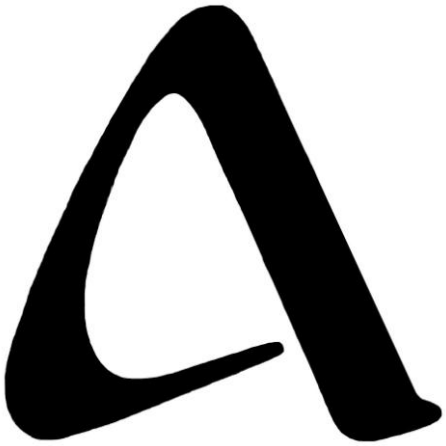
ARIZONA HEALTH CARE COST CONTAINMENT SYSTEM



MEDICAID TRANSFORMATION GRANT

HEALTH INFORMATION EXCHANGE

UTILITY PROJECT VALUE MODEL

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1. Background and Purpose

The potential benefits of electronic health records and data exchange have been discussed in diverse contexts and varying degrees of detail. Analysis includes a variety of publications, from medical papers to technical IT forums to the presidential campaigns. Virtually every group with an interest in health care is advocating a broadly accessible electronic health record as, at least, a partial solution to medical cost inflation.

The benefits often discussed tend to encompass estimates of global savings, including all possible benefits that might be realized. Yet, when the success stories are examined, we find that they have consistently followed an incremental strategy. Successful Regional Health Information Organizations (RHIOs) have developed and perfected specific solutions with a limited, well-defined scope. After successful implementation of one product, they have moved to their next project. Successful delivery and adoption of electronic health records does not begin and end in a single effort that realizes all potential benefits. More often, it is an ongoing effort that follows a strategic plan of demonstrating the usefulness of initial products, leveraging successes, and incorporating early successes into additional products.

Development of a successful strategic plan requires a framework for analyzing alternative product strategies and their value to stakeholders. The HIE Value Model provides a mechanism to compare and evaluate the costs and benefits of alternative electronic health products that can be provided through the HIE.

1.1. Approach

The approach taken in developing the Value Model for the AHCCCS Transformation Grants is an iterative approach to planning for its HIE products. The first set of products is limited to the scope of the HIE project funded by CMS Transformation Grant 1. We recognize that a much broader range of products is both desired and possible, and will be added over time. It is recommended that the value each candidate product for development be simulated using this model, including estimation of its costs and potential benefits. However, our initial model will focus on the three circumscribed products selected by Arizona providers and that are associated with high benefits and limited risks.

Over time, we envision a life cycle for various HIE products. Each potential product will pass through:

- **Design phase** that defines the requirements and product features to be included. In this phase the budget and expected return of each product would be estimated; a
- **Development phase** to create and test the product; an
- **Implementation phase** to operationally the products; and a
- **Research and assessment phase** to monitor adoption of the product and evaluate the effectiveness of the products. The evaluation phase can be used to understand whether the product met expectations. Based on the evaluation, existing products

may be modified to better meet the needs of users. Additional products can enter the HIE life cycle as the initial products mature.

Figure 1 Value Model Structure

By dividing the program into a series of iterative cycles, the HIE Value Model provides a variety of benefits and opportunities for risk mitigation to the overall HIE program, including:

- **Early-cycle Deliverable Benefits**
  The benefits of features delivered early in the program begin to materialize before other components are complete, possibly before others are even defined. This creates opportunity for refinements, and improves the value of any multi-year cost benefit analysis (CBA).

  With this in mind, program leadership may decide to lead with development cycles that show the clearest opportunity for success. They might also create cycles that combine high-value features with infrastructure development in order to manage expense and revenue flow.
- **Decreased Program/Delivery Risk**
  Smaller projects with narrowly targeted user groups begin with a focused scope that is reinforced by the user group selected for its uniform needs. This makes the Value

Model's iterative cycles more likely to satisfy time and budget constraints than a single large-development effort

- **Improved Service Provider Adoption of New Tools and Services**
  A focused value proposition offered to users with a similar set of needs will have higher acceptance rates than more complex or broadly targeted products. Particularly when adoption requires changes to one or more existing business practices, a more focused approach allows AHCCCS to provide better communication and education, and lessens the burden on potential users.
- **Flexibility to Support Developing Strategic Initiatives**
  Gaps between release cycles allow for the revision of subsequent projects based on changes in 1) industry trends, 2) observed trends with the local community, 3) governmental or departmental strategy, 4) feedback from the current user base, and 5) variance from revenue or expense forecasts. The opportunity to respond to these sources of input will help ensure the HIE Product's ongoing sustainability as well as increasing relevance.
- **Flexible Release Strategy**
  The life-cycle of some products will be associated with more technical and behavioral barriers than others. By formulating a focused product release schedule, those products that are more easily developed will not be forced into a release schedule that is slowed by the more complex products.

1.2. Benefit Estimation

The estimate of benefits expected from the HIE products is crucial to the analysis and is the least straightforward of the model's components. Our methodology includes several components:

- **Definition of Product Scope**
- **Definition of Conceptual Benefits**
- **Definition of Maximum Potential Value**
- **Verification of Arizona Maximum Potential Value**
- **Estimate of Market Penetration and Provider Adoption**
- **Estimate of Probable Benefit Value**

1.2.1. Definition of Product Scope

The estimating methodology begins by identifying the scope of the product to be presented. This includes the nature of the information to be provided, and the number of providers who would have access to the HIE. Scope also describes the delivery mechanism for health information and how users would access the information.

1.2.2. Definition of Conceptual Benefits

Based on product scope, we define the types of benefits expected from the HIE product. This includes the potential impacts on medical practice and health care outcomes as well as the effect on health care costs.

1.2.3. Quantify Maximum Potential Value

This step quantifies the maximum value of health information products. Several groups, such as the Center for Information Technology Leadership (CITL) have estimated benefits of electronic health information using national industry data. We use these estimates and standards to develop an estimate of benefits that an electronic health information exchange could produce for AHCCCS Programs. For those benefits that are not readily quantifiable, we provide a statement of potential health benefits. If health and cost impacts are measurable in financial terms, we estimate a Maximum Potential financial benefit from health record availability.

1.2.4. Verify Arizona Maximum Potential Value

Estimated value of an electronic health record exchange developed with national data or using data from other states may not apply directly to Arizona. The AHCCCS program has used the managed care approach to providing medical care that may reduce or eliminate some problems observed in other settings. It is essential, then, to compare the findings from other states with Arizona data.

1.2.5. Estimate of Market Penetration and Provider Adoption

The maximum benefit estimated above assumes that all providers would adopt the HIE products and modify practice to take advantage of the information offered. In practice, even with information more readily available, there are several reasons providers will probably not change practice immediately.

- All health data may not be captured in the system. Unless all health care providers contribute their data to the HIE, only a portion of the maximum benefit will be realized.
- All health care providers may not have access to the HIE. Some providers may not have internet access, and some products may restrict the number of users who can access them.
- Providers may not use the information to change their practices even when data are available.

Therefore, we include factors that scale back the expected benefits from a given product. We use a “Market Penetration Factor” to represent the proportion of data and the proportion of users that a given product will reach. In addition, we use an “Adoption Rate” to estimate the proportion of provider practice that will change because of the information. Given the lack of experience with these models in Arizona, the initial estimates of market penetration and adoption should be evaluated and adjusted as experience is gained.

