Texas Health Care Policy Council

-Policy Paper-

The Value of Health Information Technology in Texas

RICK PERRY
GOVERNOR

Health Care Policy Council
Nancy W. Dickey, M.D., Chair
Texas A&M University System
Ann S. Fuelberg, Vice Chair
Employee Retirement System of Texas
Maureen Milligan, Ph.D., M.P. Aff.
Health and Human Services Commission
Rick Danko, Dr. P.H.
Department of State Health Services
Jon Weizenbaum
Department of Aging & Disability Services
Larry Jones
Workforce Commission
Stacey Silverman
Higher Education Coordinating Board
Jennifer Ahrens
Department of Insurance
Ronnie Jung
Teacher Retirement System
John Monk
Health Professions Council
Michelle Massey
Texas State University System
Alexia Green, R.N., Ph.D
Texas Tech University System
Seth Chandler, A.B., J.D.
University of Houston System
Vacant
University of North Texas System
Ken Shine, M.D.
University of Texas System

Health Workforce Planning Partnership Subcommittee
Stacy Silverman, Chair
Higher Education Coordinating Board
Alexia Green, R.N., Ph.D, Vice Chair
Texas Tech University System
Maureen Milligan, Ph.D., M.P. Aff.
Health and Human Services Commission
Rick Danko, Dr. P.H.
Department of State Health Services
Larry Jones
Workforce Commission
John Monk
Health Professions Council
Ken Shine, M.D.
University of Texas System
Theresa Cruz
Office of Rural Health Affairs
Larry Phillips, Ed.D.
Angelina College

Staff
Tony Gilman, *Executive Officer*
Stephen Palmer, *Policy Analyst*

Executive Summary

Through the participation of Health Care Policy Council staff on the Gulf Coast Health Information Technology (IT) Task Force, Texas engaged the Center for Information Technology Leadership (CITL) to project the value of an electronic health information infrastructure implemented across the Texas health care system. CITL is well-known in health policy circles for its development of a national model of health IT implementation, which estimated that an electronic health information infrastructure across the national health care system could result in annual savings of $77.8 billion once fully implemented. Using a similar model, CITL estimated that an electronic health information infrastructure across the Texas health care system could save $14.2 billion annually once fully implemented.

Gulf Coast Health IT Task Force

The Gulf Coast Health IT was developed through a project of the U.S. Department of Health and Human Services, and is being administered by the Southern Governors' Association (SGA). Other states participating on the Task Force include Louisiana, Mississippi, and Alabama. The Task Force is charged with charting a digital recovery for the health information infrastructure in the Gulf Coast region that was affected by the recent hurricanes and developing plans for an electronic health information infrastructure sufficiently robust to withstand future disasters. As part of its support of the Gulf Coast Task Force, the SGA financed this economic analysis of the impact that an electronic health information infrastructure would have on the Texas health care system.

Methodology

Based on a model and analysis developed for the United States, CITL used Texas-specific inputs to determine the benefits, costs, and net value of these systems. The model incorporates inputs provided by Texas or pro-rated from national figures, as mutually agreed upon by Texas and CITL. The model considers the value of electronic transactions between providers and the stakeholders with whom they most commonly exchange information. Additionally, the model quantifies the value of the entire system moving from today's prevailing phone and mail communications to an idealized state of full computer-to-computer, standardized data exchange with minimal human involvement.

Post Office Box 12428~Austin, Texas 78711~512.463.2000 or 7-1-1 for Relay Services

Results

According to the CITL analysis, once fully established, an electronic health information infrastructure could yield a net value of $14.2 billion annually in Texas, across all participants in the health care system. In addition, the state could net $78.4 billion in savings over an initial 10-year implementation period. The largest value accrues to laboratories, providers, and payers. Individual provider organizations break even at different points during the 10-year implementation period. Medium and large medical offices see positive returns in the first year, small offices in year 3, while jumbo and large hospitals break even by years 5 and 6 respectively. Small and medium hospitals are the slowest to see positive returns, but even when incurring the costs of implementation reach a break even point in year 7. Further, these systems could eliminate over 150,500 preventable outpatient adverse drug events (ADEs) annually, as well as over 94,500 outpatient visits and 13,700 hospitalizations due to preventable ADEs.

Conclusion

The results of this analysis suggest that establishing an electronic health information infrastructure would produce significant savings in the health care system, while also improving the quality of care provided to Texans. The Council has not independently validated the models discussed in this policy paper, nor the application of the data to the Texas health care system.

