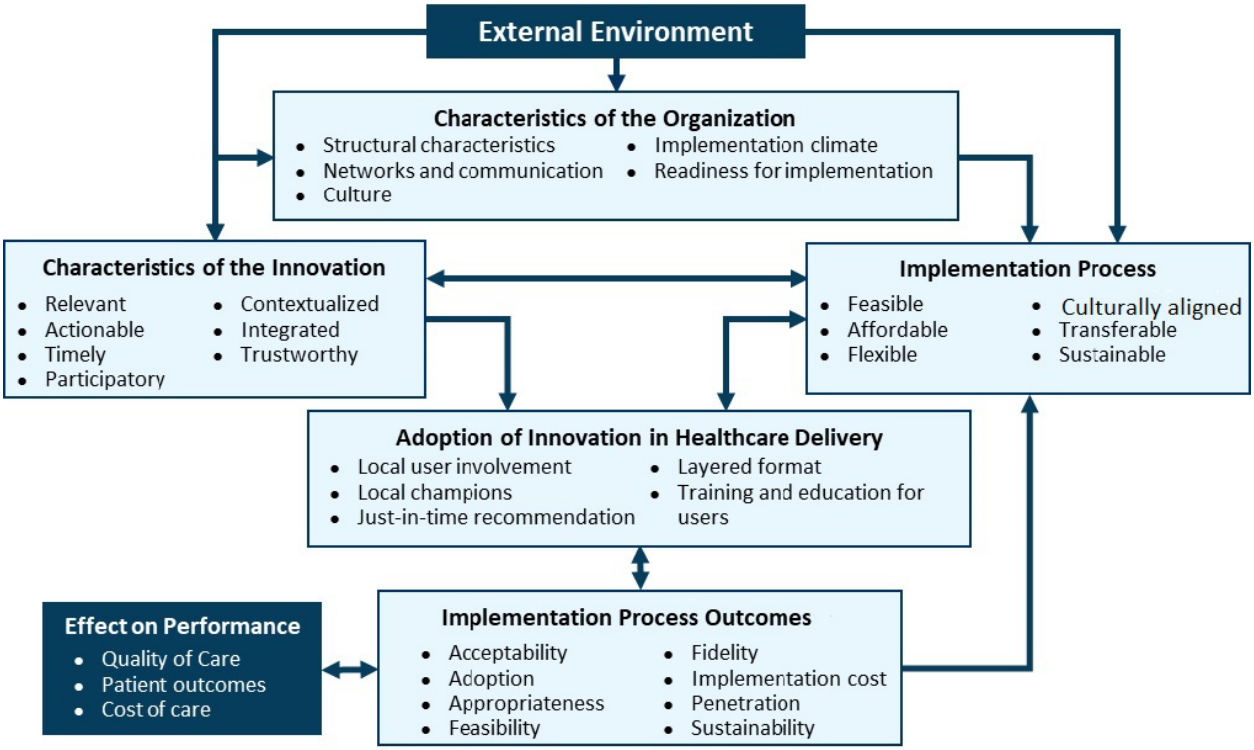
Table C-2. Summary of Antipsychotics for the Prevention and Treatment of Delirium evidence report

Report Title	Antipsychotics for the Prevention and Treatment of Delirium
Type	Systematic Review
Purpose	To assess the benefits and harms of antipsychotics for the prevention and treatment of delirium among adult patients.
Release date	September 3, 2019
Summary of scope	Addresses two key questions: • What are the benefits and harms of antipsychotics compared with each other, placebo, or non-drug approaches to prevent delirium? • What are the benefits and harms of antipsychotics compared with each other, placebo, or non-drug approaches to treat delirium?
Key messages	• Haloperidol or second-generation antipsychotics used to prevent or treat delirium did not decrease length of stay in hospital. • There was little or no evidence to determine the effect of antipsychotics on cognitive function, delirium severity, or caregiver burden, or for sedation when used for prevention. • Second-generation antipsychotics may lower the occurrence of delirium in postoperative patients. • Haloperidol or second-generation antipsychotics used to prevent or treat delirium may lead to little or no difference in sedation or extrapyramidal side effects (problems with muscles such as spasms or restlessness). Heart-related side effects tended to occur more frequently with the use of antipsychotics, in particular QT interval prolongation (a type of heart rhythm problem) in second-generation antipsychotics. • Future studies are needed to assess the effects of using antipsychotics on patient agitation and distress, subsequent memories of delirium, caregiver burden and distress, inappropriate continuation of antipsychotic therapy, and long-term cognitive and functional outcomes.
Notes/caveats	• The greatest challenge to the applicability of this body of evidence is related to the populations and outcomes studied. Trials were often conducted in medical and surgical critically ill patients. The overall results of this report may not be directly applicable to other populations, including postoperative patients, older inpatients, and patients with dementia. Any benefit and risk of antipsychotics for prevention or treatment of delirium within the context of critical illness may not be generalizable to other populations, such as those with dementia, in postacute care, or in palliative care. • For the vast majority of outcomes predetermined to be of critical importance by our panel of experts and key informants, studies did not exist or were inadequate in design or number to answer the key questions. • There was insufficient or no evidence for many comparisons and outcomes due to the paucity of studies.

