



Office of the National Coordinator
for Health Information Technology

Social Determinants of Health (SDOH) Clinical Decision Support (CDS) Feasibility Brief

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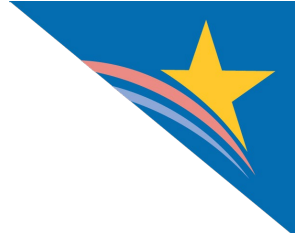
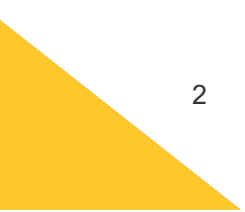


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Overview

There is a growing collection of evidence that social determinants of health (SDOH) factors can significantly impact health care outcomes. Aspects of these factors (housing instability, food insecurity, etc.) are more often being found in [clinical practice guideline](#) recommendations when diagnosing and treating patients. Guidelines that include SDOH considerations present an opportunity to advance health equity and to improve health outcomes by electronically applying these guidelines into provider workflows via electronic clinical decision support (CDS). Providers can also use CDS software programs that automate clinical guidelines to help evaluate complex rules at the point of care.

Due to this convergence of conditions and body of evidence, this is an opportune time to engage a cross-functional selection team to evaluate guideline recommendations that reference SDOH for standards-based CDS implementation. First, there is a growing collection of guidelines that include SDOH considerations. Second, it is reasonable to expect that SDOH elements included in the ONC [United States Core Data for Interoperability](#) (USCDI) Version 2 and the [Health Level Seven International®](#) (HL7) [US Core Fast Healthcare Interoperability Resources \(FHIR\) Implementation Guide \(IG\)](#) will be available for CDS evaluation. Third, standards-based CDS approaches are continuing to mature. Finally, the Standards Development Organization (SDO) HL7 has documented and published a process for selecting guidelines for CDS implementation.

This brief document is designed for developers, health IT specialists, providers, and health system staff interested in leveraging CDS to support the integration of SDOH data into care delivery per clinical guideline recommendations. It includes useful context to further a SDOH CDS feasibility investigation including: the value of using standardized CDS for guidelines that incorporate SDOH, a brief overview of the relevant standards, and a process for translating guidelines into standards-based CDS. This document also serves as a supplement to the ONC Tech Forum exhibit presentation delivered October 2022.

Reinforcing Guideline Recommendations with CDS

Practitioners have found actionable recommendations expressed in clinical guidelines helpful in producing positive health outcomes for their patients.ⁱ CDS utilizes computable logic to evaluate patient data and apply recommendations derived from clinical guidelines within an electronic health record (EHR) system workflow. CDS is not intended to replace a provider's understanding of guideline recommendations. Instead, it supports that understanding by inserting guideline-based recommendations into critical points of a provider's interaction with an EHR. By reminding providers of a guideline recommendation and facilitating an action consistent with that recommendation, CDS reinforces decision making guidance at critical points in patient care. Implementers have found that the utilization of CDS can improve patient outcomes.ⁱⁱ

Standards and SDOH Electronic CDS Feasibility

There are many benefits to using standardized CDS. Standards provide a common language that will allow CDS to interact with different EHR systems. Hence, CDS knowledge artifacts (information that represents medical knowledge/guidelines) that implement SDOH considerations should be standards based. It is critical that health IT systems support these same standards.





To effectively express a narrative guideline electronically requires the careful interpretation of guideline recommendations. Since it is expressed in human readable text, the meaning of each recommendation must be translated into computable condition logic that is consistent with the intentions of the source document. The challenges involved in interpreting and translating text into electronic interventions are compounded by a health IT infrastructure in the United States that includes a variety of different systems often utilizing proprietary approaches for expressing and managing health information. With each health information system representing and managing data according to a unique internal syntax, CDS is often only applicable to a single health care site or a single health IT system. As a result, the process of guideline interpretation and electronic implementation is reproduced in multiple health settings and systems with the outcome that a single recommendation may be expressed in a variety of instances and manners by multiple developers and implementers. This one-to-many approach to developing CDS involves the risk that one recommendation is interpreted and expressed in various ways and with varying interventions and outcomes.

CDS built using health IT standards is positioned to interact with all health IT systems that support those standards. Utilizing standards creates the possibility of a one-to-one conversion between a guideline recommendation and a CDS implementation of that recommendation. Singular representation in CDS allows for a more rigorous approach to and oversight of the narrative to computable process. The resulting CDS then provides a consistent and broadly scoped expression of guideline recommendations.

Utilizing standards may also advance equity in health care. Well-resourced health care institutions may be positioned to implement their own proprietary CDS services (a component that accepts requests containing patient information and provides responses). For recommendations with SDOH considerations to have the most impact, they should be implemented broadly across a variety of settings and services. Unfortunately, proprietary SDOH solutions and CDS services may be less likely to be available in care settings where the need for those interventions may be the greatest. Once a CDS service is developed, it has the potential to be widely utilized. With a standardized approach, health care sites can leverage previously developed and vetted CDS services to support broader adoption.