1.2.6. Estimate of Expected Benefit Value

The analysis of benefits for each HIE product estimates the value that can be expected from an ideal HIE product, after adjusting Arizona experience for expected market penetration and adoption factors..

2. Products

The AHCCCS HIE Project will implement products in at least two phases. Phase I constitutes a Proof of Concept to verity the usefulness of the products on a small scale. Project staff will work with providers who use the products in Phase I to refine the products to meet providers' needs. Phase I will not store data, but will use a gateway and emulator to translate records from disparate data sources to a common format and display them on a secure web-based viewer. Health records will not be limited to AHCCCS members, and a small set of medical practitioners who have been chosen to participate in the project will access the records of patients in their care. In Phase I the products offered will include:

- Access to Electronic Laboratory Results
- Access to Electronic medication History
- Access to Electronic discharge Summaries.

Phase II will offer many of the same products as Phase I, and will continue to use the infrastructure created during Phase I to access records from the data sources. In addition, however, Phase II may use other data sources, including AHCCCS claim and encounter data. Access to providers will be provided through a Web portal, so that any AHCCCS provider with Internet access and the proper security will be able to access HIE records.

2.1. Laboratory Results

2.1.1. The Product

The HIE will provide the results of laboratory tests on line to medical practitioners. Laboratory results will be provided by participating laboratories through the HIE emulator and gateway. Participating providers will be able to search for member records and view or print the laboratory results. For Phase I, Sonora Quest Laboratories will be the only laboratory participating.

2.1.2. Conceptual Benefits

An on-line record of laboratory test results will provider several benefits to medical providers and payers:

- Providers would be able to view test results and identify baseline data and medical conditions without repeating the tests. Urgent or emergency conditions could be treated with less delay, probably improving medical outcomes.
- Payers would experience a reduction in expenses for laboratory tests because of the reduction in duplicate tests.
- The laboratories providing tests would distribute test results on-line and should experience fewer requests for test results, because those who require the information would be able to view the electronic health record.

2.1.3. Concentration of Providers

The Concentration of Providers is important in evaluating those products that should be included in the HIE. Concentration describes how many contributors of information are required to reach an acceptable market penetration rate. Over half of the laboratory tests conducted for AHCCCS members are provided by two organizations, and just under 75 percent of tests are provided by the top 20 organizations. Table 1presents these results.

Given this concentration of providers, laboratory test results are a good candidate for capturing a large proportion of the health information from a relatively small number of sources.

Only Sonora Quest Laboratories, with a share of 23.9 percent of AHCCCS member tests, will provide laboratory data during Phase I. This will limit penetration to a maximum of 23 percent for the initial implementation. Additional penetration could be achieved by adding additional laboratories and hospitals as data suppliers for laboratory test results in subsequent product cycles. It may be useful to offer small incentives such as add-on payments for laboratory claims that are supported by results available to the HIE. For example, adding a $0.15 incentive for each claim would provide Lab Corp with approximately $230,000 per year to provide results for AHCCCS members.

Table 1 Lab Providers Ranked by Procedures

Lab Providers Ranked by Procedures					
January 1, 2007 – Jun 30, 2007					
Rank	Name	Procedure Count	Total Paid	% of Procedures	Cumulative % of Procedures
		2,745,647	$142,812,472	100.00%	
1	LABORATORY CORP OF AMER.	789214	$14,324,344.97	28.7442%	28.7442%
2	SONORA QUEST LABORATORIES	657533	$22,421,311.61	23.9482%	52.6924%
3	MARICOPA MEDICAL CENTER	76216	$4,120,193.71	2.7759%	55.4683%
4	ST JOSEPH'S HOSPITAL-PHX	59319	$4,857,156.02	2.1605%	57.6287%
5	TUCSON MEDICAL CENTER	52285	$4,126,678.75	1.9043%	59.5330%
6	UNIVERSITY MED CTR-AZ	47871	$3,247,851.34	1.7435%	61.2766%
7	BRADSHAW MTN DIAG LAB	41370	$706,359.95	1.5067%	62.7833%
8	YUMA REGIONAL MED CENTER	35871	$3,986,753.13	1.3065%	64.0898%
9	NORTHWEST MEDICAL CENTER	26261	$3,179,229.14	0.9565%	65.0462%
10	VALUE OPTIONS LAB SERVICE	25474	$371,213.73	0.9278%	65.9740%
11	BANNER DESERT MEDICAL CEN	25452	$3,724,622.25	0.9270%	66.9010%
12	PHOENIX CHILDREN'S HOSP	23424	$1,636,005.86	0.8531%	67.7542%
13	MARYVALE HOSPITAL MED CTR	23157	$3,035,026.16	0.8434%	68.5976%
14	CARONDELET ST MARYS HOSP	23031	$2,700,676.75	0.8388%	69.4364%
15	BANNER ESTRELLA MEDICAL	22950	$3,817,229.96	0.8359%	70.2723%

16	UNIVERSITY PHYSICIAN HC	22244	$1,335,511.44	0.8102%	71.0824%
17	BANNER GOOD SAM MEDICAL C	21931	$3,623,305.67	0.7988%	71.8812%
18	BANNER THUNDERBIRD MEDICA	21788	$3,503,301.38	0.7935%	72.6747%
19	PHOENIX BAPTIST HOSPITAL	21669	$2,633,724.58	0.7892%	73.4639%
20	JOHN C LINCOLN-DEER VLLY	20320	$3,141,129.05	0.7401%	74.2040%

2.1.4. Industry Estimates of Benefits

National studies of physician test orders have estimated that approximately four percent of laboratory tests are duplicates of previous tests that would provide sufficient information. Based on a review of all laboratory tests paid by AHCCCS or health plans contracted to provide care in the first six months of 2007, we estimate that over $150 million per year are paid for these services directly by AHCCCS or through capitated health plans. If four percent of the tests are unnecessary duplicates, the annual cost to AHCCCS would be approximately $6 million.

2.1.5. Verification of Potential Benefits

Literature review demonstrated an absence of standard methodology for the determination of laboratory duplication. Staff reviewed six months of AHCCCS paid claim and encounter data to evaluate whether the estimate of potential duplicates of six million dollars could be supported. Because the ordering practitioner identity is not consistently submitted with the laboratory claim, it is not possible to determine whether similar tests were ordered by one physician to verify results, or by different physicians who were unaware of existing test results. Consequently, it is difficult to obtain direct evidence of true duplicate laboratory tests.

To estimate potential duplicates, staff obtained the set of all laboratory tests that were repeated within 30 days of the first test. These data were analyzed as follows:

- Based on the clinical judgment of our Medical Director, we identified tests for which repetition would be expected. These were excluded from further analysis.
- Of the remaining tests, we identified those that would commonly be repeated in 30 days, but would not generally be repeated within six days of the original. We re-estimated the potential duplicate list by limiting the set of potential duplicates to those that were repeated within six days of the original.
- We further refined the six day list by reviewing data and identifying patterns in certain tests that indicated a planned repetition. For example, a repeated test at exact five day intervals for two months would indicate that the tests were part of an episode of care, and were not duplicate tests. For procedures that displayed repetitious patterns even with a six-day criteria, we limited our estimate of duplicates to those that were provided through different laboratories. Our rationale was that the provision at different laboratories indicates that one provider is not requesting the tests, so duplication is probably not part of a treatment pattern. When tests from the

same laboratory are excluded, the pattern of tests repeated at frequent intervals disappeared.