The Value of Healthcare Information Exchange and Interoperability and Advanced Ambulatory Computerized Provider Order Entry in the State of Texas

Prepared by the Center for Information Technology Leadership
October 2006

Texas engaged the Center for Information Technology Leadership (CITL) to project the value of two types of health information technologies in the state of Texas: healthcare information exchange and interoperability (HIEI) and ambulatory computerized provider order entry (ACPOE). Based on a model and analysis developed for the United States, CITL used Texas-specific inputs to determine the benefits, costs, and net value of these systems. The model incorporates inputs provided by Texas or pro-rated from national figures, as mutually agreed upon by Texas and CITL. This document reports value projections and summarizes the model's approach to each of its benefit and cost components.

The model considers the value of electronic transactions between providers (hospitals and medical group practices) and the stakeholders with whom they most commonly exchange information: other providers, independent laboratories and radiology centers, pharmacies, payers, and public health departments. It quantifies the value of the entire system moving from today's prevailing phone and mail communications to an idealized state of full computer-to-computer, standardized data exchange with minimal human involvement. Additionally, it considers the value of implementing ACPOE with advanced clinical decision support in all outpatient offices. Even without connections to external organizations, these systems optimize ordering and improve quality of care. ACPOE systems can help providers improve medication safety by avoiding a common type of medical error: preventable adverse drug events (ADEs), defined as injuries resulting from interventions related to drugs. CITL quantified potential sources of benefit and cost for each technology from evidence in the published literature, market research, and estimates by expert panels.

Once fully implemented, the combination of ACPOE and standardized HIEI could yield net value of $14.2 billion annually in Texas. In addition, the state could net $78.4 billion in savings over an initial 10-year implementation period. The largest value accrues to laboratories, providers, and payers. Individual provider organizations break even at different points during the 10-year implementation period. Medium and large medical offices see positive returns in the first year, small offices in year 3, while jumbo and large hospitals breakeven by years 5 and 6 respectively. Small and medium hospitals are the slowest to see positive returns, but even when incurring the costs of implementation reach a breakeven point in year 7. Further, these systems could eliminate over 150,500 preventable outpatient ADEs annually, as well as over 94,500 outpatient visits and 13,700 hospitalizations due to preventable ADEs.

This report focuses on statewide results, and detailed projections are presented in a series of tables in Appendix 1.

ANALYTIC FRAMEWORK

CITL projected the value of electronic data transactions flowing from clinical encounters between providers (hospitals and medical group practices) and other providers, and between providers and five key stakeholders with which they exchange information most commonly: independent laboratories and radiology centers, pharmacies, payers, and public health departments. The flow of transactions is represented by the arrows in Figure 1:

Figure 1 – Overview of Provider-Stakeholder Relationships in HIEI

CITL approached this financial analysis by considering separately the benefits and costs of each provider-stakeholder relationship. A large portion of benefit is reduced labor/administrative cost, in the form of time saved from work that no longer needs to be done manually once data are exchanged electronically. Throughout the report, this benefit is referred to as "administrative savings" and is translated into dollar savings. This benefit would accrue to all organizations participating in interoperability. Interoperability also leads to fewer redundant services, procedures, and tests performed. This benefit accrues to the payers and providers bearing financial risk.

CITL defines four levels of interoperability. For the state of Texas, the model calculated the value of moving from today's prevailing phone and mail communications (Level 1) to an idealized state of full computer-to-computer, standardized data exchange with minimal human involvement (Level 4.) "HIEI", "Level 4 HIEI", and "interoperability" are used interchangeably throughout this report. See Appendix 2 for a full description of the four levels of interoperability.

To achieve Level 4 interoperability, advanced electronic health records (EHRs) are required, and the Institute of Medicine's definition of an EHR includes ACPOE functionality[1]. ACPOE supports the ordering of medications, diagnostic tests, and other interventions by outpatient providers. ACPOE systems have a wide variety of capabilities and CITL recognizes five classes from basic to advanced ACPOE, described in Appendix 2. For the state of Texas, the model describes the value of implementing advanced ACPOE, which incorporates sophisticated patient-specific clinical decision support in medication and diagnostic orders. All references to order entry in this report are to advanced ACPOE.

The analysis projects organization-level value to "typical" medical offices and hospitals of varying sizes in the state. The medical office practice size categories are approximately 1, 9 and 40 physicians for small, medium, and large groups, respectively, based on the distribution of physicians in Texas. The hospital size categories for small, medium, large, and jumbo hospitals are 49 beds or fewer, 50-199 beds, 200-399 beds, and 400+ beds respectively.

The model projects annual, steady-state value after full implementation, and value over a 10-year implementation period. It assumes 20% of users implement HIEI and ACPOE each year and each user incurs acquisition costs in the first year and annual costs beginning the same year. Each user reaps 50% of total benefit in the year of implementation, and benefit climbs 10% per year until it reaches 100% in the sixth year after implementation. By year 10, all participants reach 100% of their benefit potential. Appendix 3 displays the complete year-by-year benefit realization schedule.