Appendix D. Application of the Consolidated Framework for Implementation Research in the Implementation Period

We used the Consolidated Framework for Implementation Research (CFIR) to guide discussion about the factors that are likely to influence implementation success across learning health system (LHS) target settings. The CFIR is a metatheoretical framework that draws on a wide body of previous models and includes 39 interacting constructs that are relevant for assessing implementation effectiveness. Four main CFIR variables interact to influence the adoption of innovations: (1) the external environment (e.g., new payment models); (2) the organizational structure (e.g., integrated delivery system); (3) innovation characteristics (e.g., strength of evidence); and (4) processes to foster implementation.[1] We refined this model to include implementation process outcomes; we highlight our focus in the light blue boxes, as shown in Figure D-1.

Figure D-1. Framework for analyzing adoption of innovations in LHSs



Source: Framework adapted from Fisher ES, Shortell SM, Savitz LA. Implementation science: a potential catalyst for health system reform. JAMA. 2016 Jan 26;315(4), 339-40.[2] Implementation Process Outcomes adapted from Procter E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A, Griffey R, Hensley M. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. Admin Policy Ment Health. 2011;38(2):65-76.[3]

Specifically, we drew on information about LHS features (i.e., CFIR characteristics of the organization) gathered from the LHS panelists. This information was supplemented by additional discussion with each panelist about the way each tool related to organizational needs and priorities. These features included the compatibility of each tool with existing organizational structures, processes, and strategic priorities; the perceived importance of each tool relative to

the organization's priorities; and available departments or settings to target tool implementation. AIR team implementation co-leads guided and advised the LHS panel members in this selection process, helping to ensure a good match between the LHS's needs and preferences, the available tools, and the selected topic(s) based on the LHSs' decision needs.

References for Appendix D

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Appendix E. Implementation Playbook Template

The Agency for Healthcare Research and Quality (AHRQ) Evidence-based Practice Centers (EPCs) synthesize and disseminate evidence to improve the quality and effectiveness of healthcare. To improve uptake and relevance of EPC reports, AHRQ funded the American Institutes for Research (AIR) to convene a panel of learning health systems (LHS) leaders to provide feedback to the EPC Program. As part of this effort, two companion evidence dissemination products or tools were developed to make the findings from EPC evidence reports more accessible and useful for health systems that are improving practice. The purpose of the tools is to inform care strategies and management decisions. AIR is working with leaders serving on the panel and their LHSs to implement and evaluate these tools. The tools to be tested were developed from EPC reports in two topic areas: **antipsychotics for the prevention of delirium and treatment of childhood depression**. These two topics were selected by the panel. The tools are:

- ***Triage Tool:*** This Web-based tool presents high-level results of evidence reports that enable health system leaders to quickly understand the relevance of the reports to their organization, share high-level information with key stakeholders, and link to more granular data from the report.
- ***Data Visualization Tool:*** This Web-based tool presents data from the evidence report and individual studies.

Implementation: Product implementation equates to use of the tool(s)—specifically, reviewing and considering the tool and its content as part of the health system's usual quality improvement process—to support decision making. Thus, implementation—or use of the tool(s)—will vary across the systems depending on their structure and processes to review and implement evidence as appropriate. AIR will provide a range of technical assistance support options to assist LHSs, if needed, with implementation activities.

Evaluation: The evaluation will rely on information AIR collects as part of its technical assistance support during implementation. AIR will also conduct interviews with LHS leadership and clinical staff to assess their experience with the tools and the implementation process. AIR will gather information on topics such as: (1) tools' relevance to the intended user audience; (2) how well users are able to efficiently use and apply the tool content; (3) information seeking triggered by tool review; and (4) how evidence-based resources support decision making, development of an action plan, and implementation.

Results: The evaluation results will lead to refinement of the two tools and produce recommendations for AHRQ to consider when developing future EPC Program products. AIR will summarize what has been learned in a report; this report will not attribute what is learned to a specific individual or LHS.

Timeline: AHRQ's project timeline for implementation and evaluation is planned for May 2020 to March 2021, pending approval from the Office of Management and Budget (OMB) approval.

Purpose of the Implementation Playbook: This Implementation Playbook is a tailored guide to help the American Institutes for Research (AIR) and **[LHS]** establish a mutual understanding of how selected product(s) will be implemented. Information in this playbook is based on November 2019 and January 2020 discussions between AIR and LHS Panel Member **[NAME]**. This playbook includes information about the following:

- Process to Review and Implement Evidence
- Product Selection
- Implementation Goals
- Implementation Team
- Target Audiences for Implementation
- Implementation Process and Timeline

This playbook is a "living document" that AIR and **[LHS]** will update between now and the spring of 2020 to capture additional aspects of implementation as they unfold.

