Clinical Decision Support Systems Recommended to Prevent Cardiovascular Disease

Community Preventive Services Task Force

Task Force Finding

The Community Preventive Services Task Force recommends clinical decision support systems (CDSSs) for prevention of cardiovascular disease (CVD) based on sufficient evidence of effectiveness in improving screening for CVD risk factors and practices for CVD-related preventive care services, clinical tests, and treatments.

Most of the available evidence is from studies on the effectiveness of CDSSs when implemented alone in the healthcare system rather than as part of a coordinated service delivery effort that is intended to address barriers at the patient, provider, organizational, and community levels. More evidence is needed about implementation of CDSSs as one part of a comprehensive service delivery system designed to improve outcomes for CVD risk factors and to reduce CVD-related morbidity and mortality.

A summary of the Task Force finding and rationale is available at www.thecommunityguide.org/cvd/CDSS.html.

Definition

Clinical decision support systems are computer-based information systems designed to assist healthcare providers in implementing clinical guidelines at the point of care. CDSSs use patient data to provide tailored patient assessments and evidence-based treatment recommendations for healthcare providers to consider on the basis of individual patient data. Patient information is entered manually or received automatically through an electronic health record (EHR) system. CDSSs for CVD prevention include one or more of the following:

- tailored reminders to screen for CVD risk factors and CVD-related preventive care, clinical tests, and treatments;
- assessments of patients' risk for developing CVD based on their history, risk factors, and clinical test results;
- recommendations for evidence-based treatments to prevent CVD, including intensification of existing treatment regimens;
- recommendations for health behavior changes to discuss with patients, such as quitting smoking, increasing physical activity, and reducing excessive salt intake; and
- alerts when indicators for CVD risk factors are not at goal.

CDSSs are often incorporated within EHR systems and integrated with other computer-based functions that offer patient care summary reports, feedback on quality indicators, and benchmarking. Knowledge management systems providing access to scientific literature and strategies for CVD prevention may also be linked to CDSSs.

Basis of Finding

The Task Force finding is based on evidence from 45 studies evaluating the effectiveness of CDSSs for CVD prevention. The studies were identified from a broad systematic review (Bright et al. 2012[1]; search period, January 1976–January 2011) that examined the effectiveness of CDSSs in improving quality of care and clinical outcomes for a variety of conditions (e.g., CVD prevention, cancer screening, immunization, antenatal care) and an updated search for newer CVD prevention–focused studies (search period, January 2011–October 2012).

The finding of sufficient evidence of effectiveness is based on modest improvements in quality of care outcomes (i.e., provider practices) for CVD prevention and the potential for large improvements when combined with additional interventions. Inconsistent findings for CVD risk factor outcomes represent an important evidence gap for future research.

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0749-3797/$36.00
http://dx.doi.org/10.1016/j.amepre.2015.03.041

Results from studies aimed at CVD prevention found that use of CDSSs led to modest improvements for the following three quality of care outcomes, when compared with usual care. These outcomes are composed of evaluations of provider practices based on U.S. Preventive Services Task Force (USPSTF) recommendations for preventive services and clinical guidelines for management of CVD risk factors:

- CDSS-recommended screening and other preventive care services completed or ordered by providers improved by a median of 3.8 percentage points. This included USPSTF-recommended practices for identifying CVD risk factors such as screening for high blood pressure, lipid disorders, diabetes, and smoking and for preventive care such as aspirin and counseling for diet and physical activity.
- CDSS-recommended clinical tests completed or ordered by providers increased by a median of 4.0 percentage points. This assessment included clinical tests recommended through evidence-based guidelines and protocols for management of high blood pressure, high cholesterol, or diabetes. For example, the American Diabetes Association recommends[2] hemoglobin A1c tests for patients with diabetes who have not been tested within the past 6 months, and a CDSS would alert physicians to order such a test when appropriate.
- CDSS-recommended treatments prescribed by providers improved by a median of 2.0 percentage points. Studies evaluated treatments for high blood pressure, high cholesterol, diabetes, and smoking cessation that were included in evidence-based guidelines for management of these CVD risk factors. An example of this would be a CDSS recommendation to start medication for a patient diagnosed with high blood pressure or intensify treatment for a patient who is not responding to current treatment.