All projections are reported in 2003 dollars[2]. For full information about the model and CITL methods, please refer to reports of the original models that form the foundation for this analysis[3, 4, 5].

STATEWIDE BENEFITS

Benefits of ACPOE and interoperability are described below. The model quantifies benefits where evidence exists, and other benefits are described qualitatively. For year-by-year results, and the proportion of benefits accruing to different organizations, please refer to Tables 1 and 2.

Outpatient laboratory tests and connections between providers and laboratories

Advanced ACPOE includes sophisticated clinical decision support systems (CDSS). Researchers have evaluated the impact of CDSS (presentation of test costs, prior results, and the probability of abnormal results) on outpatient laboratory ordering[6,7,8]. CITL's Expert Panel estimated the impact of ACPOE and clinical decision support on overall laboratory expenditures, and the model applied these impacts to Texas laboratory costs. The model projects the following savings to payers from avoided tests:

ACPOE Savings to Payers, Avoided Tests:

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$3,200 million	$492.0 million

Both clinicians in free-standing practices and those that are hospital-based use external laboratories. Interoperability between these organizations would enable computer-assisted reduction of redundant tests, and they would reduce delays and costs associated with paper-based ordering and reporting of results for non-redundant tests. The model combined redundancy rates from published studies[9,10], Expert Panel estimates of the impact of HIEI on these rates, and Texas test volume and cost information to project savings from avoided redundant tests. The model projects the following savings to payers from avoided redundant tests:

HIEI Savings to Payers, Redundant Tests

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$7,200 million	$1,100 million

The model also calculated administrative savings by applying Expert Panel estimates of these costs and the impact of HIEI to the remaining non-redundant tests. These savings would produce the following benefit to Texas providers and laboratories:

HIEI Savings to Providers and Laboratories

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$46,400 million	$7,140 million

Additional benefits of provider-laboratory connectivity include better clinician access to patients' longitudinal test results, elimination of errors associated with verbally reporting results, optimization of ordering patterns by making test cost information readily available to clinicians, and more convenient testing for patients.

Outpatient radiology procedures and connections between providers and radiology centers

CITL could find no studies on the impact of clinical decision support on outpatient radiology ordering, and we asked the Expert Panel to estimate its impact. The model combines this estimate with Texas outpatient radiology cost information and projects the following ACPOE-generated savings to payers from avoided outpatient radiology tests:

ACPOE Savings to Payers, Avoided Tests

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$3,800 million	$587.0 million

Most imaging procedures ordered by office-based clinicians, and some ordered by those in hospital-based ambulatory practices, are performed in external radiology centers. Connectivity between these organizations would reduce redundant tests and would save time and costs associated with paper- and film-based processes. The model combined redundancy rates from published studies[11,12], Expert Panel estimates of the impact of HIEI on these rates, and Texas test volume and cost information to project these savings to payers from avoided redundant tests:

HIEI Savings to Payers, Redundant Tests

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$1,960 million	$302.0 million

The model also calculated administrative savings by applying Expert Panel estimates of these costs and the impact of HIEI to the remaining non-redundant tests. The model projected the following statewide benefits to providers and radiology centers from administrative savings:

HIEI Savings to Providers and Radiology Centers

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$3,640 million	$560.0 million

Interoperability could also improve ordering by giving radiologists access to relevant clinical information, thereby enabling them to recommend optimal testing; improve patient safety by alerting both the provider and the radiologist to test contraindications; facilitate coordination of care and help prevent errors of omission by enabling automated reminders when follow-up studies are indicated; and lessen adverse environmental impacts by reducing the use of chemicals and paper in film processing.

Outpatient medications and connections between providers and pharmacies

ACPOE in outpatient settings and interoperability between outpatient providers and pharmacies prevent adverse drug events (ADEs), reduce medication costs, and save clinician and pharmacist time.

A type of medication error, ADEs are defined as injuries resulting from interventions related to drugs. Prevention of ADEs has been an important focus in patient safety initiatives globally. To project the impact of statewide ACPOE on ADEs, CITL calculated annual ADE rates and ADE-related encounters per Texas physician by applying published outpatient rates of preventable ADEs, preventable life-threatening ADEs, and avoided ADE-related visits and hospitalizations[13] to Texas visit volumes. These estimates are summarized in Figure 2.