1. Process to Review and Implement Evidence
2. Product Selection
3. Implementation Goals
4. Current Practice Guidelines for Selected Topic(s)
    a. Existing Clinical Supports and Care Pathways
    b. Clinical Areas Involved
5. Implementation Team: Executive Sponsor, Champion(s), and Other Stakeholders
    a. Executive Sponsor
    b. Implementation Champions, example table

Data Categories	Champion #1	Champion #2
Name		
Job Title/Role		
Email Address		
Phone Number		

    c. Other Stakeholders
6. Target Audiences for Implementation
7. Implementation Process and Timeline
    a. Initial Engagement and Planning
    b. Initial Product Review and Assessment
    c. Product Roll-out and Dissemination
    d. Product Use
    e. Ongoing Engagement

Appendix F. Desktop and Pocket User Guides for Tool Implementation

Desktop Guide

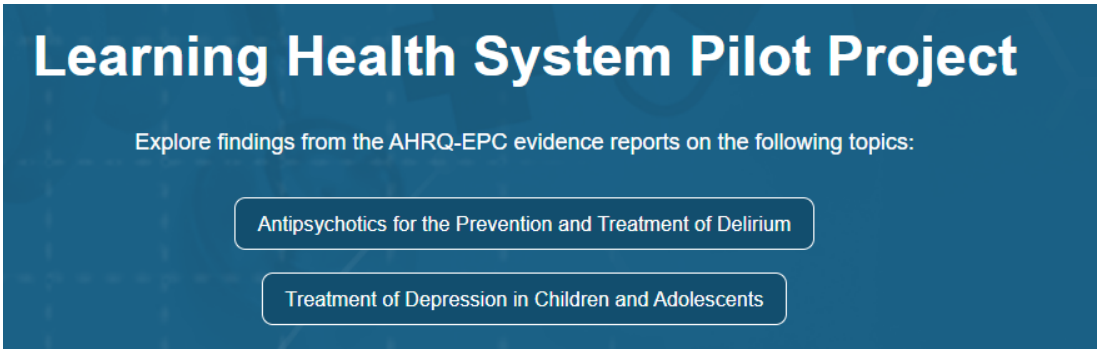
Quick Start Guide—Learning Health System Pilot Project

This guide helps users navigate the updated Evidence-based Practice Center (EPC) website, which contains two tools, the Summary of Findings and Visual Dashboard, to help learning health systems (LHSs) access evidence from a systematic review.

First Steps: Accessing the Site, Selecting a Report, and Choosing a Tool

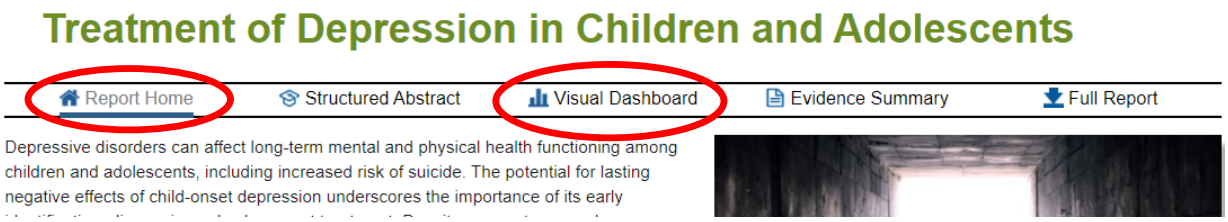
1. **Access the website (Figure F-1) here**: https://LHSpilot.ahrq.gov.
2. **Select the report you would like to view.**
   a. **Note.** Screenshots included in this guide are from the "Treatment of Depression in Children" report. Some functions for the "Antipsychotics for Prevention and Treatment of Delirium" report may differ slightly.

Figure F-1. Screenshot of learning health system pilot project website



3. **In the navigation bar (Figure F-2), choose to view the Summary of Findings (labelled Report Home) or Visual Dashboard.**
   a. Instructions for using the Summary of Findings follow in Steps # 4-6, pages 2-4.
   b. Instructions for using the Visual Dashboard follow Steps # 7-10, pages 5-7.