Additionally, a small number of studies examined CDSSs in combination with other interventions, such as team-based care and patient reminders. Larger improvements were seen in screening and preventive care services and clinical testing for these multicomponent studies when compared with the overall effect estimates; however, the effect estimate for treatments prescribed was similar to the overall effect estimate.

Applicability

The findings from the Community Guide systematic review[3] are applicable to U.S. healthcare settings. Most studies took place in outpatient, primary care settings. These primary care settings were predominantly physician group practices serving large patient populations at multiple sites.

Approximately one third of included CVD prevention–focused studies reported information on race and ethnicity; little data on SES were provided in the included literature. Most patients in included study populations were reported to have one CVD risk factor, especially diabetes, hypertension, or hyperlipidemia. Nonetheless, findings from this review are likely applicable to diverse population groups with multiple CVD risk factors.

Considerations for Implementation

The push to increase use of health information technology (HIT) in hospitals and provider practices—via the Health Information Technology for Economic and Clinical Health (HITECH) Act[4]—reflects a paradigm shift in how providers and patients will interact in the future. The "meaningful use" regulation within the HITECH Act provides incentives to hospital and provider practices to implement and adopt "certified" EHR systems.[5] As part of the certification process, these EHR systems are required to meet several core objectives, one being the implementation of clinical decision support rules. As a result, CDSSs are expected to play an important role in the U.S. healthcare system over the next 5–10 years. With evidence from the systematic review on which these findings are based[3] showing that CDSSs improve provider-related quality of care outcomes for CVD prevention, but not for CVD-related risk factors, it is imperative to acknowledge that CDSSs can support providers managing patients with multiple comorbidities; however, barriers to behavior change at the patient and provider levels—such as medication adherence and "clinical inertia"—need to be addressed to improve patient outcomes and make strides toward reducing care fragmentation at the health-system level.

The systematic review[3] found that most successful CDSSs for CVD prevention were developed locally to allow healthcare systems and providers to tailor decision support rules to their practices' specific needs; additionally, one third of included studies reported CDSSs being added to pre-existing EHR systems. In most studies, CDSSs were designed to offer recommendations to providers without user requests for information, meaning the recommendations were "system-initiated." Also, most CDSSs were designed to deliver decision support as part of clinical workflow (i.e., "synchronously"). Few studies reported whether providers were required to respond to CDSS recommendations (e.g., by acknowledging receipt of a CDSS recommendation or registering a disagreement with a CDSS recommendation).

Although CDSSs show promise in enhancing provider-related quality of care outcomes, the following challenges and barriers may deter its successful implementation and adoption in the U.S.:

- Physicians and healthcare organizations might be resistant to accepting HIT, primarily because of concerns about implementation cost and increased workload.[6–8]
- The CDSS vendor and product development sector is still in its infancy and likely needs time to mature.
- Implementation standards for "meaningful use" are in the dissemination phase and will probably require several years for full compliance.
- Implementation of HIT will likely require organizational redesign and workflow integration, which can be burdensome for all stakeholders involved.
- Investing in HIT infrastructure requires long-term maintenance costs to keep up with evolving technology and clinical practice guidelines—although the U.S. government offers financial incentives to reduce the cost burden providers and organizations will encounter, concerns may linger about long-term financial investments.

Addressing these issues is paramount for CDSSs to contribute to improved patient outcomes.