Figure 2 – Annual Clinical Benefits of ACPOE

Statewide ADE Clinical Results	Per Physician	Texas
Preventable ADEs Avoided	12	150,500
Preventable life-threatening ADEs Avoided	0.8	9,900
Avoided ADE-related visits	7	94,500
Avoided ADE-related hospitalizations	1.08	13,700

To project cost savings from ACPOE, CITL factored in Expert Panel estimates of ACPOE impact on these ADE rates. With full implementation, the model projects the following savings to payers from avoided visits and hospitalizations related to ADEs:

ACPOE Savings to Payers, Adverse Drug Events

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$1,040 million	$159.0 million

ACPOE systems also produce drug utilization savings by giving providers information that enables them to switch from brand name to generic drugs, to make cost-effective changes within a therapeutic class, and to decrease drug overuse. The model incorporated published results about changes in prescribing patterns when clinicians are provided with such clinical decision support[14,15], Texas prescription rates and overall prescription volume and costs, and Expert Panel estimates of the impact of ACPOE on medication costs. The model projects the following overall medication savings to payers statewide:

ACPOE Savings to Payers, Drug Utilization

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$22,100 million	$3,390 million

Clinicians and pharmacists spend a lot of time transmitting and clarifying prescriptions by phone[16,17]. Interoperability between outpatient providers and pharmacies would reduce the number of these medication-related phone calls. As a result, the providers and pharmacies would save:

HIEI Savings to Providers and Pharmacies

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$3,490 million	$537.0 million

Outpatient provider-pharmacy interoperability would also improve clinical care by facilitating the formation of complete medication lists, thereby reducing duplicate therapy, drug interactions and other adverse drug events, and medication abuse. It could enable automated refill alerts, offer clinicians easy access to information about whether patients fill prescriptions, and complete insurance forms required for some medications. In addition, it could help identify affected patients in the event of drug recalls, uncover new side effects, and improve formulary management.

Connections between providers and providers

Patients often see multiple clinicians, and their medical records are frequently scattered across several offices and hospitals. Based on one study[18], CITL estimates that clinicians are missing information from other institutions or practices in approximately 25% of ambulatory visits, and would request charts if it were feasible to get the information in a timely manner. Provider-provider connectivity would save time associated with handling chart requests and referrals. The model assigned estimates of administrative costs per referral letter and chart request and applied Expert Panel estimates of HIEI impact to referral rates and chart requests to project savings. The model assumes that all needed charts are requested and projects the following benefits to providers from these time savings:

HIEI Savings to Providers

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$4,610 million	$710.0 million

Moreover, connectivity would reduce fragmentation of care from scattered records and improve referral processes by giving clinicians the patient-specific information they need to consult effectively on a case.

Connections between providers and payers

Payers and providers exchange administrative data in order to document services delivered and to ensure that providers are reimbursed according to contracted rates. Provider-payer transactions currently enjoy a relatively high degree of standardization, largely because of HIPAA (Health Insurance Portability and Accountability Act of 1996). While some transactions are highly automated as a result of HIPAA, others are not, particularly in smaller organizations. Provider-payer connectivity would further improve current practices by making the exchange of seven categories of administrative data (eligibility inquiry and response, claims submission, claims attachments, claims status inquiry, remittance advices, referrals and pre-authorizations, and coordination of benefits) more efficient. This would save state providers and payers:

HIEI Savings to Providers and Payers

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$4,270 million	$658.0 million

Connections between providers and public health departments

The public health system is a network of local, state, and federal agencies that pursue a wide array of population health objectives. Provider connectivity to the U.S. public health system would make reporting of vital statistics and cases of certain diseases more efficient and complete, saving the state:

HIEI Savings to Public Health System

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$142.0 million	$21.9 million

Though not quantifiable, the most significant impact of public health interoperability will almost certainly derive from earlier recognition of emerging disease outbreaks and bio-surveillance, as it becomes far easier to identify warning signs and trends by aggregating data from many sources.

STATEWIDE COSTS

The analysis considers costs of interfaces required by providers and each stakeholder's computers for communicating with external computers. Costs for internal clinical and administrative systems for providers are also included; we do not account for these corresponding costs to stakeholders. Table 3 contains cost detail.

Medical office and hospital system costs

Advanced ACPOE and Level 4 HIEI require providers to have broad and mature clinical information systems. The model projects costs for systems incorporating functions specified by the Institute of Medicine as minimally acceptable for electronic health records (EHRs): health information, patient support, results management, administrative processes, order entry and management, reporting and population health, decision support, and electronic communication[19].

The model assumes all medical offices and hospitals in the state acquire and maintain new systems. Maintenance is assumed to be 17.5% of acquisition cost and hardware would have an average life cycle of three years.