Appendix C presents the list of major laboratory procedures considered.

2.1.6. Pricing

Once potential duplicate tests were identified, the value of the duplicate tests had to be identified. Some tests are performed for members under capitated arrangements. In these cases, encounters indicated a negligible payment amount ($0, $.01, etc.). We used encounters that reported a reasonable amount paid to estimate the average ratio of payment to charges. The average ratio of payment to charges was 28 percent for those encounters that included a reasonable payment amount. This 28-percent figure was multiplied by the charged amount on each of the capitated claims that did not report a paid amount to indicate the market value of the duplicate tests.

2.2. Benefit Estimate

Based on this analysis, we estimate that approximately 5.8 percent of tests provided through AHCCCS are potential duplicates. This is consistent with recent research on duplicate laboratory tests that indicate 6% reductions in tests when laboratory results are available. [1] These tests represent approximately 5.2 percent of AHCCCS laboratory expenditures. The spending percentage is less than the percent of tests administered because the duplicated tests tend to be more expensive than average. As a result of these findings, we believe that it is reasonable to accept the national estimate that four percent of laboratory tests duplicate previously completed tests. Our data and that from the Bates study indicate a duplicate percent that is above the standard estimates, but we will use the more conservative 4% figure.

[1] Bates, David W., and others. 1999b. "A Randomized Trial of a Computer-Based Intervention to Reduce Utilization of Redundant Laboratory Tests." *American Journal of Medicine,* vol. 106, no. 2 (February), pp. 144–150.

Table 2 Laboratory Results Annual Benefits

Laboratory Results Annual Benefits									
Stake holder	Savings	Units	Base Units	Unit Cost	% Savings	Maximum Potential Savings	Adoption in Practice	Estimated Benefits	Total Benefits
AHCCCS/MCOs									
	Reduction in Duplicate Tests	Laboratory Claims	5,580,000	$27.18	4.00%	6,066,576	50%	$3,033,288	
	Reduction in Claims Processed	Laboratory Claims	5,580,000	$4.29	4.00%	957,528	50%	$478,764	
	Electronic Attachments	Claims Requiring Lab Documentation	148,196	$11.39	50.00%	843,976	100%	$843,976	
Total AHCCCS/MCO									$4,356,028
Laboratories									
	Reduced Paper Distribution	Lab Orders	5,580,000	$10.00	75.00%	41,850,000	50%	$20,925,000	
	Reduced Requests for Results	Chart Requests	1,116,000	$14.00	75.00%	11,718,000	50%	$5,859,000	
Total Laboratories									$26,784,000
Practitioners									
	Reduced Requests for Results	Chart Requests	1,116,000	$10.00	75.00%	8,370,000	50%	$4,185,000	
Total Practitioners									$4,185,000
Industry Benefits									$35,325,028

Table 2 presents the implications of our findings for potential benefits of having laboratory test results on-line. We assume an adoption rate of 50%, meaning that in half of the instances where physicians have information on laboratory results available they will refrain from ordering duplicative tests.

Reduction in Duplicate Tests: In FY 2007 we estimate that AHCCCS programs paid for over 4.8 million lab tests per year, at an average cost of $27.18 per test. A four percent duplication rate would suggest $6.066 million per year in unnecessary expenses. We believe that not all physicians may rely on existing test results, but if 50 percent change their practice to use existing results, AHCCCS programs would reduce expenditures by over $3.033 million annually.

Reduction in Claims Processed: Operational savings would be realized for AHCCCS and health plans by reducing the number of claims processed by 4 percent. AHCCCS staff estimate that the average cost of processing an electronic claim is $4.29. Assuming that most laboratory claims are electronic, this would save $478,764 in claims processing costs.

Electronic Attachments: In addition to a reduction in the number of claims processed, using the test results available on-line rather than requiring attachments for claims, could save $948,454 per year for AHCCCS alone. A recent review found that AHCCCS currently processes 148,196 paper attachments for claims. We assume that half of the documentation is laboratory test results. CITL has estimated that the average cost of processing a paper attachment for the industry is $11.39. Paper attachments also increase the probability that providers will bill using paper rather than electronic claims. If claims reviewers and prior authorization staff could view laboratory results on-line rather than requiring paper results an estimated cost of $843,976 per year would be eliminated. To date, we have not been able to reliably estimate the number of claim attachments required by health plans, so this figure probably underestimates the savings that will be realized from elimination of such attachments.

Qualification: It should be noted that although potential savings from reducing test duplication are available, those savings may not translate immediately into reduced costs for payers. Many of these services are provided through capitated arrangements, so a reduction in test volume may not immediately impact specific plan expenditures. Over time, however, reductions in cost should contribute to reduction of capitation rates.

2.2.1. Other Industry Savings

Several studies have demonstrated the cost effectiveness of distributing laboratory tests on-line. Laboratories experience reduced costs in distributing laboratory test results to the requesting physician and in processing subsequent requests for results from practitioners. Approximately 20 percent of all laboratory tests are requested after the initial results have been distributed. Practitioners experience greater efficiency because they do not have to request results and receive and file the responses. These are not benefits that would accrue to AHCCCS directly, but they are benefits to be realized by the health care industry. Staff also confirms that subsequent broader use of electronic order and report capabilities can significantly streamline laboratory provider operations.

Laboratories

- If 75 percent of AHCCCS laboratory results could be distributed electronically, 4,185,000 test results would be available each year, saving $10 per test[2] in distribution expense. The potential savings to laboratories would approximate $41.8 million. If 50 percent of practitioners change their practice to take advantage of electronic distribution, the savings would be $20.925 million.
- If availability of electronic results for 75 percent of tests eliminated follow-up requests for results, and the cost of obtaining and distributing results is $14 per request[3], the savings available would be $11.718 million per year. If 50 percent of practitioners change their practice to take advantage of electronic distribution, the annual savings would be $5.859 million.

Clinicians

- We assume that electronic results will be provided for 75 percent of test results. This will eliminate follow-up requests for results available on-line, and at an estimated cost of $10 per request[4] practitioners would have $8.370 million in cost reductions available. If 50 percent of practitioners change their practice to take advantage of electronic distribution, the annual savings would be $4.185 million.

2.3. Medication History

2.3.1. The Product

The electronic medication history will provide access to data on prescriptions filled by PBMs and display a patient's medication history on the HIE viewer. This on-line, comprehensive medication history will ideally provide physicians and pharmacies with information on medications that a patient has received over a selected period of time. Participating providers will be able to search for member records and view or print the patient's medication history. For Phase I, all PBMs that provide medication to AHCCCS members have agreed to participate in the project. Virtually all medications provided in an outpatient setting should be available for physicians.

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[2] SAHIE Economic Model V33, Deloitte Consulting estimates the cost of processing a request for Laboratory Tests results at $10 per request. Source is Center for Information Technology Leadership, "Improving Healthcare Value - The Value of Healthcare Information Exchange and Interoperability"

[3] SAHIE Economic Model V33, Deloitte Consulting estimates the cost of pulling and sending a client chart at $14 per transaction. Source: Center for Information Technology Leadership, "Improving Healthcare Value - The Value of Healthcare Information Exchange and Interoperability" – 2004."