ONC has developed the USCDI, a standardized set of health data classes and constituent data elements for nationwide, interoperable health information exchange. Since the publication of USCDI version 2, four SDOH data elements (SDOH Assessment, SDOH Problems/Health Concerns, SDOH Goals and SDOH Interventions) were added and support the collection of SDOH data across several SDOH domains. It is reasonable to expect that SDOH data elements included in the USCDI version 2 and subsequently the US Core FHIR IG (the base set of requirements for FHIR implementation in the US) will be available for CDS evaluation and use. For example, a data element included in USCDI and supported by the current version of the US FHIR Core IG might be more technically feasible to implement as part of CDS. Using these standards and others, CDS approaches are expected to continue to mature.





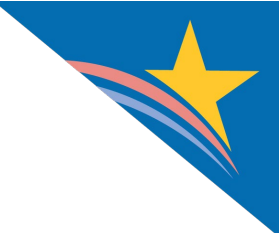
Foundations for a Standardized Approach for Electronic SDOH CDS

A standards-based CDS service will often employ a combination of health IT standards to interact with health IT systems, acquire relevant patient health information, evaluate that information using condition logic, and return appropriate guidance following that evaluation. HL7 is the primary international health IT interoperability standards organization that vets and ballots IGs through an American National Standards Institute (ANSI) accredited consensus process.ⁱⁱⁱ There are several HL7 FHIR standards and tools available to support a standardized approach for SDOH CDS. These may include terminology standards which are used to consistently identify data concepts or application programming interfaces (APIs) which can help patients and clinicians more easily receive and return information to an EHR.^{iv} These types of FHIR Resources are growing in support among EHR systems, as they provide a common language that facilitates the retrieval and sharing of health information among different systems. Given the benefits of utilizing standardized CDS, the following are some of the standards and resources used for translating clinical guidelines into electronic CDS and an explanation of the approaches taken in EHR systems.

- **HL7 Clinical Quality Language (CQL)** supports guideline knowledge representation through logical evaluations and implements the condition logic or “thinking” component of a CDS service. CQL is a mature standard and has already been adopted by the Centers for Medicare & Medicaid Services (CMS) for electronic clinical quality measurement specifications.^v Other CDS standards can be combined with CQL to implement a CDS service.
- **HL7 CDS Hooks** supports EHR workflow integration by triggering alerts or reminders within the EHR workflow; health IT vendors must build support for this specification into their systems which must include support for hooks^{vi} (an activity that triggers the service). The most mature hook is the patient-view hook which is invoked whenever the user views a patient's information within the EHR.^{vii}
- **HL7 FHIR Clinical Guidelines** (FHIR CPG IG) provides HL7 balloted and approved guidance for developing standardized CDS. This IG provides a methodology for representing recommendations as computable artifacts.^{viii} The HL7 FHIR CPG Implementation Guide (IG) can support the CDS selection step and is a guide for developing standardized CDS developed and published using HL7's ANSI accredited consensus process.^{ix}
- **Substitutable Medical Apps, Reusable Technologies (SMART)** supports EHR app integration and is accessible as a tab in the EHR and requires proactive usage, a requirement by the ONC Certification program by Dec 31, 2022, [HL7 SMART Application Launch Frame Implementation Guide Release 1.0.0](#).^x
- **United States Core Data for Interoperability (USCDI) Version 2** includes data classes and elements for SDOH data that are also specified in the US Core IG.^{xi, xii}

CDS built with these health IT standards and resources have the potential to be broadly implemented among health IT systems across a variety of settings and services.





Translating Clinical Guidelines into Electronic SDOH CDS Considerations

A variety of journal articles have been published on the topic of translating clinical guidelines into computable implementations.^{xiii} There are several considerations when deciding to translate these guidelines into a computable format.

- Identify clinical guidelines that incorporate SDOH factors into their evaluations and recommendations. As examples, guidelines in specialty areas such as pediatrics, cardiovascular health, and substance use disorder (SUD) reference SDOH components within their recommendations (see appendix Tables 1-4).
- Apply a CDS selection process such as the HL7 FHIR CPG IG to identify which guideline recommendations may prove the most impactful and feasible when translated into CDS.
- Identify if a particular data item is likely to be represented in standardized form within an EHR.
- Examine if it is possible to accurately represent written guidelines in a condition logic format for translation into computable guidelines using a high-level framework such as that in the article, “A Multi-Layered Framework for Disseminating Knowledge for Computer-Based Decision Support” (see Table 5 in the appendix).^{xiv}

Evaluating Candidate Clinical Guidelines for SDOH

As evidence of the impact of SDOH factors on health outcomes grows, clinical practice guidelines have drawn on that evidence to advance recommendations that incorporate SDOH considerations. Many of the clinical guidelines that incorporate SDOH factors within their recommendations include clinical specialties focused on pediatrics, cardiovascular health, and SUD. Below is one example that evaluates a guideline that incorporates SDOH by recommending a SDOH assessment as an option for CDS using the patient-view CDS Hooks Service. This example evaluation includes an example of the CDS story, CDS narrative, an evaluation of the CDS factors (as noted in the CPG on FHIR IG), and an example overall conclusion.