The cost of acquiring, implementing, and maintaining EHRs incorporating ACPOE and capable of supporting Level 4 HIEI is based on CITL market research[20]. Costs were applied to the number of medical offices in Texas. Statewide system cost projections are as follows:

Total Medical Office Costs

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$14,500 million	$825.0 million

For inpatient systems, the model applies Birkmeyer's estimates of hospital clinical systems costs[21] to Texas hospital statistics. The model projects statewide inpatient system costs as follows:

Total Hospital System Costs

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$1,890 million	$110.0 million

Provider interface costs

CITL estimates the cost of developing each HIEI-capable interface to be $50,000 for hospitals and $20,000 for medical offices, and annual maintenance to be 17.5% of those costs, beginning in year one. At Level 4 HIEI, all message formats and vocabularies are standardized; therefore, each provider needs only five interfaces, one to each type of external organization. The model applies these costs to Texas hospital and office statistics and projects the following interface costs:

Total Provider Interface Costs

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$6,240 million	$442.0 million

Cost of interfaces for pharmacies, laboratories, radiology centers, payer organizations, and public health departments

Each pharmacy, laboratory, and radiology center needs one interface to provider EHR systems. Public health departments would likely maintain separate interfaces for hospitals and offices, and the model assumes two per local office. Costs are $50,000 per interface for development and 17.5% annual maintenance beginning in year one. The model applied these figures to the number of Texas laboratories, radiology centers, pharmacies, and local health departments. Payer costs are taken from the HIPAA Final Impact Analysis[22]. The model relies on the Analysis's total payer cost estimates to comply with HIPAA standard transactions. HIPPA assigns all costs to start-up with no on-going annual cost. Statewide interface costs for these stakeholders are as follows:

Total Stakeholder Interface Costs

Implementation Years 1-10	Annual, Steady-State Starting Year 11
$877.0 million	$45.0 million

STATEWIDE NET VALUE

ACPOE Net Value

Combining the benefits and costs above, the net value of Advanced ACPOE in Texas is:

	Implementation Years 1-10	Annual, Steady-State Starting Year 11
Benefit	$30,100 million	$4,630 million
Cost	$14,500 million	$825.0 million
Net Value	**$15,600 million**	**$3,800 million**

The benefits of ACPOE accrue to payers (Table 2) through avoided tests, reduced medication costs, and fewer ADE related visits and admissions. In this model, providers pay for these systems.

Level 4 HIEI Net Value

Combining the benefits and costs above, the net value of Level 4 HIEI in Texas is:

	Implementation Years 1-10	Annual, Steady-State Starting Year 11
Benefit	$71,700 million	$11,000 million
Cost	$23,500 million	$ 1,400 million
Net Value	**$48,300 million**	**$ 9,600 million**

Figure 3 shows how annual net HIEI value accrues to stakeholders (Table 4). The sum of the value shown is $10.5 billion. Providers' annual system maintenance costs of $935 million were not allocated to the illustrated transactions. When they are subtracted, the total net value to providers is $3.8 billion and the statewide net value is $9.6 billion.

Figure 3 – Annual Steady State Net Value at Leve 4 HIEI

Combined ACPOE and Level 4 HIEI Net Value

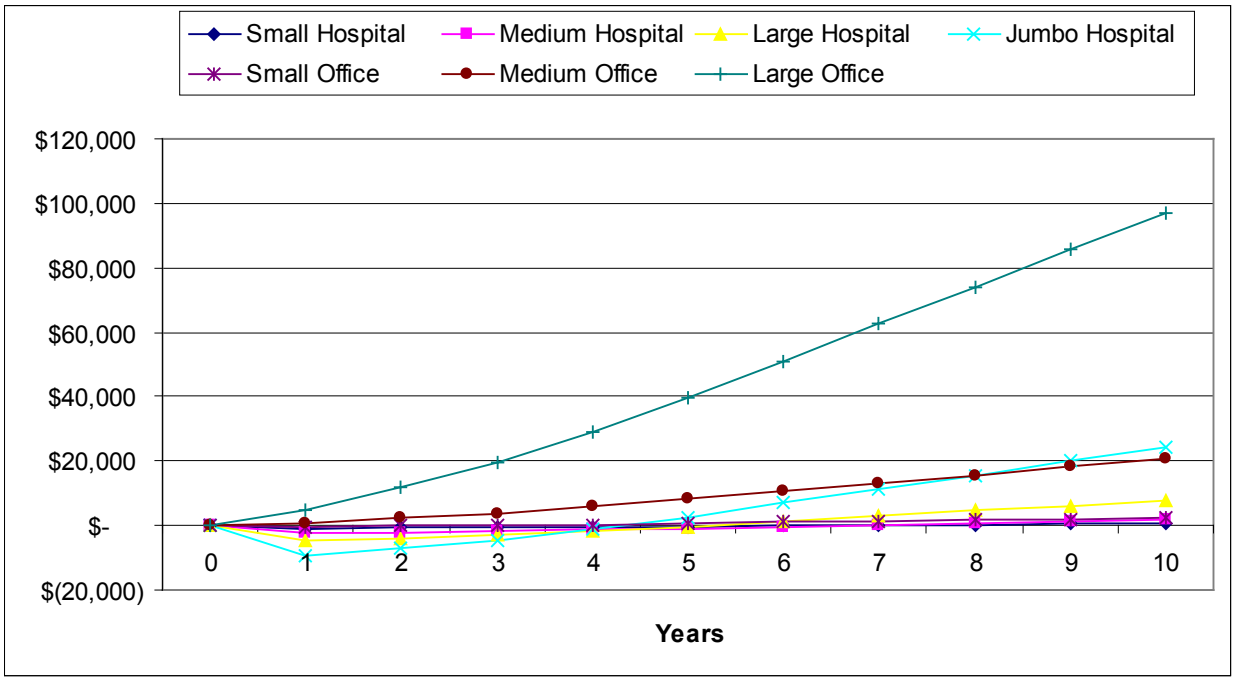
Combining the benefits and costs above, the net value of Level 4 HIEI with Advanced ACPOE in Texas is:

	Implementation Years 1-10	Annual, Steady-State Starting Year 11
Benefit of HIEI	$71,700 million	$11,000 million
Benefit of ACPOE	$30,100 million	$ 4,630 million
Cost	$23,500 million	$ 1,400 million
Net Value	**$78,400 million**	**$14,200 million**

Net value to provider organizations

If both ACPOE and HIEI are implemented, all medical offices and hospitals achieve positive net value at the end of 10 years, but they break even at different points (Figure 4, Tables 5 and 6). Medium and large medical offices reach positive net value in the first year and attain $20.7 million and $97.3 million dollars in net value respectively over 10 years. Small offices break even in year 3, jumbo hospitals in year 5 and large hospitals in year 6. Small and medium hospitals are the slowest, not reaching positive net value until year 7 and reaping $800 thousand and $2.0 million over 10 years, respectively. Information about the costs and benefits of each provider relationship can be found in Table 7.

Figure 4 - Cumulative Net Value per Medical Office or Hospital during Implementation



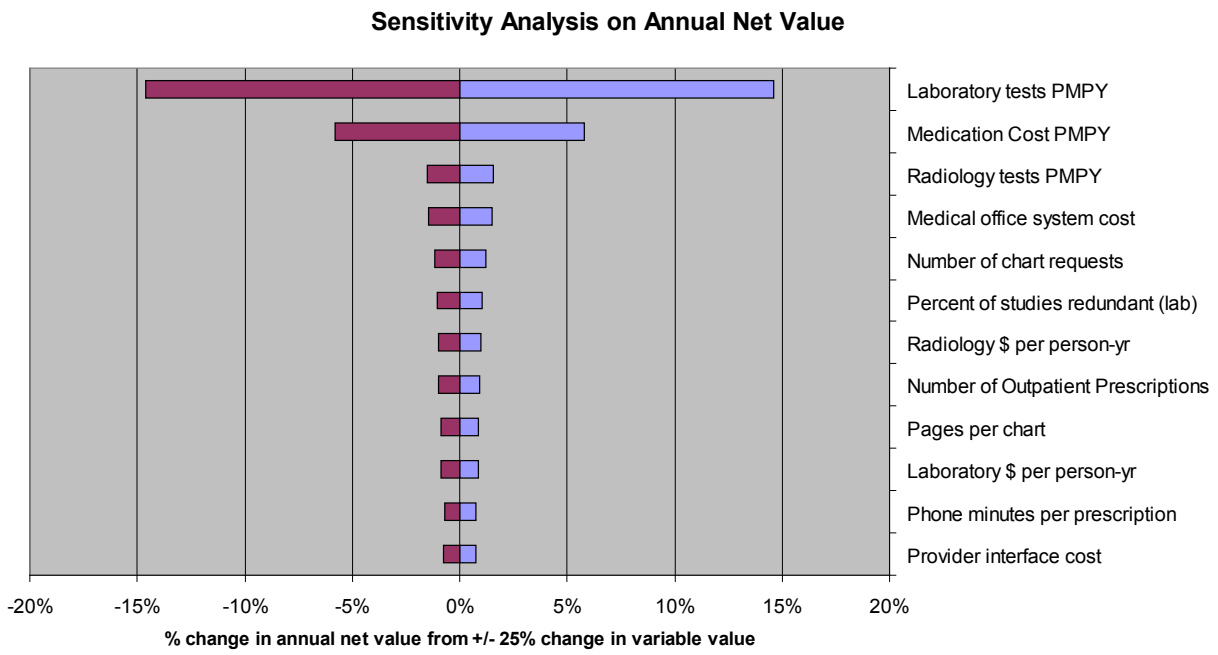
in millions

Sensitivity Analyses

The steady state net value of ACPOE and HIEI combined is most sensitive to test costs, medication expenditures, medical system costs and chart request costs. The tornado diagram in Figure 5 reflects the percent by which the annual, steady state net financial value would change statewide if factors were

increased and decreased by 25%. For example, if laboratory expenditures were decreased by 25%, the annual, steady state net value would increase 15% from $14 billion to $16 billion, whereas increasing expenditures by 25% lowers annual, steady state net value 15% to $12 billion. As a result, any effort that results in lower laboratory expenditures will lead to the greatest increase in value. Implementation period net value is sensitive to substantially the same medication expenditures and test costs, however, office system and interface costs have a much greater influence since they reflect acquisition costs. Full sensitivity analysis results are included in Tables 8 and 9.