[4] SAHIE Economic Model V33, Deloitte Consulting estimates the cost of processing a request for Laboratory Tests results at $10 per request. Source is Center for Information Technology Leadership, "Improving Healthcare Value - The Value of Healthcare Information Exchange and Interoperability"

2.3.2. Conceptual Benefits

An on-line medication history will be useful in several ways:

- Any practitioner that cares for an AHCCCS member in an emergency situation will have access to current information on the drugs being used by that member. Even if the member is unable to provide the information, the record will be available.
- Providers who are serving new patients who are not known to their practice can quickly obtain the patient's medication history.
- Providers whose patients see multiple prescribing providers will have immediate access to data on prescriptions received and filled by the member regardless of who prescribed the medication.

Providing an integrated on-line medication history for members enrolled with Behavioral Health plans is particularly important. These members are enrolled with at least two health plans. The Acute Care plan serves the member's medical needs, while the Behavioral Health plan serves the member's behavioral health needs. Providers in both plans may prescribe for the patient, but there is no integration of prescriptions across plans. The plans use different data systems and different PBMs, so analysis of prescribing practice across the plans is currently virtually impossible to obtain.

2.3.3. Industry Estimate of Benefits

There are two potential benefits to be obtained for payers from providing an on-line pharmacy record:

- Reduction in adverse drug interactions (ADIs). Health experts report that over 7,000 deaths occur in the United States annually from reactions caused by properly administered prescription drugs. In addition, they estimate that two to three percent of all hospital admissions and emergency room visits are caused by adverse drug interaction (ADI) events. Some of these ADIs and patient deaths could be avoided if prescribers had a current report of the patient's active medications and prescriptions available.
- Unnecessary Drug Claims. The lack of a comprehensive pharmacy record available for each patient suggests that practitioners may duplicate existing prescriptions or prescribe drugs that conflict with existing prescriptions. This would suggest that payers are receiving and reimbursing unnecessary prescriptions.

2.3.4. Arizona Evidence

In order to corroborate national estimates of ADIs and the resulting inpatient admissions and outpatient visits, staff reviewed data on all admissions and emergency department visits reimbursed by AHCCCS or their health plans during the second half of FY 2007. The records were examined for diagnosis codes in the first four diagnosis fields on claims and encounters. While we found some diagnoses that indicated an adverse reaction to a properly administered prescription drug, the volume of ADIs was not as great as expected. These indicated that less than one half of a percent of admissions could be at least partially attributable to ADIs.

In discussing our results with our pharmacist advisors, we found that they were not surprised by the lack of evidence in claim and encounter data. They indicated that physicians generally code the immediate presenting symptom rather than ADI as the diagnoses. All of the studies that document ADI as a cause of admission or ED visits have been clinical reviews of medical records. The pharmacists advised that the documentation from claims and encounters would seriously underestimate the extent of the problem.

A second source of data on the impact on ADIs on patient health is the Arizona Department of Health (ADOH) quarterly report of Behavioral Health member deaths. The Department reviews for cause of death in every case where the member was enrolled in the Behavioral Health Program. It and publishes a quarterly report that summarizes the results. Those results indicate that approximately 39 deaths each quarter are due to accidental causes, which include adverse drug interactions. These include overdose of illegal drugs, but a review of two quarters of the deaths indicates about half involve high levels of prescription drugs. The physician responsible for the reviews states that he believes that the lack of coordination between medical and behavioral health plans in prescribing contributed to these deaths. These data suggest that lack of coordination in prescribing may contribute to 70 to eighty deaths per year.

Since Arizona contains just over two percent of the nation's population, we would expect Arizona to have about 150 of the nation's 7,000 deaths from ADIs each year. The AHCCCS population is under 20 percent of the State's population, so 30 deaths among AHCCCS members would be expected. The ADOH data on deaths among the behavioral health population indicates that Arizona's death rate may exceed the national norm.

2.3.4.1.Conclusion

While we were not able to support the industry estimate that two to three percent of inpatient admissions and ED visits are related to ADIs, the claim and encounter data does document some level of support the contention that ADIs are related to admissions and ED visits. In addition, the Behavioral Health data indicates that significant numbers of deaths could be avoided by a readily available medication history. Finally, the heavy drug regimens documented in the next section lends support to the assertion that e-prescribing and/or an electronic medication history can produce cost reductions through reduced hospital admissions and ED visits. Accordingly, our estimate of payer costs that can be avoided through e-prescribing or an electronic pharmacy record will be placed at the lower range of the national estimate, two percent of admissions and ED visits. This indicates that the maximum potential benefit to payers from reductions in inpatient and outpatient costs would exceed $20 million per year.

In addition to mortality, adverse drug interactions can cause long-term morbidity. These conditions may not appear in ED or inpatient stays, but can affect the health and quality of life over extended periods of time.

2.3.5. Unnecessary Prescriptions

The second source of benefits from e-prescribing or an electronic medication history is the elimination of unnecessary pharmacy claims. Staff reviewed all claims and encounters for pharmacy services from January 1, 2007 through May 31, 2007 to estimate the potential extent of excess prescribing. The data indicated that some AHCCCS received very heavy levels of prescription medications during this period.

The measure used to indicate heavy prescription levels is the number of days supply provided during the period. Days supply indicates the number of day's dosage that the prescriber intended to provide for the patient. The dosage level or quantity prescribed may vary markedly based on the condition being treated and the evaluation of the physician regarding the level required to treat the conditions. Days supply represents the medication level the prescriber believed was necessary for a specific period.

At the upper end of the prescribing range, AHCCCS members received as many as 5,000 daily doses of medication in a 151-day period. This indicates that the patient was taking more than 30 daily doses of prescription drugs. Table 3 presents the heaviest users of medication in the data analyzed.

Table 3 Member Medications

Member Medications, 1/1/2007 Through 3/31/2007			
Patient Rank	Number of Prescriptions	Sum Of Paid Amount	Sum Of Quantity Days Supplied
1	156	$6,857.40	6050
2	155	$8,563.14	5616
3	108	$10,484.15	5268
4	114	$6,736.81	4944
5	85	$8,798.57	4928
6	97	$6,322.99	4832
7	90	$7,229.94	4746
8	103	$10,103.90	4738
9	88	$3,336.51	4585
10	109	$3,895.19	4455
11	78	$4,520.13	4401
12	95	$8,713.40	4389
13	88	$5,043.94	4372
14	73	$5,579.49	4340
15	79	$7,022.77	4325
16	88	$6,874.10	4318
17	90	$5,945.12	4305
18	109	$5,830.03	4168
19	89	$5,248.73	4103

Member Medications, 1/1/2007 Through 3/31/2007			
20	96	$5,749.23	4064
21	78	$12,638.00	4063
22	83	$4,135.93	4017
23	93	$6,205.08	4016
24	87	$4,409.37	3998
25	87	$9,898.02	3939

Heavy medication use may not represent overuse of drugs. Some AHCCCS members require multiple medications. In addition, the prescription claim record could indicate duplicate billing of prescriptions to acute and behavioral health plans. To explore what these doses represented, we reviewed several cases at the top prescription levels.

A more detailed pharmacological review of the top five members in the ranking identified more than 60 drug conflicts, ranging from moderate to critical. Some of these patients were enrolled with only one MCO while others were enrolled in both acute and behavioral health plans. One set of interactions is displayed in Appendix 1. Our analysis of these data and future, more detailed analysis, is hampered by the lack of consistent prescribing physician data on encounter data. That data is available on pharmacy claims and should be included in data warehouse records to support analysis of drug utilization data.