[American Academy of Pediatrics: Bright Futures Promoting Healthy Weight^{xv}](#)

Recommendation Summary: When screening for obesity risks incorporate an evaluation of current behaviors, family attitudes, socioeconomic concerns, and psychosocial situation

Example CDS Story:

Persona: A pediatric caregiver evaluating patient’s obesity risk, in coordination with a patient, and possibly a patient’s parent or guardian.

Activities: Capture social and environmental factors that can inform an obesity risk assessment and mitigation.

Processes: Encourage pediatric providers to capture and utilize SDOH factors when they have concerns about a patient’s obesity risks.

Setting: Opening a patient’s chart at the beginning of a pediatric visit or when placing an order related to weight management, such as nutritional counseling.





Support: Unknown, this guideline does not rank the strength of its recommendations or evidence.

Example CDS Narrative:

1. When opening a patient’s chart, check if obesity is recorded as a diagnosed condition.
 - > if true, check to see if an SDOH assessment has been conducted in the past year.
 - > if false, recommend that an SDOH assessment be conducted for this patient.
2. When signing an order for a weight management therapy or counseling session, check to see if an SDOH assessment has been conducted in the past year.
 - > if true then recommend that the provider consider this information in their treatment approach.
 - > if false, recommend that an assessment be conducted.

Example evaluation of CDS Factors

Value: High – Per the Guideline, “Families may not recognize excess weight or be aware of risks that obesity poses. Or they may be unable to make behavior changes to improve eating and physical activity behaviors. This may often be caused by changes in economic, employment, or other psychosocial situations.” Identifying and addressing these conditions should improve obesity treatment outcomes.

Effort: Moderate – CDS will need to query for an obesity diagnosis and SDOH assessment completion and alert providers as they open a chart or place an order.

Feasibility: Emerging – The use of standardized data and FHIR representations by EHRs are needed for evaluating the status of an obesity diagnosis, SDOH survey completion date, and possible weight management related service request. The SDOH data elements, SDOH Assessment, and SDOH Health Concern are included in USCDI Version 2 and can be expressed in FHIR by an EHR. Therefore, the feasibility of an CDS intervention for this recommendation will be more likely.

Delivery mechanisms: CDS Hooks can call an CDS service when a patient’s chart is being opened. HL7 recently published the patient-view hook as a standard for trial use.^{xvi} CDS Hooks may also call an CDS service when a target order is being placed.

Example Overall Conclusion: This is potentially an impactful intervention with moderate implementation effort. Given that SDOH elements are currently included in USCDI Version 2 and Version 3, the feasibility of this implementation will improve. One possible approach would be to utilize the patient-view hook to trigger an CDS evaluation when a patient’s chart is opened.

This example helps to delineate how a patient-view CDS Hooks service could alert a provider regarding the need to conduct an SDOH assessment. It could also be used to alert a provider of the availability of assessment information for that patient, or other SDOH related clinical guidance that might be helpful as part of a patient visit. When a guideline recommends that a provider engages in an SDOH discussion with a pediatric patient, CDS could recommend an SDOH assessment when the provider opens the patient’s chart. It also offers a potential approach, by way of using CDS Hooks, for enabling SDOH screening as part of routine workflow to support effective care delivery.





Conclusion

To further enhance health care outcomes, the development of CDS, like the authoring of the guidelines themselves, should follow a rigorous development and review process. Translation from textual narrative to electronic evaluation is not without risk. Subtleties in interpretation or logical expression can develop the risk of electronic interventions no longer aligning with the guideline authors' intent. Standards, specifically the FHIR Clinical Practice Guidelines (CPG) IG, was developed and sponsored by the HL7 Clinical Decision Workgroup (CDS WG) to mitigate the risk of misinterpreting clinical guidelines. It is recommended that a cross-functional team thoroughly evaluate candidate guidelines by first developing a narrative story that describes a context for the CDS intervention per the example in the report.

Given the significant impact of SDOH conditions on a patient's health, it is not surprising that some clinical guidelines include SDOH factors in their recommendations. It also follows that those electronic interventions that address SDOH concerns are potentially impactful and may be compelling candidates for CDS implementation.



