



USING CLINICAL DECISION SUPPORT TO IMPROVE HEALTH AND ACHIEVE COST SAVINGS

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About this Report

To better understand the financial impact of clinical decision support (CDS) systems, Anvita Health commissioned this study to: 1) assess the current costs attributed to poor patient safety and quality in various areas of healthcare, and 2) calculate the potential cost-savings from implementing real-time CDS analytics on these same areas of healthcare.

I. Introduction: Clinical Decision Support is Life-Saving and Cost-Saving

Enthusiasm about clinical decision support (CDS) is growing. CDS is appealing because it promises to deliver two kinds of "returns"— improved patient health and reduced medical costs. Potential benefits from CDS include: 1) improved patient safety through reduced medication errors and adverse drug events, 2) improved quality of care through identification of evidence-based gaps in care and opportunities for patient adherence interventions, and 3) improved efficiency through automated business processes at the point-of-service, reductions in test duplication, and therapeutic interchange to cheaper generic brands.

Building the Business Case for CDS

This study highlights the potential cost-savings from implementing a CDS system with advanced analytical capabilities including real-time and batch interfaces, semantic interoperability and large scalability. Despite numerous benefits of CDS demonstrated in the literature on specific health and cost outcomes, the total cost-savings attributed to these electronic systems has largely gone undocumented. Researchers have examined the financial impact of improving individual clinical guidelines, reducing specific medication errors and increasing adherence to certain medications. However, there has been a lack of combining these findings to gain a comprehensive view of the financial impact of CDS on healthcare costs.

This paper shows the potential cost-savings from implementing CDS in four main areas of healthcare: 1) guideline compliance, 2) medication adherence, 3) drug safety, and 4) imaging. Calculations based on the existing medical literature show that the potential cost-savings attributable to decreased medical costs from using advanced CDS are over \$250 per member per year (PMPY), and are described in this paper (see Graph 1).

What is a Clinical Decision Support System?

Clinical Decision Support (CDS) Systems are defined broadly as information systems that link health information with health knowledge to improve clinical decision making and enhance patient care. These systems provide support through clinical guideline alerts, prescription drug advice, reminders for adherence and overdue recommended care, analysis of existing active care, and by facilitating future patient care.

Advanced or Intelligent CDS systems continuously analyze an individual's medical profile and prioritize answers based on established health guidelines.

Anvita Health believes that understanding the cost-savings potential of CDS by studying the existing medical literature is a necessary step toward better information health care IT decisions, building the business case for CDS and ultimately improving population health.

The Value of Clinical Decision Support to All Healthcare Constituents

CDS benefits various stakeholders in the healthcare ecosystem. Some of the advantages for certain groups include:

Health Plans – improved member quality of care; reductions in healthcare costs; automated business processes and claims data at the point of care; improved connection to other stakeholders; and, lower administrative costs.

Consumers -- empowered with personalized, actionable information; improved patient care, outcomes and quality of life; slower growth in health insurance premiums; and, lower out-of-pocket expenses.

Employers – empowered employees with better healthcare and health outcomes; slower growth in health insurance premiums; decreases in absenteeism, disability, and worker's compensation; and, increases in productivity.

Hospitals & Providers -- improved patient care through timely, patient-relevant evidence-based information; improved clinician productivity; a foundation for pay for performance; lower administrative costs from streamlined workflow; and, reductions in emergency care costs resulting from medical errors.

"Direct and indirect costs of medication nonadherence are estimated to total as much as \$177 billion annually in the U.S."

Ray Bullman, Executive Vice President, National Council on Patient Information and Education, 2007

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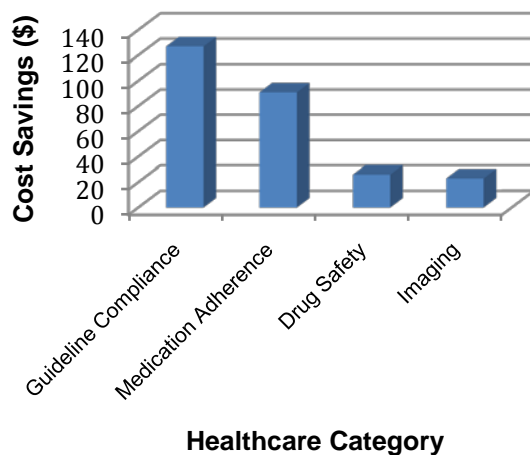
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Adoption of CDS systems and products has been increasing, but enthusiasm varies based on the quality and usefulness of offerings. In general, more integrated systems that use sophisticated analytics typically deliver greater value and are more readily adopted in the increasingly technologically advanced healthcare environment.

the point-of-care when compliance can best occur. A batch-mode interface enables physicians, health plans, and care managers to identify patients who will be coming due for future interventions, with an opportunity to intervene before harm occurs.