The claims and encounters for this period represented over 3.5 million records, so a complete manual analysis of the data was not possible. A full automated analysis of prescribing practice represented by these data or similar data is to be conducted and will inform this ROI model when it is complete.

The use of prescriptions by one member, presented in Table 4 illustrates the type of behavior that represents potentially excessive prescription payments. AHCCCS plans paid for prescriptions for the same medication, a level IV controlled substance, from multiple doctors, from both a behavioral health MCO and an acute MCO. In some cases, the patient filled both prescriptions in the same day. Over the course of the study period, the patient received 282 days supply during a 151-day period.

Table 4 Uncoordinated Prescriptions across Plans

Uncoordinated Prescriptions Across Plans				
NDC Description	Prescription Filled	Plan	Paid Amount	Quantity Days Supplied
ALPRAZOLAM 1 MG TABLET	01-Jan-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	05-Jan-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	09-Jan-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	13-Jan-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	22-Jan-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	22-Jan-07	Behavioral	$3.27	7
ALPRAZOLAM 1 MG TABLET	27-Jan-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	27-Jan-07	Behavioral	$3.27	7
ALPRAZOLAM 1 MG TABLET	01-Feb-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	01-Feb-07	Behavioral	$3.27	7
ALPRAZOLAM 1 MG TABLET	05-Feb-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	05-Feb-07	Behavioral	$3.27	7
ALPRAZOLAM 1 MG TABLET	10-Feb-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	10-Feb-07	Behavioral	$3.27	7
ALPRAZOLAM 1 MG TABLET	15-Feb-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	15-Feb-07	Behavioral	$3.27	7
ALPRAZOLAM 1 MG TABLET	22-Feb-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	22-Feb-07	Behavioral	$3.27	7
ALPRAZOLAM 1 MG TABLET	26-Feb-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	26-Feb-07	Behavioral	$3.27	7
ALPRAZOLAM 1 MG TABLET	03-Mar-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	03-Mar-07	Behavioral	$3.27	7
ALPRAZOLAM 1 MG TABLET	08-Mar-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	08-Mar-07	Behavioral	$3.27	7
ALPRAZOLAM 1 MG TABLET	14-Mar-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	14-Mar-07	Behavioral	$3.27	7
ALPRAZOLAM 1 MG TABLET	21-Mar-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	30-Mar-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	05-Apr-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	12-Apr-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	19-Apr-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	27-Apr-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	04-May-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	11-May-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	17-May-07	Acute	$3.15	7
ALPRAZOLAM 1 MG TABLET	23-May-07	Acute	$3.15	30
ALPRAZOLAM 1 MG TABLET	31-May-07	Acute	$3.15	7
Total Days Supply				282

The member obtained the prescription through an acute plan from January 1 through January 13, receiving 28 days supply. From January 22 through March 14, the pharmacy filled prescriptions from both the acute plan and the behavioral health plan, receiving 154 days supply in about 50 days elapsed time. From March 21 through March 31, the member obtained prescriptions from the acute plan only, receiving 100 days supply in 71 days elapsed time.

The pattern represented by this claim data may not represent an overuse of medications. The same day overlap of prescriptions indicates that the pharmacy probably billed both behavioral health and acute care plans for the same prescription. This would still indicate overpayment for drugs, but the health implications are not as important if the pattern represents duplicate billing.

As an interim estimate, we considered the value of all prescriptions that are re-filled more than 10 days prior to the end of the days supply provided. This is a very conservative measure, because it does not include possible duplicates from prescribing multiple drugs that serve the same purpose; prescriptions of less than 10 days duration, or contraindicated prescriptions. Even with these limitations, however, we estimate that unnecessary prescriptions cost AHCCCS and its health plans $4.437 million annually.

Table 5 Benefits of Medication History Available On-Line

Benefits of Medication History Available On-Line*									
Stakeholder	**Savings**	**Units**	**Base Units**	**Unit Cost**	**% Savings**	**Maximum Potential Savings**	**Adoption in Practice**	**Estimated Benefits**	**Total Benefits**
AHCCCS/MCOs									
	Reduction in Adverse Drug Reactions	ED Visits	656,378	$338.00	2.00%	4,437,115	75%	$3,327,836	
	Reduction in Adverse Drug Reactions	Inpatient Hospital Stays	226,934	$5,283.00	2.00%	23,977,846	75%	$17,983,385	
	Reduced Drug Costs for Duplicate Scripts	Duplicate Prescriptions	$4,443,000	$1.00	100.00%	4,443,000	75%	$3,332,250	
	Reduced Hospital Claims	Reduced Hospital Claims	883,312	$4.29	2.00%	75,788	75%	$56,841	
	Reduced Pharmacy Claims	Reduced Pharmacy Claims	56,500	$4.29	100.00%	242,385	75%	$181,789	
Total AHCCCS									**$24,643,471**

2.3.6. Benefits Estimate

Our estimates assume that the HIE efforts are integrated with the AHCCCS e-Prescribing Initiative. The literature indicates that information on the medication history is most effective when delivered when the prescription is being written. Coordination between the e-prescribing initiative and the HIE medication history will maximize information delivery, both at the point of prescribing and as part of the member's CCR Medication History record.

Table 5 summarizes the potential benefits to be realized from providing an on-line medication history for AHCCCS members. For the on-line medication history, we assume that the adoption in practice will be relatively high, at 75 percent. Staff in the Behavioral Health program in ADOH have been very positive in their support of an on-line, integrated medication history. We believe that as long as the medication history is easily accessed in the course of normal business practice, physicians will access and use the information.

Emergency Department Visits. Based on analysis of claims and encounters paid during the second half of FY 2007, AHCCCS and health plans reimburse an average of $338 for 656,378 ED visits per year. If two percent of those visits could be prevented by eliminating visits due to adverse drug interactions, service expenditures could be reduced by $4,437,115 per year. If the electronic medication history is incorporated into practice in 75 percent of the cases, the expected actual savings from this produce will be $3.328 million.

Inpatient Hospital Stays. Based on analysis of claims and encounters paid during the second half of FY 2007, AHCCCS and health plans reimburse an average of $5,282 for 226,934 inpatient segments per year. If two percent of those stays could be prevented by eliminating adverse drug interactions, service expenditures could be reduced by $23,977,846 per year. If the electronic record is incorporated into practice in 75 percent of the cases, the expected actual savings from this produce will be $17.983 million.

Duplicate Prescriptions. In our analysis of overlapping prescriptions for the same drug, we estimate that 56,000 prescriptions were potentially unnecessary in FY 2007. These represented a total paid amount of $4.443 million for the year. If practice changes to incorporate the on-line medication history for 75 percent of physicians, the annual savings would approximate $3.33 million.

Reduced Hospital Claims. We estimate that the total number of inpatient and outpatient claims paid by AHCCCS and its health plans equaled 883,312 for 2007. If the average cost of processing an electronic claim is $4.29, a two-percent reduction in those claims would reduce operations costs in AHCCCS and health plans by $75,788. With a 75-percent adoption rate, the potential savings would be $56,841.

Reduced Pharmacy Claims. Our analysis of overlapping prescriptions indicates that 56,500 pharmacy claims are probably unnecessary. Using the average claim cost of $4.29, a reduction in these claims would reduce operations expenses by $242,385. With a 75-percent practice adoption rate, the estimated potential savings would be $181,789.