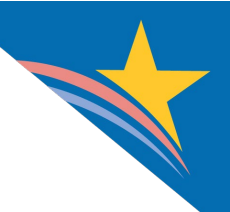


Appendix

Table 1: A sample set of cardiovascular guidelines with SDOH components

Guideline	Evaluations and Recommendations that Reference SDOH Information
<p>American Academy of Pediatrics: Bright Futures Promoting Healthy Weight^{xvii}</p>	<p>Staff should flag charts of children and adolescents with overweight or obesity so all staff at all visits of the problem and can monitor growth, risk factors, and social and emotional issues.</p> <p>Universal Assessment of Obesity Risk Screening for obesity risk, an ongoing process, starts with BMI evaluation (or weight-for-length if the child is <2 years) and incorporates evaluation of medical conditions and risks, current behaviors, family attitudes, socioeconomic concerns, and psychosocial situation. According to this information, health care professionals can promote obesity prevention through anticipatory guidance and by reinforcing behaviors that will promote sustained healthy weight (e.g., increasing intake of vegetables and; increase physical activity; decreasing intake of food high in calories, fats, and added sugars; decreasing screen time and other sedentary behaviors) or treat overweight or obesity.</p> <p>Assess attitude and emotional state, including any socioeconomic stressors. Families may not recognize excess weight or be aware of risks that obesity poses. Or, they may be unable to make behavior changes to improve eating and physical activity behaviors. This may often be caused by changes in economic, employment, or other psychosocial situations. Before providing anticipatory guidance about new behaviors, it is recommended that health care professionals assess attitude and capacity for change.</p> <p>Treating Overweight and Obesity The primary goal of obesity treatment is to improve long-term physical and psychosocial health through establishing permanent healthy lifestyle behaviors and changes to the environment where the child or adolescent lives. For some children and adolescents who have overweight or obesity, implementing these habits alone will lead to improved weight (weight loss or weight maintenance during linear growth)...</p>



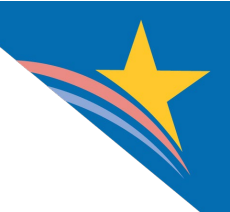


Guideline	Evaluations and Recommendations that Reference SDOH Information
<p>Screening for Hypertension in Adults US Preventive Services Task Force Reaffirmation Recommendation Statement^{xviii}</p>	<p>Although all adults should be screened for hypertension, risk factors that increase a person’s risk for the condition include older age, Black race, family history, excess weight and obesity, lifestyle habits (lack of physical activity, stress, and tobacco use), and dietary factors (diet high in fat or sodium, diet low in potassium, or excessive alcohol intake).</p>
<p>AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA 2018 Guideline on the Management of Blood Cholesterol^{xix}</p>	<p>In children and adolescents with lipid abnormalities and obesity, lifestyle-modification therapy should be intensified over and above usual therapy for childhood obesity and should include moderate caloric restriction and sufficient physical activity (e.g., 30-60 minutes of moderate to vigorous activity on most days). Utilization of resources for nutritional education and counseling is encouraged.</p> <p>Lifestyle Modifications: Review lifestyle habits (e.g., diet, physical activity, weight or body mass index, and use).</p> <p>In individuals at increased risk of both ASCVD and incident diabetes mellitus, it is recommended that counseling based on the ADA prevention approach be provided. This approach encourages regular moderate physical activity, maintaining a healthy dietary pattern, and sustaining modest weight loss (according to the core principles of the Diabetes Prevention Program).</p>

Table 2: A sample set of pediatric guidelines with SDOH components

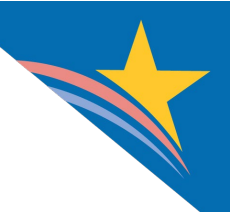
Guideline	Evaluations and Recommendations that Reference SDOH Information
<p>American Academy of Pediatrics: Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents^{xx}</p>	<p>Encouraging strong family-school partnerships helps the ADHD management process, and addressing social determinants of health is essential to these partnerships.</p> <p>It is also important for PCCs to be aware of health disparities and social determinants that may impact patient outcomes and strive to provide culturally appropriate care to all children and adolescents in their practice.</p>





Guideline	Evaluations and Recommendations that Reference SDOH Information
<p>American Academy of Pediatrics CLINICAL REPORT Guidance for the Clinician in Rendering Pediatric Care: Prenatal Visit^{xxi}</p>	<p>Objective of Prenatal Visit - Objective 4: To identify psychosocial factors (e.g., perinatal depression) that may affect family function and family adjustment to the newborn (e.g., social determinants of health, adverse child experiences, and promoting healthy social emotional development and resiliency).</p> <p>Gathering information about pregnancy complications, parental depression, and family medical and social history (especially social determinants of health) is helpful as a background to the context of the pregnancy.</p> <p>The prenatal visit also offers an opportunity for assessment of family risk factors and connections to key evidence-based and other early learning, health, and development programs in the community.</p>
<p>Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents^{xxii}</p>	<p>Social determinants of health are one of the 5 Anticipatory Guidance priorities in every Infancy Visit and in most visits thereafter.</p> <p>Prenatal Visit, Newborn Visit, First Week Visit, 1, 2, 4, 6, 9, 12, 18 Month Visits, Annual Visits 2 - 18 Years: the Bright Futures Infancy Expert Panel has given priority to the following topics for discussion in this visit: Social determinants of health: Risks (living situation and food security, environmental risks, pregnancy adjustment, intimate partner violence, maternal drug and alcohol use, maternal tobacco use), strengths and protective factors (becoming well informed, family constellation and cultural traditions).</p> <p>The prenatal visit also offers an opportunity for assessment of family risk factors and connections to key evidence-based and other early learning, health, and development programs in the community.</p>