Graph 1: Annual Cost-Savings Per Member from Using CDS



II. Guideline Compliance

Many studies show that patients often do not receive important clinical services recommended by the leading industry-accepted sources. Clinical alerts can increase the likelihood of delivering evidence-based care by communicating knowledge of gaps in care to the individual, physician and care manager.

Table 1 shows the average cost savings from using CDS to improve clinical guideline compliance for some of the most important, and often overlooked clinical guidelines. Cost-savings PMPY range from \$5 for improving compliance for taking a beta blocker after myocardial infarction to \$80 for improving compliance for controlling hypertension. The calculations were based on the assumption that delivering clinical alerts to physicians along with messages directly to their patients increased guideline compliance by 21 percent, based on the data from two studies that appeared in the American Journal of Managed Care.^{1,2}

A computer system that integrates pharmacy, medical, lab, health risk assessment, and any other health data about the patient can enable physicians and pharmacists to monitor, identify and notify patients of gaps in care (deviations from best practices) for a single patient or all patients within a practice. A real-time interface enables alerting physicians at

III. Medication Adherence:

The World Health Organization defines medication adherence as the extent to which patients take medications as prescribed by their health care provider.* Industry estimates of patient nonadherence to medications range from 30 to 50 percent. Studies—mainly focused on specific medications—show that increased adherence rates improve clinical outcomes and decrease health care costs.

Table 2 shows the average cost savings from using CDS to improve medication adherence for some of the most prevalent chronic diseases in the U.S. Cost-savings PMPY range from \$4 for improving congestive heart failure medication adherence to \$35 for improving high cholesterol medication adherence. For the calculations, nonadherence was conservatively estimated at 30 percent. As with guideline compliance above, the calculations were based on the 21 percent shown in past studies for improved compliance from using CDS.^{1,2}

A computer system that integrates pharmacy, medical, lab, health risk assessment, and any other health data about the patient can enable physicians and pharmacists to monitor and identify patients with poor medication adherence or who are at risk of poor adherence. A sophisticated analytical engine enables prioritizing patients and prioritizing multiple alerts for an individual patient, based on clinical and financial data. A real-time CDS interface allows communication for improving adherence to occur at the point-of-service (e.g., physician visit, prescription pick-up)—the optimal time for influencing behavior change.

IV. Drug Safety

Many medication errors are due to harmful drug-drug interactions and drug-disease interactions.³ Unique combinations of interactions cause medication errors and adverse drug events (ADE) that can result in permanent disability or death for both inpatients and outpatients, and significantly increase costs.⁴

Table 3 shows the average cost savings from using CDS for drug safety. Cost-savings PMPY range from \$2 for preventing inpatient drug-drug interactions to \$12 for preventing outpatient drug-disease interactions. As with the calculation in Tables 1 and 2, guideline compliance improvement was assumed at 21 percent.^{1,2}

* The term "medication adherence" was used instead of "medication compliance" because "compliance" suggests the patient is passively following physician

“On average, a hospital patient is subject to at least one medication error per day.”

Institute of Medicine, Preventing Medication Errors Report 2007



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Table 1: Average Cost Savings from using CDS for Clinical Guideline Compliance*	Beta Blocker After Myocardial Infarction	Cholesterol Management After Acute Cardiovascular Event	Control Hypertension	Preventive Eye Care for Diabetics
% U.S. adult population guideline applicable ⁶⁻⁸	4.0%	4.0%	34%	7.8%
% Noncompliance with no alerts ⁹⁻¹²	40%	30%	30%	58%
Cost-savings per year per converted ¹³⁻¹⁸	\$1,505	\$2,253	\$3,781	\$1,933
Cost of guideline noncompliance PMPY (multiply 3 rows above)	\$24	\$27	\$381	\$88
CDS impact on guideline compliance ^{1, 2}	21%	21%	21%	21%
% Noncompliance <i>with CDS</i> (CDS impact * % noncompliance)	32%	24%	24%	46%
Cost of guideline noncompliance PMPY <i>with CDS</i>	\$19	\$21	\$301	\$69
Cost savings PMPY (= cost with CDS – cost without CDS)	\$5	\$6	\$80	\$18

*Values in table are averages and, in some cases, rounded to the dollar.

Table 2: Average Cost Savings from using CDS for Medication Adherence*	Asthma	Congestive Heart Failure	Diabetes	High Blood Pressure	High Cholesterol
Annual additional health care cost per nonadherent patient ^{20, 21}	\$2,000	\$4,000	\$4,000	\$1,500	\$1,500
% Nonadherence	30%	30%	30%	30%	30%
Condition prevalence ²²⁻²⁶	7.7%	1.8%	7.8%	23.0%	37.1%
Cost nonadherence PMPY (multiply 3 rows above)	\$46	\$21	\$94	\$104	\$167
CDS impact on medication adherence ^{1, 2}	21%	21%	21%	21%	21%
% Nonadherence <i>with CDS</i> (CDS impact * % nonadherence)	24%	24%	24%	24%	24%
Cost of medication nonadherence PMPY <i>with CDS</i>	\$37	\$17	\$74	\$82	\$132
Ave. cost savings PMPY (= cost w/ CDS – cost w/ no CDS)	\$10	\$4	\$20	\$22	\$35

*Values in table are averages and, in some cases, rounded to the dollar.