Industry Benefits. The on-line medication history is a display record only, and does not support e-prescribing. Accordingly, the savings to be obtained from reductions in calls related to automated submission of prescriptions will not be realized with this product. There may be some savings to practitioners in the time required to obtain the medication history from the patient's medical record, but display of the medication history alone will not eliminate the need to obtain the medical record. Accordingly, while we believe that the availability of the on-line medication history will reduce the workload of physicians or their office staff, we have not estimated a broader industry benefit for the medication history.

2.3.7. Medication History and e-Prescribing

Provision of a Medication History and e-prescribing may appear to overlap and provide the same set of benefits. However, because of differences in access and delivery methods, the two electronic health record products provide somewhat different benefits and are complementary rather than competitive.

The electronic medication history is part of the patient electronic medical record, and is available as part of the patient history whether or not the health care provider is prescribing medication. In an ideal delivery system, the medication record would be available any time the physician's office retrieves eligibility or health information from the Health Information Exchange. The patient information can be accessed as part of a patient history prior to an office visit or treatment in an emergency setting to inform physician decisions.

Further, the electronic medication history is available whether or not a physician participates in e-prescribing. Physician adoption of e-prescribing has been very slow. Currently, only three percent of Arizona physicians use e-prescribing. An on-line medication history can alert physicians and prevent duplicate or conflicting prescriptions even when the physician is not prescribing electronically.

Finally, the medication history to be provided by the Health Information Exchange Utility will include all of the PBMs that serve AHCCCS members, and will provide 100 percent of the medications prescribed. A single e-prescribing product may not fully integrate prescription data from all PBMs that serve AHCCCS members, even though that is the intent.

The advantage of e-prescribing is that it provides a medication history at the point the physician is prescribing medications and automatically provides alerts if conflicting or duplicative medications are prescribed. This provides the strongest single tool for preventing adverse drug interactions because it is automatic and is integrated with the normal prescribing workflow.

Despite its benefits, e-prescribing has not been widely adopted by physicians. In Arizona, only three percent of prescriptions utilize e-prescribing. Several factors will probably increase this proportion in the future:

- Medicare will provide incentives for e-prescribing within a year, and will eventually impose penalties for bypassing e-prescribing;
- The DEA, which has prohibited e-prescriptions for controlled substances has published rules to east those prohibitions
- The Governor of Arizona has announced an initiative to promote e-prescribing
- AHCCCS has developed a plan to support e-prescribing among participating physicians.

All of these factors should accelerate the adoption of e-prescribing, but at this time the rate of future adoption is unknown.

The combination of e-prescribing and an on-line medication history covers the broadest set of circumstances where medication data is helpful, and automatic intervention at the point of prescribing. It also provides integrated data from all prescribers and PBMs for those physicians who prescribe manually. We have assumed that both the medication history and e-prescribing will be available when the Health Information Exchange Utility Project reaches production, and have estimated benefits accordingly.

The Health Information Exchange Utility Project will not include e-prescribing, though a separate project will develop that capability for use by AHCCCS providers. To attribute a share of the benefits specifically to the Medication History is difficult at this time because current e-prescribing use is so small and the rate of adoption over the five year projection period for the value model is uncertain. The on-line medication history may be the most common means of obtaining a client medication record for the next year or two, and gradually become less important as e-prescribing becomes the dominant method of prescribing.

Because of the uncertainty regarding adoption of e-prescribing, we will continue to accrue benefits to Medication History and assume that the AHCCCS e-prescribing initiative is responsible for an increasing share of benefits as it is adopted. Eventually, the share of benefits attributable to e-prescribing may fall to 25% of potential benefits. Even at those levels, the potential benefits of an on-line medication history represents over $8million., a reduction from $24 million per year assumed in this model.

2.4. Discharge Summary

2.4.1. The Product

For each inpatient stay at a participating hospital, the hospital will provide an electronic copy of the discharge summary to the HIE. The Discharge Summary from each hospital stay at a participating hospital would be displayed on the patient's electronic profile. The summary would include diagnoses identified during the hospital episode, procedures performed, and the results of medical tests performed.

2.4.2. Provider Concentration

Phase I of the HIER Project has negotiated participation with Maricopa Medical Center, St Joseph's Hospital, and Banner Hospitals. These hospitals represent just over 32 percent of the hospital days provided to AHCCCS members during the first six months of 2007. Table 6 presents those figures.

Table 6 Proportion of Inpatient Days by Hospital

Proportion of Inpatient Days by Hospital Phase I Participants				
Servicing Provider Name	Days	Paid Amount	Percent of Total Days	Cumulative Percent of Total Days
ST JOSEPH'S HOSPITAL-PHX	35628	$57,219,475.78	7.37%	7.37%
MARICOPA MEDICAL CENTER	35337	$45,655,792.05	7.31%	14.68%
BANNER DESERT MEDICAL CEN	21135	$26,405,465.42	4.37%	19.06%
BANNER BAYWOOD MEDICAL CN	7477	$8,229,796.20	1.55%	20.60%
BANNER ESTRELLA MEDICAL	7459	$9,767,671.60	1.54%	22.15%
BANNER MESA MEDICAL CENTE	4892	$5,385,706.43	1.01%	23.16%
BANNER HEART HOSPITAL	788	$1,981,903.59	0.16%	23.32%
BANNER THUNDERBIRD MEDICA	14679	$15,777,334.73	3.04%	26.36%
BANNER GOOD SAM MEDICAL C	26506	$37,074,961.79	5.48%	31.84%
BANNER BEHAVORIAL HEALTH	809	$369,457.50	0.17%	32.01%

Despite an initial agreement interest in participating with all hospitals, Banner may withdraw participation of Thunderbird, Good Samaritan and Banner Behavioral Health. This would reduce the proportion of hospital days included in Phase I by nearly 30 percent and constitute a major setback to the scope of the on-line discharge summary.

2.4.3. Conceptual Benefits

The benefits of providing the discharge summary on-line include:

- Any practitioner that cares for an AHCCCS member in an emergency situation will have access to information on their recent hospitalizations and any diagnosis identified or treatment provided.
- Providers whose patients are hospitalized will have immediate access to data on the outcome of treatment without having to request that data from the hospital. This eliminates the need for the provider to request a discharge summary and for the hospital to respond to that request.

There are no comprehensive estimates on the impact of having a discharge summary available on the quality of care provided. . However, impressive initial results have been reported by one Midwestern state that has recently implemented an electronic discharge summary. They report that having the discharge summary available in the ED has accelerated treatment, prevented unnecessary tests and diagnostic imaging, and in some cases has prevented admission.

Making the discharge summary available on-line was among the highest priorities requested during the HIE provider survey. The administrative benefits from having the discharge summary available on-line include reduced time required from both physicians and hospital staff. The physician does not have to request the discharge summary from the hospital, and hospital staff do not have to find, verify, and send the discharge summary to the physician

2.4.4. Industry Benefit Estimates

CITL has estimated that physician offices spend an average of $10 to request a medical record. Responding to the request for a medical record will cost the hospital approximately $14 to reproduce and send the record. In developing the SAHIE Value Model, Deloitte Consulting used these figures to estimate the value of eliminating manual requests for and provision of charts and medical records.

Anecdotal evidence from the Wisconsin ED Transformation grant indicates that benefits also accrue from more rapid treatment when a discharge summary is available, and from reductions is laboratory tests and imaging. A comprehensive estimate of benefits identified in that study is being developed as part of the transformation grant project.