Figure 5 - Sensitivity of Annual Net Value to Changes in Key Factors



Texas versus National Value

The steady-state net value of Level 4 HIEI, $9.6 billion, is approximately 8.6% of the $112 billion in total 2003 health care expenditures in Texas[23]. This is higher in comparison to the national analysis, where the projected annual net value of $77.8 billion is approximately 4.7% of national expenditures of $1,661 billion in 2003[24]. The majority of this difference may be attributable to the higher number of laboratory tests performed per person in Texas annually, compared to the nation (9 versus 2) and Texas's higher average laboratory test cost of $10.60 compared to $7.20 nationally. Therefore, Texas has a greater potential for savings from avoided redundant laboratory testing and the associated administrative time.

Additionally, the steady-state net value of Advanced ACPOE, $3.80 billion, is approximately 3.4% of total 2003 Texas health care expenditures, in comparison to the national analysis, where the projected annual net ACPOE value of $35.2 million is approximately 2.1% of 2003 national expenditures. The larger net ACPOE value in Texas is due chiefly to prescription expenditures, which are higher than the national average. Texas has 2.6 times as many prescriptions per capita as the national average and spends $50.70 per person per month, compared to $28.50 nationally. Therefore Texas has a greater opportunity to realize the benefits of medication savings through improvements in prescription efficiencies from ACPOE.

Further, compared to national results, Texas payers accrue a relatively higher proportion of net value; and providers accrue relatively less. This difference is due to the structure of capitated payment in the state, which is estimated at 3%. Nationally, 11.6%[25] of primary care provider revenues come from capitated contracts. Therefore, providers accrue 11.6% of any savings from avoided procedures and payers accrue the remaining 88.4% of savings. (Patients also avoid co-payments, but they are small when compared to full costs and are ignored in this analysis.) With Texas' current risk-sharing arrangements, Texas payers accrue 97% and Texas providers accrue 3% of the savings from these avoided services.

Limitations

With little real world experience with HIEI and ACPOE or their impact, quantitative evidence about their value is limited. The analysis incorporates the best evidence available, combining estimates from experts and a small number of studies.

The figures above represent a financial analysis that does not impute a dollar value to important improvements derived from HIEI that yield additional clinical and organizational value. CITL suspects that the clinical payoff in improved patient safety and quality of care could dwarf the benefits projected from this model, which does not project improvements in clinical care, except for reducing outpatient ADEs. Additionally, the model considers only transactions between providers and five other entities, ignoring benefits accruing from transactions among many other participants that would be supported by HIEI. Further, it does not assign a dollar value to many other benefits that will accrue such as the value of HIEI-capable systems *within* an enterprise. For example, HIEI-capable systems in hospitals deliver many clinical benefits and administrative efficiencies internally. As a result, the quantitative analysis cannot be considered comprehensive.

Stakeholders may not realize some of the projected savings as financial benefit. If providers do not currently ask for charts from other providers when they are missing information, they will not realize the savings attributed to avoiding the manual processes of handling chart requests; however, they may realize significant clinical quality improvements beyond what's currently predicted in the model. If employees are redeployed, the financial benefits projected from time savings may be realized as improved productivity or service quality, rather than pocketed dollar savings, and the model did not distinguish between these endpoints.

Just as the model underestimates the value of some important benefits because of lack of available data, it underestimates some costs. While the analysis calculates costs for providers to acquire HIEI-capable systems, it does not account fully for similar costs incurred by laboratories, radiology centers, pharmacies, payers, and public health departments. Also, it does not estimate the cost of developing and implementing state-wide standards or adopting national standards that will be essential for achieving Level 4 HIEI, for major workflow disruptions during systems implementation, nor for updating legacy systems.

Conclusion

The results of this analysis indicate that statewide implementation of health care information exchange and interoperability is a good investment. Fully standardized HIEI with advanced ACPOE could yield Texas a net value of $14.2 billion annually, or approximately 12.7% of total 2003 state health care expenditures. Even while stakeholders incur costs of installing systems during a 10-year implementation period, Level 4 interoperability is financially positive if implemented statewide. Further, statewide adoption of advanced ACPOE would eliminate 150,500 preventable ADEs and 9,900 life threatening ADEs per year, as well as

94,500 annual outpatients visits and 13,700 hospitalizations. Additionally, the clinical impact of HIEI with advanced ACPOE for which quantitative estimates cannot yet be made would likely add further value.