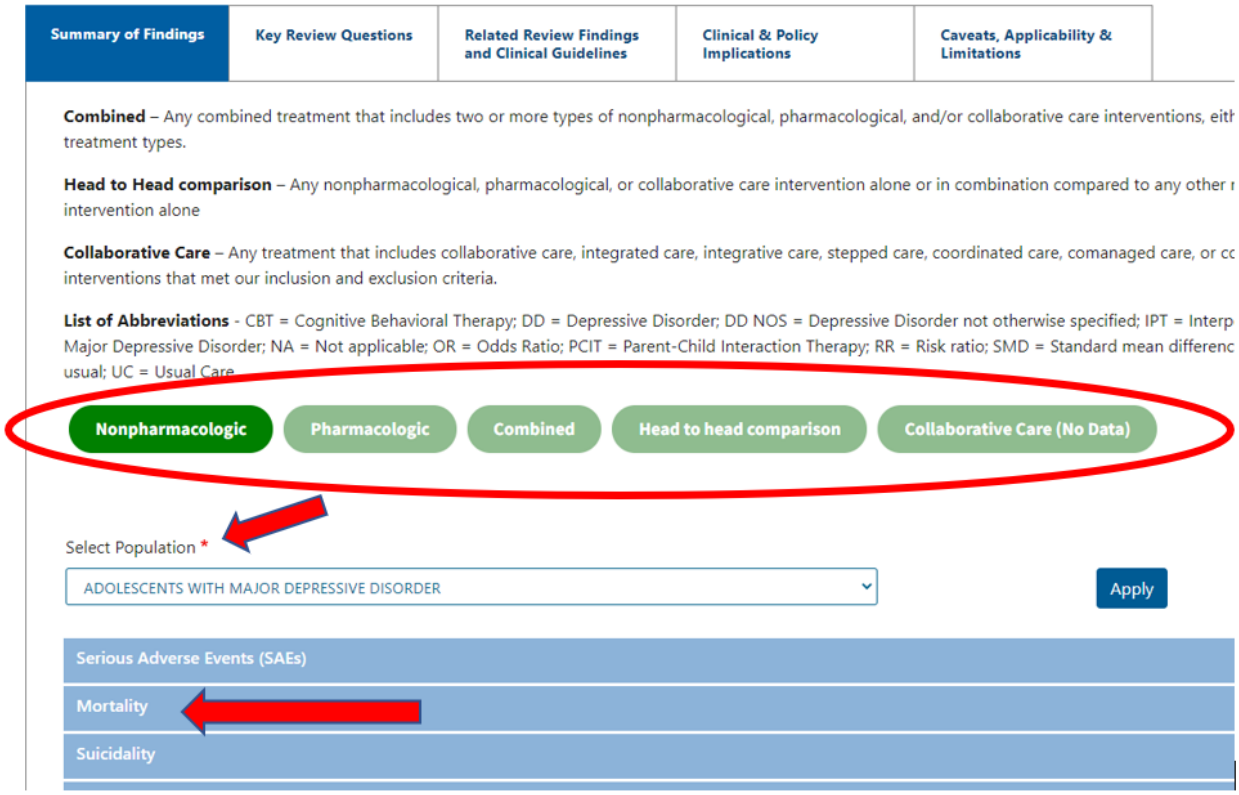
Figure F-2. Screenshot of Report Home and Visual Dashboard tabs



Using the Summary Findings Tabs

4. **Scroll down to the bottom of the page for the Summary of Findings (shown in Figure F-3).** Focus the findings based on:
   a. **Intervention:** Click on the Green Button to look at findings by intervention type.
   b. **Population:** Use the dropdown list to select a research population. Click the blue apply button after you make your choice.
   c. **Outcome:** Click on the blue bar with the name of the outcome that you would like to review.

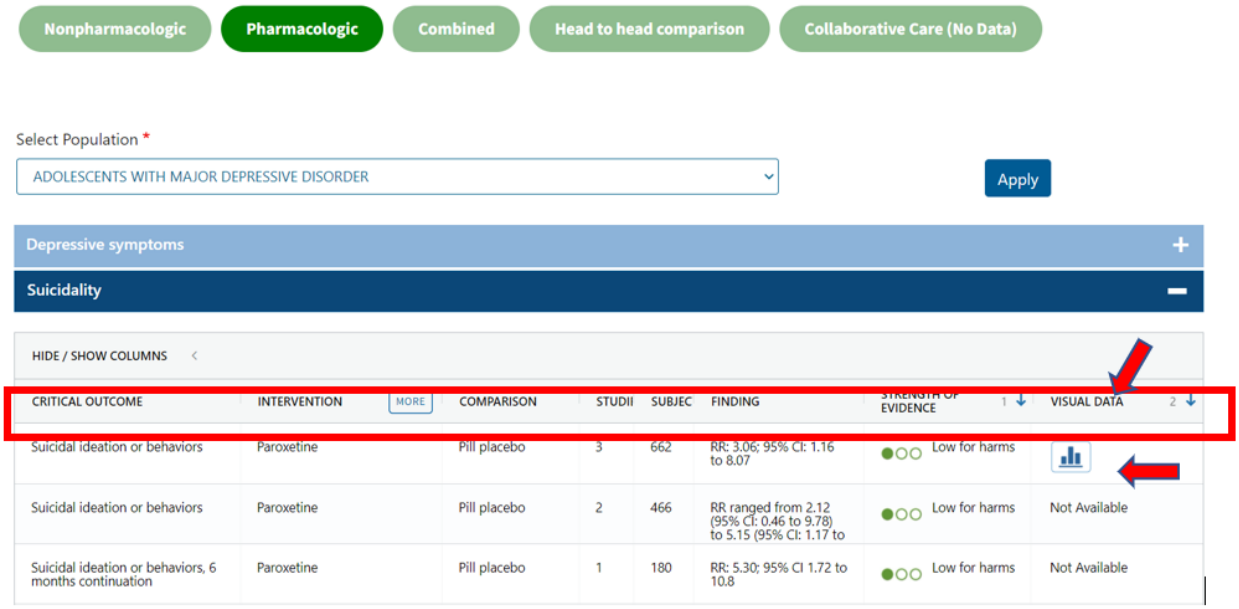
Figure F-3. Screenshot of the Summary of Findings



5. **Review the selected findings (Figure F-4).**
   a. **Table headers.** After you pick an outcome, a table will open that shows the findings for the chosen outcome. The column headers in the table are: critical outcome, intervention, comparison, # studies, # subjects, findings, strength of evidence, and visual data.
   b. **Sorting.** The small blue arrow next to a name at the top of a column will tell you if the table is sorted by that column. To sort the table by a different column header, click the name in the column header.