Table 3: Average Cost Savings from using CDS for Drug Safety*	Inpatient	Outpatient
Visits/admissions PMPY ^{27, 28}	118	200.7
% Visits/admissions with ADE due to drug interaction ^{4, 29-31}	2.08% (drug-drug) 7.25% (drug-disease)	1.08% (drug-drug) 3.77% (drug-disease)
Cost ADE ^{3, 32}	\$9,500	\$1,500
% Preventable ^{3, 33}	50%	50%
Cost of preventable drug interactions (multiply all rows above)	\$12 - \$41	\$16 - \$57
CDS impact on drug interactions ^{1, 2}	21%	21%
% Visits/admissions with ADE due to drug interaction <i>with CDS</i>	1.64% (drug-drug) 5.73% (drug-disease)	0.85% (drug-drug) 2.97% (drug-disease)
Cost of preventable drug interactions <i>with CDS</i>	\$9 - \$32	\$13 - \$45
Cost savings PMPY (= cost w/ CDS – cost w/ no CDS)	\$2 - \$9	\$3 - \$12

*Values in table are averages and, in some cases, rounded to the dollar.



Table 4: Average Cost Savings from using CDS for Imaging*	CT Scans	MRI	Nuclear Medicine Scans	Ultrasounds	X-rays
No. images PMPY ³⁴⁻³⁶	.21	.09	.03	1.26	1.50
Cost / procedure ^{37, 38}	\$750	\$2,000	\$1,000	\$200	\$100
Cost PMPY (multiply 2 rows above)	\$155	\$183	\$33	\$252	\$150
% Unnecessary ^{34, 39}	30%	30%	30%	30%	30%
Cost unnecessary imaging (multiply 2 rows above)	\$47	\$55	\$10	\$76	\$45
CDS impact (assumed)	10%	10%	10%	10%	10%
Cost savings PMPY (multiply 2 rows above)	\$5	\$6	\$1	\$8	\$5

*Values in table are averages and, in some cases, rounded to the dollar.

A computer system that integrates pharmacy, medical, lab, health risk assessment, and any other health data about the patient can enable physicians and pharmacists to monitor, identify and notify patients of potentially harmful drug interactions and drug contraindications. A real-time interface enables drug interaction detection at the point-of-service. Such computerized systems can also track the incidence of medication errors and adverse drug events, leading to the prevention of future harmful drug interactions.

V. Imaging

About one-third of all CT scans are not justified by a medical need.¹⁹ Unjustified CT scans and other imaging procedures being performed on millions of U.S. adults and children each year needlessly increase health care costs and pose a risk of overexposure to radiation in the population.

Table 4 shows the average cost savings from using CDS for imaging. Cost-savings PMPY range from \$1 for preventing unnecessary nuclear medicine scans to \$8 for preventing unnecessary ultrasounds. This was calculated by first determining the cost of unnecessary imaging and then assuming a 10 percent decrease in costs from using CDS.

Though not shown here, another area of potential cost-savings is with lower administrative costs resulting from CDS-enabled pre-authorization of imaging tests. This technology eliminates time-consuming and inefficient administrative processes associated with existing telephone-based systems.

A computer system that integrates patient imaging history with other medical claims and laboratory data can enable physicians to identify the most appropriate and safest diagnostic imaging tests for a specific patient. Knowledge about the volume and type of past scans inform the patient and physician at the point-of-service and help in determining if the additional radiation exposure is justified.

VI. Summary

There are significantly high costs attributed to poor patient safety and quality in healthcare. Intelligent CDS tools with advanced analytical capabilities can greatly improve areas of patient safety, quality of care and efficiency in healthcare delivery. Based on the current medical literature, the potential cost-savings from using advanced CDS is over \$250 PMPY. This is in line with a randomized controlled trial published in the American Journal of Managed Care in 2005, in which the researchers found that a CDS system decreased medical expenses by approximately \$223 PMPY.¹

There are significant challenges to overcome before widespread adoption of CDS tools. First, while the majority of existing evidence demonstrates the value of CDS for specific health outcomes, the total potential financial benefits accrued from using intelligent CDS tools, as shown in this paper, has hitherto been undocumented.

Second, there is a lack of research and best practices on the optimal implementation of CDS systems at the point of care, so as to decrease physician burden in implementing and using CDS.

As the healthcare industry increasingly shifts to electronic medical records, CDS will become more feasible and likely part of standard practice. The path to widespread adoption of CDS is somewhat complicated and rife with challenges, but it is a necessary step toward decreasing healthcare costs and improving the health of the population.



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