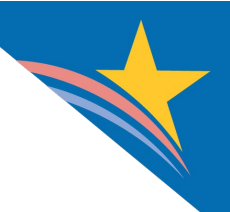


Guideline	Evaluations and Recommendations that Reference SDOH Information
<p>American Academy of Pediatrics: American Academy of Pediatrics Guidelines for Prenatal Care 8th Edition^{xxiii}</p>	<p>Example Health Screenings for Women of Reproductive Age includes Social Supports Questions: Safety (Domestic Violence) and Personal Resources (Transportation and Housing). Women who have not received prenatal care are more at risk for social problems and SUD. If the patient is in early labor or is prodromal, then conduct an assessment first before admission.</p> <p>Early discharge risks are higher for patients with poverty or social conflict.</p> <p>Postpartum visits should include a full assessment of social well-being.</p> <p>Minimal criteria for discharging newborn infant includes assessment for family, environmental and social risk.</p>
<p>American Academy of Pediatrics, Guidance for the Clinician in Rendering Pediatric Care: Recognition and Management of Medical Complexity^{xxiv}</p>	<p>Limiting the construct of complexity to high health care resource use or multiple diagnosed medical conditions that are easily identified through administrative records, without considering associated social or functional issues, may hamper the development of resources and policies needed to address complexity. In addition, such an approach does not embrace patient and family-centered care (PFCC) principles of incorporating the preferences, experiences, and psychosocial needs of the family.</p> <p>The effective delivery of PFCC may require a shift in culture from the traditional physician-patient paradigm, leading to a collaborative partnership with shared decision making that directly addresses family needs.</p>

Table 3: A sample set of substance use disorder guidelines with SDOH components

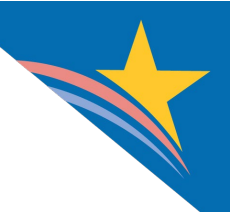
Guideline	Evaluations and Recommendations that Reference SDOH Information
<p>VA/DoD Clinical Practice Guideline for the Management of Substance Use Disorders^{xxv}</p>	<p>Recommendation 22: Among patients in early recovery from substance use disorders or following relapse, we suggest prioritizing other needs through shared decision making (e.g., related to other mental health conditions, housing, supportive recovery environment, employment, or related recovery-relevant factors) among identified biopsychosocial problems and arranging services to address them.</p>





Guideline	Evaluations and Recommendations that Reference SDOH Information
<p>SAMHSA: Treatment of Stimulant Use Disorders^{xxvi}</p>	<p>Substance use disorders and recovery from them are often associated with social determinants of health such as income and housing instability.</p> <p>Other life circumstances, such as low income, experiencing homelessness, domestic violence, and child maltreatment, also affect the success of stimulant use disorder treatment. Coordination of care should encompass these social determinants of health and providers should attempt to integrate resources and social supports from the client’s community.</p> <p>Stimulant use treatment providers are well positioned to support systemic changes to address social determinants in their community. Providers and other stakeholders can identify gaps in services and promote additional resources to improve social and economic conditions of their clients.</p>
<p>SAMHSA: Clinical Guidance for Treating Pregnant and Parenting Women with Opioid Use Disorder and Their Infants^{xxvii}</p>	<p>Treatment for pregnant women with OUD should promote and facilitate family, community, and social support as well as social inclusion by cultivating strong links with available childcare, economic supports, education, housing, and other relevant services as reviewed in A Collaborative Approach to the Treatment of Pregnant Women With Opioid Use Disorders: Practice and Policy Considerations for Child Welfare, Collaborating Medical, and Service Providers (SAMHSA, 2016a).</p> <p>If a pregnant woman returns to substance use: Are issues of personal safety or inadequate food or housing contributing to the return to substance use?</p>