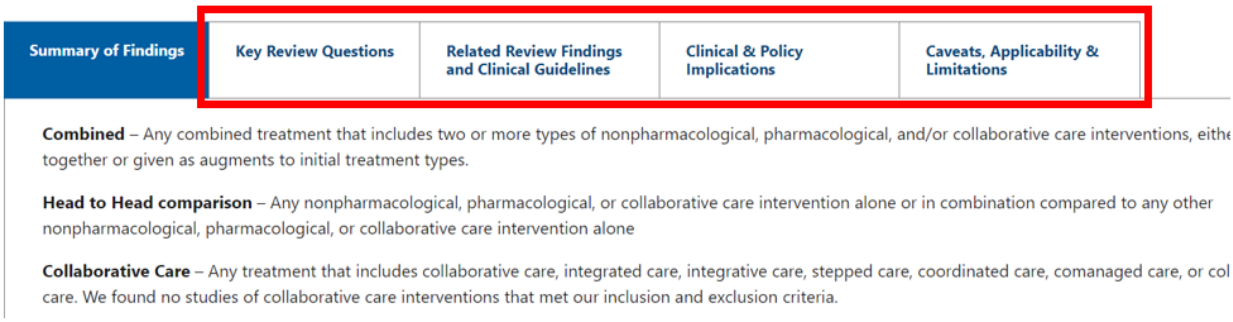
c. **Connect to other tools.** To see a visual of the findings, click on the icon in the column called visual data.

Figure F-4. Screenshot of selected findings



6. **Explore additional information from the report (Figure F-5) by clicking on:**
   a. Key review questions
   b. Related review findings and clinical guidelines
   c. Clinical and policy implications
   d. Caveats, applicability and limitations

Figure F-5. Screenshot of additional information in the Summary of Findings



Using the Visual Dashboard

7. **In the Visual Dashboard:** pick a tab (Figure F-6) to choose the level of data to review
   a. **Summary:** Click on the Summary tab to look at aggregated study data.
   b. **Studies:** Click on the Study tab to look at individual study data.
   c. **All Outcomes:** Click on the All Outcomes tab to look at data by the type of intervention.

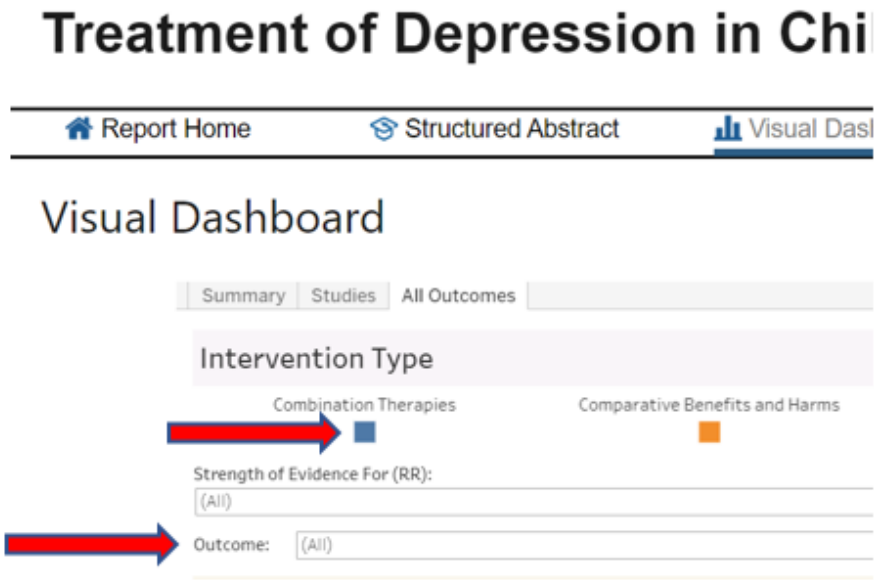
Figure F-6. Screenshot of tabs in the Visual Dashboard

8. **Focus the findings**. In the Summary and Studies tabs:
   a. Click on the colored square next to the population name to filter the graphs by that population (Figure F-7).

Figure F-7. Screenshot of colored squares next to population names in the Summary and Studies tabs