References

1 Committee on Data Standards for Patient Safety. Key Capabilities of an Electronic Health Record System. Institute of Medicine. National Academies of Sciences. 2003.

2 Bureau of Labor Statistics. United States Department of Labor. Available at http://www.bls.gov.cpi

3 Pan E, Johnston D, Walker J, Adler-Milstein J, Bates DW, Middleton B. The Value of Healthcare Information Exchange and Interoperability. Chicago: Health Information Management and Systems Society, 2005.

4 Walker J, Pan E, Johnston D, Adler-Milstein J, Bates DW, Middleton B. The Value of Health Care Information Exchange and Interoperability. Health Affairs. January 19, 2005.

5 Johnston D, Pan E, Walker J, Bates DW, Middleton B. The Value of Computerized Provider Order Entry in Ambulatory Settings. Chicago: Health Information Management and Systems Society, 2003.

6 Tierney WM, McDonald CJ, Martin DK, Hui SL, Rogers MP. Computerized Display of Past Test Results. Effect on Outpatient Testing. *Ann Intern Med*. 1987;107:569-574.

7 Tierney WM, Miller ME, McDonald CJ. The Effect on Test Ordering of Informing Physicians of the Charges for Outpatient Diagnostic Tests. *NEJM*. 1990;322:1499-1504.

8 Tierney WM, McDonald CJ, Hui SL, Martin DK. Computerized Display of Abnormal Test Results: Effects on Outpatient Testing. *JAMA*. 1988;259:1194-1198.

9 Bates DW, Boyle DL, Rittenberg E, Kuperman GJ, Ma'Luf N, Menkin V, Winkelman JW, Tanasijevic MJ. What proportion of common diagnostic tests appear redundant? *Am J Med*. 1998;104:361-368.

10 Brailer D, Augustinos N, Evans L, Karp S. Moving Toward Electronic Health Information Exchange: The Interim Report on the Santa Barbara County Data Exchange. *California HealthCare Foundation*. July 2003.

11 Bates 1998.

12 Brailer 2003.

13 Honigman B, Lee J, Rothschild J, Light P, Pulling RM, Yu T, Bates DW. Using Computerized Data to Identify Adverse Drug Events in Outpatients. *JAMIA*. 2001;8(3):254-266.

14 Cap Gemini Ernst & Young. TouchScript Medication Management System: Brook Hollow Practice, Site Impact Analysis. *AllScripts*. May 1999.

15 Cap Gemini Ernst & Young. TouchScript Medication Management System: Financial Impact Analysis on Pharmacy Risk Pools. *AllScripts*. 2000:1-11.

16 Workgroup for Electronic Data Interchange. Appendix 9: Financial Implications. Technical Advisory Group White Paper. *WEDI*. October 1993.

17 Ogura H, Sagara E, Iwata M, Nishioka Y, Furutani H, Yamamoto K, Kitazoe Y. Online support functions of prescription order system and prescription audit in an integrated hospital information system. *Med Infor. London, England.* 1988;13(3):161- 169.

18 Tang PC, Fafchamps D, Shortliffe EH. Traditional Medical Records as a source of clinical data in the outpatient setting. *Proc Annu Symp Comput Appl Med Care.* 1994:575-9.

19 Committee on Data Standards for Patient Safety. Key Capabilities of an Electronic Health Record System. Institute of Medicine. National Academies of Sciences. 2003.

20 Johnston, 2003.

21 Birkmeyer CM, Lee J, Bates DW, Birkmeyer JD. Will electronic order entry reduce health care costs? *Eff Clin Pract*. 2002;5:67-74.

22 Standards for Electronic Transactions and Code Sets: Final Impact Analysis. Federal Register, August 17, 2000.

23 Center for Medicare & Medicaid Services. "United States Personal Health Care Expenditures (PHCE), All Payers 1980-2000. Available at: http://www.cms.hhs.gov/NationalHealthExpendData/downloads/nhestatehealthaccountstables.pdf#search=%22CMS%20United%20States%20Personal%20Health%20Care%20Expenditures%20(PHCE)%2C%20All%20Payers%201980-2000.%22

24 Center for Medicare & Medicaid Services: "Table 3: National Health Expenditures Aggregate and per Capita Amounts, Percent distribution and Average Annual Percent Change by Source of Funds: Selected Calendar Years 1980-2012," 27 September 2004. Available at http://cms.hhs.gov/statistics/nhe/projections-2002/t3.asp

25 American Medical Association. Physician Socioeconomic Statistics 2000-2002. *AMA*. 2000. CITL estimated a mean PCP capitation rate, 11.6%, using AMA data reporting general physician "percent revenue from capitated contracts" and AMA's definition of PCPs.

Office of the Governor
Post Office Box 12428
Austin, Texas 78711-2428