With technology constantly changing and full implementation of "meaningful use" expected by the end of this decade, future CDSSs may provide more robust improvements in the quality of care, thus leading to better clinical outcomes in the long term. Moreover, these implementers should consider supplementing CDSSs with health system–level interventions that fully engage patients to take a more active role in their own health care. One such intervention is the use of team-based care. Team-based care models reduce care fragmentation and enable physicians to shift some care responsibilities to other providers—such as nurses, pharmacists, physician assistants, and community health workers—to better manage risk factors related to CVD. It is also important that healthcare organizations and CDSS developers provide regular trainings to address the needs of providers, as well as to mitigate decision support "alert fatigue"—where clinicians inadvertently ignore clinically useful alerts, thus diminishing the system's effectiveness.[9]

Information from Other Advisory Groups

The 2012 IOM report *Best Care at Lower Cost: The Path to Continuously Learning Health Care in America*[10] identified several recommendations on ways to improve health care and lower its cost in the U.S. One was the use of clinical decision support to "accelerate integration of the best clinical knowledge into care decisions." The IOM strategies for progress toward this goal called for

- clinicians and healthcare organizations to adopt tools that deliver reliable, up-to-date clinical knowledge at the point of care, and to adopt incentives to encourage use of CDSSs;
- research organizations, advocacy organizations, care delivery organizations, and professional specialty societies to facilitate the development, accessibility, and use of evidence-based clinical guidelines;
- public and private payers to promote use of CDSSs and clinical guidelines by structuring payment and contracting policies to reward effective, evidence-based care that improves patient health;
- health education programs to teach new methods for accessing, managing, and applying evidence; engaging in lifelong learning; understanding human behavior and social science; and delivering safe care in interdisciplinary environments; and
- research funding agencies and organizations to promote research into barriers and systematic challenges to dissemination and use of evidence at the point of care, and to support research to develop strategies and methods that improve the usefulness and accessibility of patient outcome data and scientific evidence for clinicians and patients.

The Agency for Healthcare Research and Quality–funded Clinical Decision Support Consortium[11]—a 33-member organization consisting of 15 vendors, eight healthcare institutions, and ten academic institutions—carries out a variety of activities to improve knowledge about decision support, with the ultimate goal of supporting and enabling widespread sharing and adoption of clinical decision support. The Consortium is currently translating clinical guidelines from the American Heart Association, American Diabetes Association, American College of Cardiology, and USPSTF. Translated guidelines will be used to create a web-based knowledge portal and repository for participating organizations.

Evidence Gaps

The Community Guide systematic review[3] identified several evidence gaps that need to be addressed in future CDSS research studies. There is insufficient reporting on context and implementation components for CDSS interventions. Most included studies evaluated CDSS interventions less than 12 months in duration. Future studies should examine longer durations to better

understand issues related to workflow integration and sustainability. Additionally, evidence is lacking on the impact of CDSSs on CVD risk factor outcomes such as systolic and diastolic blood pressure, lipids, diabetes, and CVD-related morbidity and mortality. Patient-centered outcomes and processes, such as patients' satisfaction with care, should also be examined.

Additional evidence is also needed on the impact of CDSSs on reducing health disparities as it relates to CVD risk factors. Most studies evaluated the use of CDSSs by physicians; evaluations of other care team providers' use of CDSSs, such as nurses, physician assistants, and pharmacists, are needed. Researchers should conduct studies in real-world settings to better understand barriers related to implementation and provider trainings. Moreover, better understanding of how CDSSs can be used to close the "clinical gap" between knowledge and clinical practice as it relates to the development, dissemination, and implementation of practice guidelines would be greatly beneficial, especially from a public health perspective.

In summary, the Task Force recommends the use of CDSSs to prevent CVD based on sufficient evidence of effectiveness in improving provider-related quality of care outcomes—such as screening and preventive care services, ordering recommended clinical tests, and prescribing recommended treatments to mitigate the risk of CVD. Although results from the Community Guide systematic review[3] were inconsistent for CVD-related clinical outcomes, improved reporting of these outcomes is expected in future studies as "meaningful use" objectives are fully implemented and more clinical guidelines are integrated into EHRs, thus enabling a thorough examination of the impact of CDSSs on CVD-related patient outcomes. In the meantime, implementing CDSSs with evidence-based health systems–level interventions, such as team-based care, will likely result in improved quality of care and patient outcomes, as well as better care coordination.

No financial disclosures were reported by the authors of this paper.

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