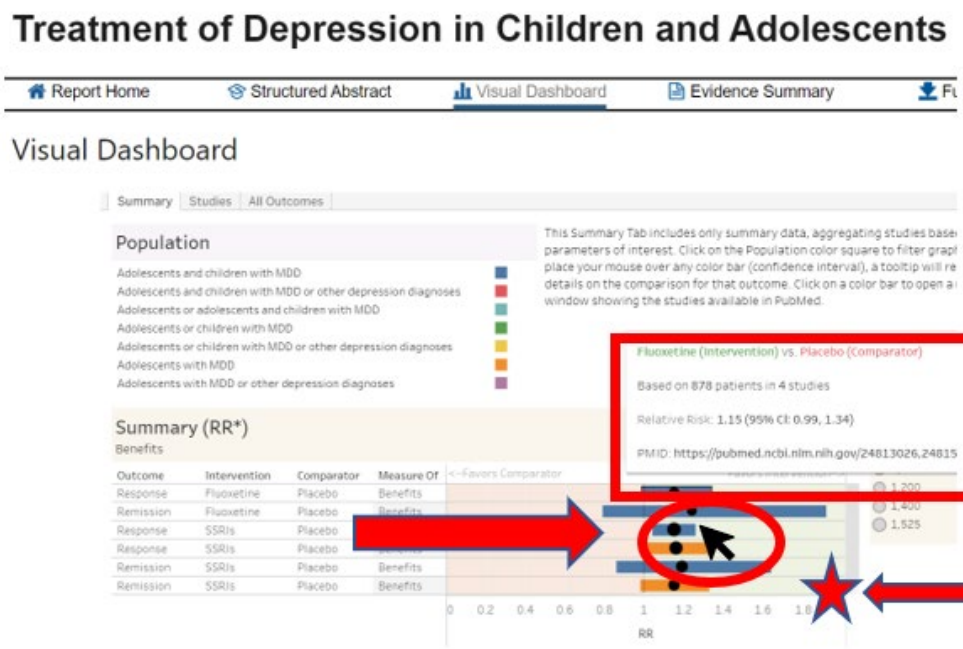
9. **Focus the findings.** In the Summary and Studies tabs:
   a. Click on the colored squares below the intervention type (Figure F-8) to filter by intervention.
   b. Use the drop down lists to filter by strength of evidence or one or more outcomes.

Figure F-8. Screenshot of colored squares below intervention types in the Summary and Studies tabs



10. **Review the selected findings (Figure F-9).** The visual dashboard displays data for relative risk (RR) or for standardized mean difference in the form of a forest plot. A few options to help you review the findings include:
    a. **Mouse over.** Place your mouse over any color bar, which is a confidence interval. A box will appear that provides details on the comparison for that outcome.
    b. **Click on a colored bar.** Clicking on a colored bar will open a new window showing the studies in PubMed.
    c. **Scroll down.** Use the vertical scroll bar to the right of the colored bars to scroll through the data listed in each table.

Figure F-9. Screenshot of selected findings



Pocket Guide–Summary of Findings Tool

Quick Start Guide–Summary of Findings Tool

This tool shows tables of the main findings and results from a systematic review. Users can choose which findings to look at and how to sort them in these tables.

---

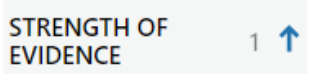
1. **Access the website.** https://LHSpilot.ahrq.gov/
2. **Click on the report** you want to view.
3. **Locate the tool.** Scroll to the bottom of the page for the Summary of Findings tool

4. **Focus the findings based** on:
   a. **Interventions:** Click on the GREEN BUTTON to look at findings by intervention type.
   b. **Populations:** The tool is set to show the overall findings. To narrow the findings down to a specific group of people, use the dropdown list called population. Click the BLUE APPLY BUTTON after you pick a group.
   c. **Outcomes:** Pick a study outcome by clicking on a BLUE BAR with the name of the outcome. For example, if you want to select recovery, you would select the following:

5. **Review the selected findings:**
   a. **Table headers.** After you pick an outcome, a table will open that shows the findings for the chosen outcome. The column headers in the table are: critical outcome, intervention, comparison, # studies, # subjects, findings, strength of evidence, and visual data.
   b. **Sorting.** The small blue arrow next to a name at the top of a column will tell you if the table is sorted by that column. For example, when the table first appears, it is sorted by strength of evidence. You will see a 1 and a small blue arrow in the column header, as follows:



   c. To sort the table by a different column header, such as the *intervention*, **click the word** INTERVENTION at the top of the column. You will then see the small blue arrow in the column header; this shows that the table is now sorted by intervention.
   d. **Connect to other tools.** To see a visual display of the findings, click on the icon in the column called visual data.

Pocket Guide—Visual Dashboard for the Treatment of Depression in Children and Adolescents Evidence Report

Quick Start Guide—Visual Dashboard

This tool permits users to quickly access and assess the bottom line from the Agency for Healthcare Research and Quality (AHRQ) Evidence-based Practice Center (EPC) evidence report, including the magnitude and direction of effect, confidence intervals, and the strength of the evidence. It also allows users to sort findings based on outcomes and interventions of interest.

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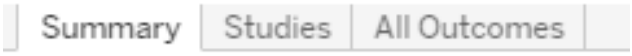
1. **Access the website.** https://lhspilot.ahrq.gov/.
2. **Click on the report you want to view:** Treatment of Depression in Children and Adolescents.

Figure F-10. Screenshot of the Visual Dashboard tab in the menu bar

3. **Click Visual Dashboard** in the menu bar (Figure F-10).
4. **Pick a tab to choose the level of data to review (Figure F-11).**