2.4.5. Arizona Verification

There is no reasonable way to independently verify the industry estimates of the cost to providers of requesting, processing, and receiving the discharge summary. To estimate the maximum potential benefit of the discharge summary in reducing administrative costs, we will use the values developed by Deloitte Consulting in formulating the SAHIE Value Model. Deloitte worked hospitals and practitioners in estimating the time required to complete certain administrative actions. These findings are specific to Arizona experience and, as such, represent provider costs more accurately than those developed nationally.

Arizona data on ED use supports the need for an electronic discharge summary. Our claims and encounter data indicate that members often move between emergency departments, and even between hospital systems. The data indicate that 10 percent of members who used an ED more than one time also used more than one hospital. The ability of the HIE to integrate discharge summaries from multiple hospitals and hospital systems allows it to provide an integrated record to the physicians that care for members across a number of setting and institutions.

Table 7 ED Use by AHCCCS Members in Maricopa County

ED Use by AHCCCS Members in Maricopa County
January 1 - June 30, 2007

Number of Visits For Member	Number of Hospitals 1	2	3	4	5+	TOTAL
1	153,444					153,444
2	27,834	10,684				38,518
3	7,330	4,203	927			12,460
4	2,281	1,714	618	106		4,719
5	883	763	384	140	16	2,186
6-10	788	767	555	300	196	2,606
11-20	71	92	94	104	202	563
21+	5	4	9	13	101	132
TOTAL	192,636	18,227	2,587	663	515	214,628

Table 8 Discharge Summary Potential Benefits

Discharge Summary Potential Benefits										
Stakeholder		Savings	Units	Base Units	Unit Cost	% Savings	Potential Savings	Practice Change	Estimated Benefits	Total Benefits
AHCCCS/MCOs			Benefits to be Estimated as Data become Available							
Practitioners										
		Reduction in Discharge Summary Requests	Discharges	226,934	$10.00	100.00%	2,269,340	75%	$1,702,005	
		Reduction in Processing Summaries Received	Discharges	226,934	$10.00	100.00%	2,269,340	75%	$1,702,005	
	Total Practitioners									$3,404,010
Hospitals										
		Reduced Response to Discharge Summary Requests	Discharges	226,934	$14.00	100.00%	3,177,076	75%	$2,382,807	
	Total Hospitals									$2,382,807
Total Industry										$5,786,817

2.4.6. Benefits Estimate

Table 8 presents the summary of benefits for the discharge summary. AHCCCS members had 113,467 inpatient stays during the first half of 2007, or approximately 226,934 on an annual basis. Our analysis assumes that:

- An average of one physician requested and received a discharge summary for each stay
- The average cost of requesting the summary was $10 for the physician[5]
- The average cost of responding was $14 for the hospital[6]

2.4.6.1.AHCCCS and Health Plans

While the care provided to AHCCCS members may improve with the immediate availability of the discharge summary, there does not appear to be a quantifiable benefit accruing to AHCCCS from displaying the discharge summary on-line.

2.4.6.2.Practitioners

Physician offices will be able to view the discharge summary on-line and either save copies to their files or print a copy for their records. AHCCCS members experience approximately 227,000 hospital stays per year. Viewing the discharge summary on-line would eliminate the need to request 227,000 summaries. At a cost of $10 dollars per request, the on-line summary could save $2.27 million, or at a 75 percent practice adoption rate, would save $1.7 million. Similarly, the need to receive and process the discharge summaries would be eliminated at an additional savings of $1.7 million.

2.4.6.3.Hospitals

Because physician offices would view the discharge summary on-line, hospitals would receive fewer requests for the discharge summary. If all 227,000 summaries were on line, and if the average cost to fill a medical documentation request is $14, hospitals could reduce their cost of responding by $3.177 million. If the adoption rate for viewing the discharge summary on-line were 75 percent, the savings realized by hospitals would be $2.383 million.

[5] SAHIE Economic Model V33, Deloitte Consulting estimates the cost of a request for patient records at $10 per request. Source is Center for Information Technology Leadership, ”Improving Healthcare Value - The Value of Healthcare Information Exchange and Interoperability”

[6] SAHIE Economic Model V33, Deloitte Consulting estimates the cost of pulling and sending a client chart at $14 per transaction. Source: Center for Information Technology Leadership, ”Improving Healthcare Value - The Value of Healthcare Information Exchange and Interoperability" – 2004”

2.5. Potential Products

In addition to the products to be provided in Phase One of the HIE project, several other products have been discussed as potential products during Phase II or a later phase of the project. These are high priority products that are expected to complement the Phase I offerings.

2.5.1. Eligibility Integration

Eligibility Verification is currently provided on-line to AHCCCS providers. Providers ranked eligibility information as a very high priority in the AHCCCS HIE survey of provider needs. The Phase II project should provide access to health information on the same portal that is used for eligibility inquiry. This will allow a provider office checking eligibility to access and view or print recent lab results, discharge summaries, and medication history. Integrating health information with the normal process of verifying member eligibility should increase the probability that the HIE products will fit easily into provider workflow. While more providers may use on-line verification if it were linked to additional information such as laboratory results and a pharmacy record, we are not assuming any direct benefits from this product. Rather, it will increase the effectiveness and penetration of other products.

2.5.2. Imaging Results

Imaging results Product would be similar to the on-line Laboratory Results product, but would obtain results from imaging providers to display as part of the electronic health record. The conceptual benefits would be immediate availability of image results in an emergency treatment situation or was part of the medical history for a new patient. In addition, the on-line image could reduce the number of duplicate images ordered by physicians. One barrier to displaying imaging results on line is that the number of providers for AHCCCS members is very large, and so obtaining a sufficient set of data contributors is a greater challenge than with laboratory results.

2.5.3. Clinical Decision support

AHCCCS has explored the use of best practice indicators for targeted conditions such as diabetes in the past. Provision of a clinical decision support tool has been recommended as a future product for the HIE project. The product would review member data and identify recommended practices for patients with high risk conditions. It would recommend preferred patterns of care to the patient's providers of care.

The addition of eligibility information, imaging results and clinical decision support are expected to enhance the benefit of the HIE to providers. As additional products are added, the synergy of multiple products should enhance the percentage of clinical adoption for all products. As the information available form the HIE expands with new products, providers should find the results more beneficial and the time required to access the records more cost beneficial.

3. The ROI Model

Our estimates of benefits to be derived from the products to be implemented during the Transformation Grant can be used to estimate the Return on Investment (ROI) from the HIE project. The ROI model compares projected expenditures over the life of the products to be produced with the expected benefits from those products.

The model begins by estimating the budget and cost for each product. It then applies the results of benefit estimation and estimates a penetration rate for each product based on the nature and implementation approach for the product. Using these estimated costs and benefits, the model projects the annual net return for the project over a ten year projected product life. Finally, the net return on investment (ROI) is estimated for the project over its life. .

3.1. Budget and Implementation Assumptions

The Model assumes that State FY 2008 is devoted to building the infrastructure for both the Phase I demonstration and the Phase II model. State Fiscal Year 2009 continues to be a building year. We assume that Phase I will continue development for the first quarter of FY2009 and will implement the record locator model and viewer early in the second quarter of the fiscal year. We assume that Phase II will continue development and will implement the web version of HIE in the last quarter of Fiscal 2009.