Guideline	Evaluations and Recommendations that Reference SDOH Information
<p>SAMHSA: A Collaborative Approach to the Treatment of Pregnant Women with Opioid Use Disorders^{xxviii}</p>	<p>A woman with an SUD should be offered appropriate evidence-based behavioral, pharmacological, and social services to support the discontinuation of these substances, especially nicotine and alcohol.</p> <p>When caring for pregnant women with OUD, a comprehensive plan of care should be developed that lists each health and social problem, how it will be addressed, and who is responsible for addressing it. Evaluation for pharmacological treatment for other SUDs should be provided in conjunction with medical, social, and environmental interventions.</p> <p>Actions for the Social Worker or Case Manager at or Shortly After Discharge</p> <ul style="list-style-type: none"> ● Schedule a pediatric medical follow-up appointment within 2–5 days of discharge. ● Help the family get to the appointment (e.g., arrange transportation). <p>Pharmacotherapy for OUD should be discontinued only when in the best interest of the mother and infant. Personal safety and adequate food and housing are also essential to both short and long-term recovery.</p>
<p>The American Psychiatric Association Practice Guideline for The Pharmacological Treatment of Patients With Alcohol Use Disorder^{xxix}</p>	<p>AUD can be associated with psychosocial stressors (e.g., family issues, employment or financial difficulties, legal problems) that can also influence mood or be associated with anxiety. Thus, a careful consideration of differential diagnostic possibilities (American Psychiatric Association 2013) is important before embarking on treatment.</p> <p>Comprehensive and person-centered treatment plan - A plan of treatment that is developed as an outgrowth of the psychiatric evaluation and is modified as clinically indicated. A comprehensive treatment plan can include nonpharmacological treatments, pharmacological treatments, or both. It is individualized to the patient’s clinical presentation, safety-related needs, concomitant medical conditions, personal background, relationships, life circumstances, and strengths and vulnerabilities.</p>

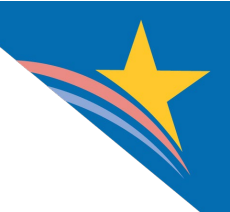




Table 4: An additional sample set of clinical practice guidelines that reference SDOH factors

Guideline	Evaluations and Recommendations that Reference SDOH Information
<p>Cervical Cancer Screening for Individuals at Average Risk: 2020 Guideline Update from the American Cancer Society^{xxx}</p>	<p>Cervical cancer incidence and mortality have sharply declined over time, but disparities still exist, with differences by state and rural/urban residence, and with greater burden in racial/ethnic minorities, particularly after adjustment for hysterectomy status, and in individuals of lower socioeconomic status.</p> <p>The contributors to these inequities include the differential participation and follow-up in cervical cancer screening programs, health seeking behaviors, and screening and treatment access barriers.</p>
<p>American Psychological Association: Practice Guideline for the Treatment of Patients With Alzheimer’s Disease and Other Dementias^{xxxi}</p>	<p>Caregivers Well-being: ...other key tasks include providing critical support for family members and other caregivers and making referrals to social, legal, and other community resources.</p> <p>Clinical experience suggests that by decreasing caregiver burden these programs may also improve the quality of life for patients and their families. Other resources that may be helpful include social service agencies, community-based social workers, home health agencies, cleaning services, Meals on Wheels, transportation programs, geriatric law specialists, and financial planners.</p> <p>Another critical demographic factor affecting the care of patients with dementia is social support. The availability of a spouse, adult child, or other loved one with the physical and emotional ability to supervise and care for the patient, communicate with treating physicians, and otherwise coordinate care may influence the patient’s quality of life as well as the need for institutionalization. In addition, a social network of friends, neighbors, and community may play a key role in supporting the patient and primary caregivers. Spiritual supports and religious beliefs have been shown to have positive benefits for caregivers’ well-being. These findings should be taken into account in assessment and treatment planning.</p> <p>Driving: When making recommendations to limit or stop driving, clinicians should be sensitive to the significant psychological meaning of giving up driving. In addition, patients and their families will need to make plans for alternative modes of transportation. A social service referral may be helpful for some families to help with transportation arrangements and costs.</p> <p>Agitation: Psychosis, aggression, and agitation are common in patients with dementia and may respond to similar therapies. When deciding if treatment is indicated, it is critical to consider the safety of the patient and those around him or her. A careful evaluation for general medical, psychiatric, environmental, or</p>