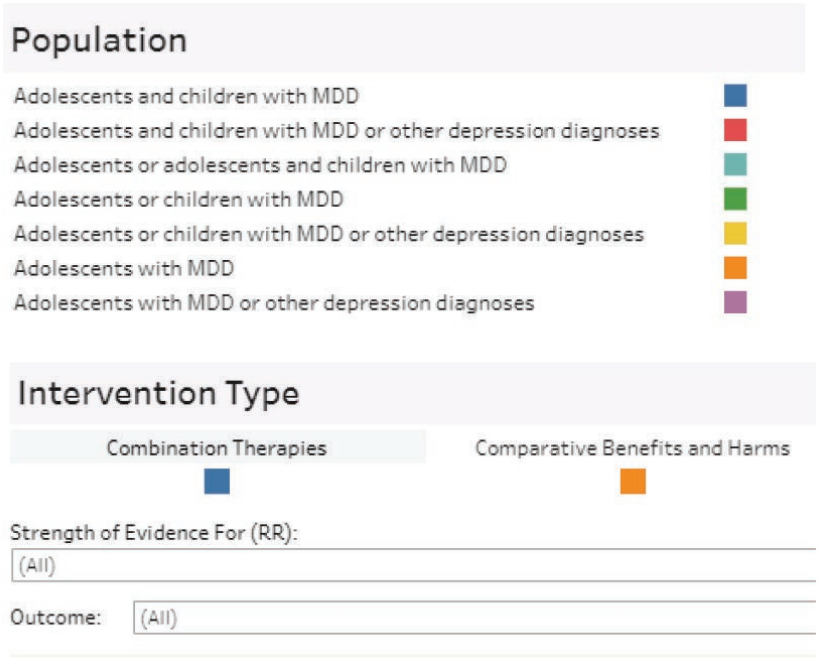
Figure F-11. Screenshot of Summary, Studies, and All Outcomes tabs



   a. **Summary:** Click on the Summary Tab to look at aggregated study data (the results from the meta-analysis).
   b. **Studies:** Click on the Study Tab to look at individual study data.
   c. **All Outcomes:** Click on the All Outcomes Tab to look at data by the type of intervention (all outcomes data, including single-study outcomes).

5. **Focus the findings**
   a. In the Summary and Studies tabs—
      i. Click on the colored square next to the population name (Figure F-12) to filter the graphs by that population.
   b. In the All Outcomes tab—
      i. Click on the colored squares below the intervention type (Figure F-12) to filter by intervention.
      ii. Use the drop down lists to filter by strength of evidence or one or more outcomes.

Figure F-12. Screenshot of colored squares for populations and intervention types



6. **Review the selected findings.** The visual dashboard displays data for relative risk (RR) or for standardized mean difference (SMD) in the form of a forest plot. A few options to help you review the findings include:
   a. **Mouse over.** Place your mouse over any color bar, which is a confidence interval. A box will appear that provides details on the comparison for that outcome.
   b. **Click on a colored bar.** Clicking on a colored bar will open a new window showing the studies in PubMed.
   c. **Scroll down.** Use the vertical scroll bar to the right of the colored bars to scroll through the data listed in each table.

Pocket Guide–Visual Dashboard for the Antipsychotics for the Prevention and Treatment of Delirium Evidence Report

Quick Start Guide–Visual Dashboard

This tool permits users to quickly access and assess the bottom line from the Agency for Healthcare Research and Quality (AHRQ) Evidence-based Practice Center (EPC) evidence report, including the magnitude and direction of effect, confidence intervals, and the strength of the evidence. It also allows users to sort findings based on outcomes and interventions of interest.

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1. **Access the website.** https://lhspilot.ahrq.gov/
2. **Click on the report you want to view:** Antipsychotics for the Prevention and Treatment of Delirium
3. **Click Visual Dashboard** in the menu bar (Figure F-13).

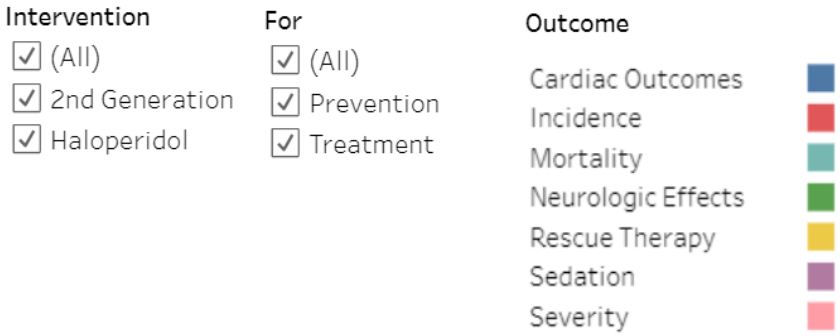
Figure F-13. Screenshot of Visual Dashboard tab in the menu bar

4. **Pick a tab to choose the level of data review (Figure F-14).**
   a. **Summary:** Click on the Summary Tab to look at aggregated study data.
   b. **Studies:** Click on the Study Tab to look at individual study data.

Figure F-14. Screenshot of the summary and studies tabs

5. **Focus the findings based on—**
   a. **Interventions:** The default settings display all findings (Figure F-15). A check mark in the box next to an intervention indicates that the displayed results include these interventions. Click on the check mark to clear interventions you do not want to see displayed.
   b. **Purpose:** Click on the check mark to view comparisons for prevention or treatment of delirium.
   c. **Outcomes:** To view a single outcome, click on the colored square next to the outcome listed. To clear your selection and view all outcomes, click the selected outcome again.

Figure F-15. Screenshot of settings for findings



6. **Review the selected findings.** The visual dashboard displays data for relative risk (RR) in the form of a forest plot. Options to help you review the findings include:
   a. **Mouse over.** Place your mouse over any color bar, which is a confidence interval. A box will appear that provides details on the comparison for that outcome.
   b. **Click on a colored bar.** Clicking on a colored bar in the visual display will open a new window showing the studies in PubMed.
   c. **Scroll down.** Use the vertical scroll bar to the right of the colored bars to scroll through the visual data displayed in each table.

