Using Dashboard Technology and Clinical Decision Support Systems to Improve Heart Team Efficiency and Accuracy: Review of the Literature

Sarah CLARKE MSN, ACNP-BC[a1], Marisa L. WILSON DNSc MHSc RN-BC CPHIMS[b], and Mary TERHAAR DNSc, RN[c]

[a] *DNP Student, Johns Hopkins University School of Nursing, Baltimore, MD. USA and Nurse Practitioner, Scripps Clinic and Green Hospital, La Jolla, CA. USA*

[b] *Family, Community, and Health Systems, The University of Alabama at Birmingham School of Nursing, USA*

[c] *Professor; Associate Dean for Nursing Academic Affairs, Case Western Reserve University, Cleveland, OH. USA*

Abstract. Aim: This review aimed to provide a comprehensive overview of the current state of evidence for the use of clinical dashboards and clinical decision support systems (CDSS) in multidisciplinary teams. Methods: A literature search was performed for the dates 2004-2014 on CINAHL, Medline, Embase, and Cochrane Library. A citation search and a hand search of relevant papers were also conducted. Results: (One hundred and twelve full text papers were retrieved of which 22 were included in the review.) There was considerable heterogeneity in setting, users, and indicators utilized. Information on usability and human-computer interaction was thoroughly reviewed. There was evidence that dashboards were associated with improved care processes when end-user input was incorporated and information was concurrent, pertinent and intuitive. Conclusion: There is some evidence that implementing clinical dashboards and/or CDSS that provide immediate access to current patient information for clinicians can improve processes and patient outcomes.

Keywords. Clinical dashboard, review, clinical decision support systems

1. Introduction

The multidisciplinary Heart Team is becoming the standard of care for patients undergoing Transcatheter Aortic Valve Implantation (TAVI). Governmental and professional groups have stressed the importance of having a heart team to collaborate and come to a consensus on candidacy for TAVI [1-3]. The goal of the heart team is to use a patient-centered approach to determine the optimal treatment plan of the patient. This cohesive approach is imperative in elderly patients with critical aortic stenosis and multiple comorbidities.

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[1] Corresponding author: Sarahclarke.np@gmail.com

Care of patients undergoing TAVI requires assimilation of data from multiple sources and coordination between multiple caregivers. Patients screened for TAVI undergo numerous diagnostic tests that generate more than 150 data points necessary for patient and therapy selection. An increasingly significant observation is that the volume of data that needs to be processed in our TAVI meeting is not only large and variable, but also comes from different sources, making consolidation more difficult. Adding to the complexity of the situation, TAVI teams work against compressed time schedules, and often need to determine the best treatment option within a matter of minutes. Consequently, the heart team is inherently prone to inefficiencies and errors, primarily because relevant information may not be considered. This necessitates the availability of accurate and timely information on patient status.

Electronic health records (EHRs) have the potential to increase efficiencies and increase patient care. Unfortunately they inexplicably function more as data warehouses than as robust databases [4]. Researchers have documented positive effects of several interventions on communicating information and status to the heart team. Informatics tools, such as dashboards, Clinical Decision Support Systems (CDSS), and alerts have been shown to aid in clinician compliance with guidelines or protocols. Research into the impact of CDSS on healthcare practitioner performance and patient outcomes in hospital settings has increased.

2. Methods

A literature review was completed using PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Embase to find relevant, high-quality evidence. The search terms (i.e., surgical procedures, outcome and process assessment, information dissemination, quality improvement, dashboard, benchmark, clinical decision support system) were used independently and in varied combinations using AND and OR as the Boolean concepts. Included studies described an aspect of dashboard or clinical decision support system that addressed at least one element of quality improvement such as patient outcome, process or system improvement. Reviews were appraised for studies that included outcomes. Twenty-two studies remained for final analysis. In evaluating the evidence based on Johns Hopkins University Research Evidence Appraisal Tool [5], the overwhelming majority of the evidence was garnered from descriptive or observational studies. The appraisal tool was used to evaluate not only the strength but also the quality of the data. Critical aspects were synthesized.

2.1 *System Development*

Several commercial platforms exist that incorporate information visualization strategies. However, integrating user-centered design principles is critical for successful implementation. System development is comprehensive and requires clear communication and input from stakeholders such as physicians, nurses, administration, and information technology. Careful attention must be paid to the human-computer interaction to ensure enduring practice changes. CDSS displaying high-density clinically relevant information also helps streamline communications and efficiencies.

2.2 System Workflow

Providers and healthcare institutions are under considerable pressure to improve efficiencies. CDSS is a proven tool and can increase productivity and decrease errors when it integrates into existing clinical workflows. Pertinent clinical information at the point of care is required to improve provider decisions.

3.   Results

Synthesis of the evidence identifies key components of system development and workflow. Early end-user involvement is an iterative process with a clear-cut return on investment. Continuous feedback and demonstrated improvements to the CDSS safeguard usability, scalability and portability. Indeed, a lack of fit between a CDSS and its users can create inefficiencies and prevent achievement of intended results.

Ensuring quality and accuracy of the information provided in the CDSS is of the utmost importance. Collaborative efforts with the Information Technology team are necessary to conduct a phased-approach to implementation while minimizing errors in data entry, data interface, and information translation.

4.   Discussion

A well-defined, intuitive and comprehensive CDSS can streamline communication, reduce errors, improve efficiency and ultimately impact patient outcomes. CDSS and dashboards are utilized more consistently and demonstrate improved outcomes when they are easy for the clinicians to use and findings suggest that an effective clinical decision support system must minimize the effort required by clinicians to receive and act on system recommendations. The advanced practice nurse with clinical expertise has the opportunity to collaborate with the creation, testing, and utilizing CDSS in an interdisciplinary and multifaceted approach. The next logical step would be to create a clinical decision support using identified concepts and conduct usability testing.

5.   References

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