Guideline	Evaluations and Recommendations that Reference SDOH Information
	<p>psychosocial problems that may underlie the disturbance should be undertaken. If possible and safe, such underlying causes should be treated first.</p> <p>Level of care: The appropriate level of care may change over time, and patients often move from one level of care to another during the course of dementia. If available, consultation with a social worker or geriatric case manager may be to assess the current support system and facilitate referrals to additional services.</p> <p>Cultural Considerations: Cultural background also has an impact on social networks, caregiving style, presentation of disease symptoms such as depression, and acceptance of behavioral symptoms.</p> <p>Both the patient’s characteristics (e.g., race, functional dependence, impaired cognition, behavior) and caregivers’ characteristics (e.g., older age, level of caregiver burden) are determinants of nursing home placement.</p>
<p>VA/DoD Clinical Practice Guideline For The Management Of Posttraumatic Stress Disorder And Acute Stress Disorder^{xxxii}</p>	<p>Persons exposed to trauma should be assessed for the type, frequency, nature, and severity of the trauma...</p> <p>c. Assessment of existing social supports and ongoing stressors is important.</p>
<p>Clinical Practice Guideline for the Treatment of Posttraumatic Stress Disorder (PTSD) in Adults American Psychological Association^{xxxiii}</p>	<p>Some individuals and populations are especially at risk, and comorbidities such as substance use and abuse, depression, anxiety, dissociation and dissociative disorders, personality disorders, psychosis, cognitive impairment, personal risk taking, violence toward self and others, difficulty with relationships and parenting, and increased risk of nonsuicidal self-injury and of suicide are common to the diagnosis (Sareen, 2014).</p> <p>Psychosocial impacts can include occupational and career difficulties, homelessness, poverty, and incarceration, among many others (such as Vogt et al., 2017).</p>



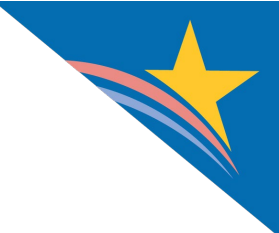


Table 5: A high-level framework of knowledge representation levels for examining clinical guidelines for translation into computable artifacts

Knowledge Level	Description	Knowledge Artifacts	Details
L1	Narrative	Clinical Practice Guidelines	Clinical decision-making recommendations detailed within a guideline that is intended for human consumption
L2	Semi-structured	Description Artifacts	Flow diagrams, decision trees, logic tables, if-then statements, or other similarly formatted expressions of decision-making processes in a human-readable format
L3	Structured	Formalized Artifacts	Standards-compliant, computer-interpretable specification encoding logic with data model(s), terminology/code sets, and value sets that are ready to be implemented
L4	Executable	Decision Support Service that is Integrated with a Health IT System	CDS integrated with a health IT data system (e.g., CDS that is live in an EHR production system or available via web services)





Notes

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- i A study conducted by Grimshaw and Russell concluded that of the 59 clinical guidelines investigated “All but 4 of these studies detected significant improvements in the process of care after the introduction of guidelines...”<https://pubmed.ncbi.nlm.nih.gov/7901634/>
 - ii For example, “Kaiser Permanente used CDS alongside healthcare delivery redesign to increase BP control for every race/ethnicity from 48% (the national average) in 2004 to 86% in 2012 and reduce CV death...” Current Hypertension Reports (2020) 22: 67
<https://doi.org/10.1007/s11906-020-01083-9>
 - iii The American National Standards Institute, Accessed November 21, 2022, <https://ansi.org/>
 - iv Examples include ICD10 and SNOMED CT for problems, RxNorm for medications, LOINC for observation identifiers, SNOMED CT for structured observation values, and CPT4, ICD10, and SNOMED CT for procedures
 - v “Electronic Specifications for Clinical Quality Measures”, Center for Medicare and Medicaid Services. Last modified December 1, 2021, https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Electronic_Reporting_Spec
 - vi A previous published release of the CDS Hooks specification, HL7 and Boston Children’s Hospital, Accessed November 21, 2022, <https://cds-hooks.hl7.org/1.0/>
 - vii A workflow hook for the purpose of providing clinical decision support using CDS Hooks, HL7 and Boston Children’s Hospital, Accessed November 21, 2022, <https://cds-hooks.hl7.org/hooks/patient-view/STU1/patient-view/>
 - viii FHIR Clinical Guidelines (v1.0.0) (STU1), HL7 International, Accessed November 21, 2022, <http://hl7.org/fhir/uv/cpg/methodology.html#select-step>
 - ix “American National Standards (ANS) Process”, ANSI, Accessed November 21, 2022, <https://www.ansi.org/american-national-standards/info-for-standards-developers/accreditation>
 - x “Standardized API for patient and population services”, Office of the National Coordinator for Health IT, Accessed November 21, 2022, <https://www.healthit.gov/test-method/standardized-api-patient-and-population-services>
 - xi “United States Core Data for Interoperability”, Office of the National Coordinator for Health IT, Accessed November 21, 2022, <https://www.healthit.gov/isa/united-states-core-data-interoperability-uscdi>
 - xii US Core Implementation Guide, HL7 International, Accessed November 21, 2022, <http://hl7.org/fhir/us/core/>
 - xiii For a collection of articles on this topic area see https://pubmed.ncbi.nlm.nih.gov/?linkname=pubmed_pubmed&from_uid=22052898
 - xiv Aziz A. Boxwala et al. “A Multi-Layered Framework for Disseminating Knowledge for Computer-Based Decision Support”, J Am Med Inform Assoc, (2011), 18 Suppl 1(Suppl 1):i132-9. doi: 10.1136/amiajnl-2011-000334. Epub November 3, 2011
 - xv Guidelines for Health Supervision of Infants, Children, and Adolescents, American Academy of Pediatrics, February 2017, <https://doi.org/10.1542/9781610020237>
 - xvi A workflow hook for the purpose of providing clinical decision support using CDS Hooks, HL7 and Boston Children’s Hospital, Accessed November 21, 2022, <https://cds-hooks.hl7.org/hooks/patient-view/STU1/patient-view/>
 - xvii Guidelines for Health Supervision of Infants, Children, and Adolescents, American Academy of Pediatrics, February 2017, <https://doi.org/10.1542/9781610020237>