Appendix G. Website Utilization Metrics

The website metrics provide a general sense of how many people accessed and interacted with the Summary of Findings and Visual Dashboard tools from late March 2021 to the end of July 2021. The metrics report on the overall number of users, sessions (website visits), and pageviews, and the pageview duration for both tools. In addition, the metrics show the number of pageviews and pageview duration for each tool. The metrics represent visits made by learning health system (LHS) leaders and staff as well as the American Institutes for Research (AIR) project team and staff from the Agency for Healthcare Research and Quality (AHRQ).

To interpret the pageview data, it is important to understand what the numbers represent. A pageview counts the number of times a user views a page with a unique URL. Because the Summary of Findings tool pulls up a unique URL each time users filter the data by population and treatment and the Visual Dashboard tool does not, the pageview metrics are not comparable between the two tools.

A summary of the metrics overall and by tool and report topic is provided in the text that follows and in Tables G-1 through G-3.

Combined Utilization Metrics for the Summary of Findings and Visual Dashboard Tools

- ***Number of users and sessions.*** There were 149 users and a total of 311 sessions. On average, users returned to the website about two times.
- ***Overall pageviews and pageview duration.*** On average, users viewed almost seven pages per session. The average time spent viewing each page was 1 minute and 14 seconds but this time ranged from about 2 seconds to almost 15 minutes. The average time per page might be skewed to the lower side; a number of pages in the Summary of Findings tab did not contain data for a specific population, and, as a result, when users filtered to these pages, views were for less than 10 seconds.

Table G-1. Combined metrics for the Summary of Findings and Visual Dashboard tools

Utilization Metric	Combined Metrics (Number)
Users (count)	149
Sessions (website visits)	311
Returns to website per user (mean)	2
Overall pageviews per session (mean)	7
Pageview duration (seconds)	10

Metrics for the Summary of Findings Tool

- ***Depression tool.*** Overall, the Summary of Findings tool for depression had 609 pageviews. The default view of the tool (i.e., no filters selected by a user; this is what is shown when a user accesses the tool) had 249 pageviews for an average of 2 minutes and 12 seconds per page. Use of either of two filters—the key question filter and the population drop-down filter—was counted as a separate pageview. Users filtered the content with the key question and population drop-down filters 121 times and 151 times,

respectively. The number of pageviews for the additional context tabs ranged from 27 to 46, with an average time on the page for these tabs ranging from 2 seconds to almost 2 minutes.

- ***Delirium tool.*** Overall, the Summary of Findings tool for delirium had 408 pageviews. The default view of the tool (i.e., no filters selected by a user) had 304 pageviews for an average of 1 minute and 51 seconds. Users filtered content with the key question and population drop-down filters 71 times and 52 times, respectively. The number of pageviews for the additional context tabs ranged from 35 to 76, with the average time on the page for these tabs ranging from 2 seconds to 1 minute and 30 seconds.

Table G-2. Summary of Findings metrics

Utilization Metric	Depression Report Data (Number)	Delirium Report Data (Number)
Pageviews, overall	609	408
Pageviews (default view)*	249	304
Pageview duration (seconds)	132	111
Key questions filters (number of times applied)	121	71
Population filter (number of times applied)	151	52
Additional context tabs pageviews (range)	27–46	35–76
Additional context tabs pageview durations (seconds)	2–120	2–90

*Default view is the page users see prior to applying a filter.

Metrics for the Visual Dashboard Tool

- The Visual Dashboard for childhood depression had 161 pageviews with users spending an average of 3 minutes viewing each page. The Visual Dashboard for delirium had 146 pageviews with users spending an average of 2 minutes and 25 seconds per page.

Table G-3. Visual Dashboard metrics

Utilization Metric	Depression Report Data (Number)	Delirium Report Data (Number)
Pageviews (overall)	161	146
Pageview duration (seconds)	180	145

Summary of Results

The metrics indicate that users used the tools and also returned to the site. These findings are based on data indicating that users bookmarked pages and shared direct page links with their colleagues. The tool rollout introduced users to the landing page, which then linked to the report data by topic. The majority of entrances to the website were to the landing page. However, over time, some users entered the website through a specific tool or report topic directly. The metrics also show a handful of entrances to filtered data on the Summary of Findings tool rather than to

the main default view page for a topic. The overall time spent on the two tools appears to be comparable but it is difficult to say conclusively because of how the URLs were designed.

Limitations

Here are some important limitations to keep in mind when considering the Google analytics data:

- The data include AIR, Scientific Resource Center, and AHRQ staff visits during this time period. The setup of the Google Analytics data capture did not allow for the exclusion of specific users from the data captured.
- Users who spent longer periods of time on the site were not necessarily engaged with the content the entire time.
- The average time on page metric may be skewed because of pages without data.
- User interaction with features in both tools could not be measured because the URL does not change as users interact with the Visual Dashboard tables and with the column sorting features or modal windows in the Summary of Findings tool. However, applying a filter in the Summary of Findings tool does count as a new page view because the URL does change.