- xviii “Hypertension in Adults: Screening”, US Preventative Services. Published April 27, 2021, <https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/hypertension-in-adults-screening>
- xix Cholesterol Clinical Practice Guidelines, The American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines, (2019), 139:e1046–e1081. DOI: 10.1161/CIR.0000000000000624, <https://www.ahajournals.org/doi/pdf/10.1161/CIR.0000000000000624>
- xx ADHD: Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents, Pediatrics, (2011), 128 (5): 1007–1022. <https://doi.org/10.1542/peds.2011-2654>
- xxi Michael Yogman et al. “The Prenatal Visit”, Pediatrics, (2018), 142(1):e20181218, <https://pediatrics.aappublications.org/content/pediatrics/142/1/e20181218.full.pdf>
- xxii Guidelines for Health Supervision of Infants, Children, and Adolescents Pocket Guided, American Academy of Pediatrics, https://brightfutures.aap.org/Bright%20Futures%20Documents/BF4_POCKETGUIDE.pdf
- xxiii Guidelines for perinatal care, American Academy of Pediatrics [and] the American College of Obstetricians and Gynecologists, (2017), <https://www.acog.org/clinical-information/physician-faqs/-/media/3a22e153b67446a6b31fb051e469187c.ashx>
- xxiv Dennis D. Kuo et al. Council On Children With Disabilities. Recognition and Management of Medical Complexity, Pediatrics, (2016), 138(6):e20163021, <https://pediatrics.aappublications.org/content/pediatrics/138/6/e20163021.full.pdf>
- xxv “VA/DoD Clinical Practice Guideline For The Management of Substance Use Disorders”, The Department of Veterans Affairs and the Department of Defense, 2015, <https://www.healthquality.va.gov/guidelines/MH/sud/VADoDSUDCPGRevised22216.pdf>
- xxvi Treatment of Stimulant Use Disorders, Substance Abuse and Mental Health Services Administration, (June 2020), <https://store.samhsa.gov/product/Treatment-of-Stimulant-Use-Disorder/PEP20-06-01-001>
- xxvii Clinical Guidance for Treating Pregnant and Parenting Women With Opioid Use Disorder and Their Infants, Substance Abuse and Mental Health Services Administration, January (January 2018), <https://store.samhsa.gov/product/Clinical-Guidance-for-Treating-Pregnant-and-Parenting-Women-With-Opioid-Use-Disorder-and-Their-Infants/SMA18-5054>
- xxviii A Collaborative Approach to the Treatment of Pregnant Women with Opioid Use Disorders, Substance Abuse and Mental Health Services Administration, (October 2016), <https://store.samhsa.gov/product/A-Collaborative-Approach-to-the-Treatment-of-Pregnant-Women-with-Opioid-Use-Disorders/SMA16-4978>
- xxix The American Psychiatric Association Practice Guideline For The Pharmacological Treatment Of Patients With Alcohol Use Disorder, The American Psychiatric Association, <https://psychiatryonline.org/doi/book/10.1176/appi.books.9781615371969>
- xxx Cervical Cancer Screening for Individuals at Average Risk: 2020 Guideline Update from the American Cancer Society, CA Cancer J Clin (2020), 0:1-26, American Cancer Society, <https://sph.lsuhscc.edu/wp-content/uploads/2020/08/caac.21628.pdf>
- xxxi Practice Guideline for the Treatment of Patients With Alzheimer’s Disease and Other Dementias, The American Psychiatric Association, (October 2007), https://psychiatryonline.org/pb/assets/raw/sitewide/practice_guidelines/guidelines/alzheimers.pdf
- xxxii VA/DOD Clinical Practice Guideline for the Management of Posttraumatic Stress Disorder and Acute Stress Disorder, Department of Veterans Affairs and Department of Defense, (June 2017), <https://www.healthquality.va.gov/guidelines/MH/ptsd/VADoDPTSDCPGFinal.pdf>
- xxxiii Guideline Development Panel for the Treatment of PTSD in Adults, American Psychological Association, Summary of the clinical practice guideline for the treatment of posttraumatic stress disorder (PTSD) in adults, American Psychologist, (2019), 74(5), 596–607. <https://doi.org/10.1037/amp0000473>, <https://content.apa.org/record/2019-39191-006>