Table 9 presents our estimates of expense for the HIE project. The expense figure for 2008 is actual expenditures to date. The estimates for other years are not exact because the scope of Phase II of the project is still being determined and the final 2009 budgets for both Phase I and Phase II have not been approved. Finally, the budgets for operations in years after 2009 have not been formulated. The figures presented for all other years are preliminary estimates based on conversations with HIE staff. We believe the expenses for development and implementation for 2009 will total $3.8 million, and that operating costs for the current project scope will approximate $2.2 million per year. The operations figure is consistent with the Deloitte estimates of ongoing operations costs for the SAHIE project.

Table 9 HIE Expense Estimates

HIE Expense Estimates ($000)							
Fiscal Year	2008	2009	2010	2011	2012	2013	2014
Expense							
Basic Infrastructure	$7,480	$1,400	$1,100	$1,100	$1,100	$1,100	$1,100
Lab Results	$0	$800	$400	$400	$400	$400	$400
Medication History	$0	$800	$300	$300	$300	$300	$300
Clinical Documents - Discharge Summary	$0	$800	$400	$400	$400	$400	$400
Total Expense	$7,480	$3,800	$2,200	$2,200	$2,200	$2,200	$2,200

3.2. Estimated ROI

We use the estimates of expected benefits and projected expenses from the HIE project to estimate the net value and ROI for the HIE Project. Figure 2 summarizes the analysis used to estimate the expected ROI from the HIE.

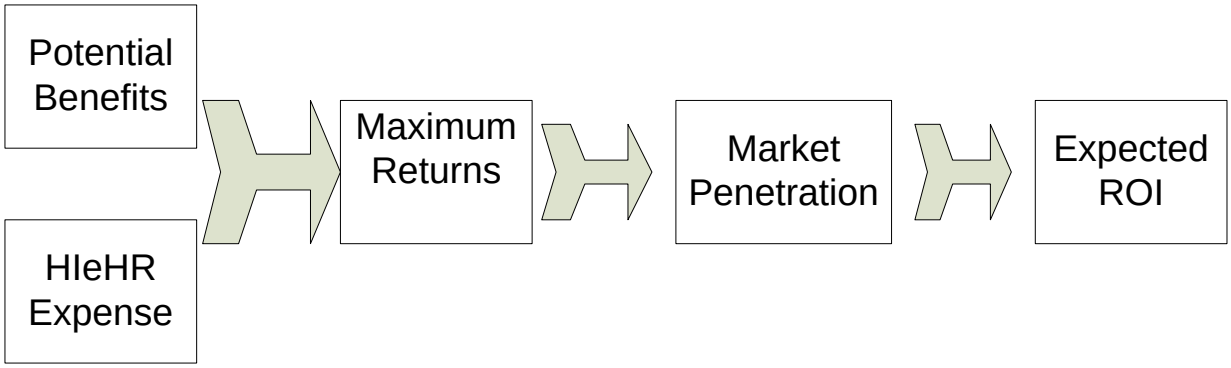


Figure 2 Expected ROI Estimation

The first step is to summarize estimated expenses, and summarize the potential benefits that have been identified. These estimations are used to develop the Maximum Returns possible with the products introduced in the HIE project. This analysis is presented in Table 10. These are the costs and benefits that could be realized if the scope of the project included all AHCCCS providers.

1. In fact, the HIE project does not include all data sources or all providers. There are periods when both data sources and users are limited, so we do not expect to obtain full benefits from the HIE project. Based on the scope of the project and expected participants for each product, we estimate a "Market Penetration Rate," the proportion of providers and users who will participate in the HIE project.
2. Applying the market penetration rate to the Maximum Value Estimate, we obtain a set of expected costs and benefits. This is the actual value – costs and benefits – we expect from the HIE project. These values are used to calculate an expected ROI.

3.2.1. Estimated Maximum Returns

Table 10 presents a summary of value possible from AHCCCS HIE project with global participation. Expenses are represented as presented above. The benefits for each product are presented as they were estimated in previous portions of this report, but are presented in two sections:

- The AHCCCS/MCO benefits represents the benefit level that accrues to AHCCCS and the health plans from each product. It does not include benefits to broader industry groups such as hospitals, laboratories, and practitioners. These figures are used in calculating the ROI for AHCCCS.
- The Total Industry Benefits section includes all benefits, including those that accrue to AHCCCS health plans and providers. This second measure provides a more comprehensive evaluation of benefits that accrue to the industry.

The Maximum Total Benefits is the sum of the benefits from all products for each year. This is the highest level of benefits that can be expected if all providers are included in the user group and adoption rates equal those specified in the benefits discussion.

The Annual Net Benefits row represents benefits expected from the HIE project less estimated costs of the project.

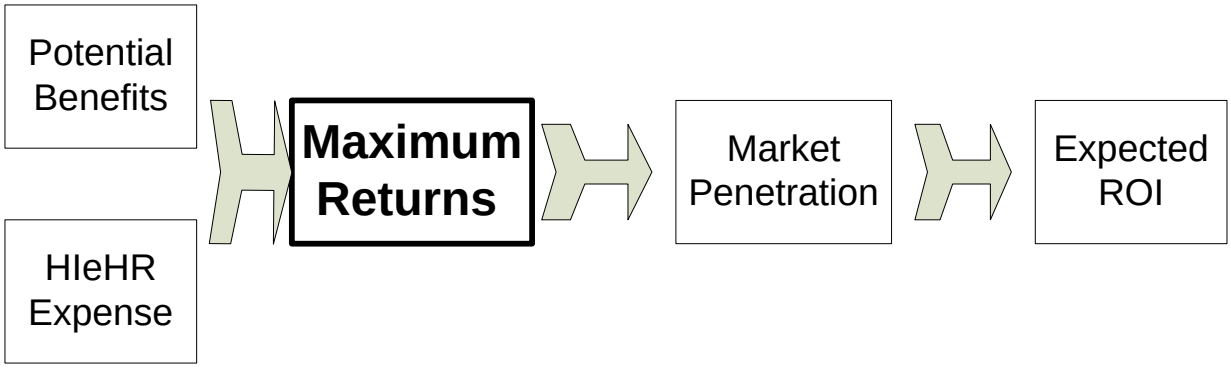


Table 10 HIE Maximum Returns

HIE Maximum Returns ($000)							
Fiscal Year	2008	2009	2010	2011	2012	2013	2014
Expense							
Basic Infrastructure	$7,480	$1,400	$1,100	$1,100	$1,100	$1,100	$1,100
Lab Results	$0	$800	$400	$400	$400	$400	$400
Medication History	$0	$800	$300	$300	$300	$300	$300
Clinical Documents - Discharge Summary	$0	$800	$400	$400	$400	$400	$400
Total Expense	$7,480	$3,800	$2,200	$2,200	$2,200	$2,200	$2,200
AHCCCS Benefits							
Basic Infrastructure	$0	$0	$0	$0	$0	$0	$0
Lab Results	$0	$2,178	$4,356	$4,356	$4,356	$4,356	$4,356
Medication History	$0	$12,322	$24,643	$24,643	$24,643	$24,643	$24,643
Discharge Summary	$0	$0	$0	$0	$0	$0	$0
AHCCCS Maximum Benefits	$0	$14,500	$28,999	$28,999	$28,999	$28,999	$28,999
AHCCCS Annual Net Benefits	-$7,480	$10,700	$26,799	$26,799	$26,799	$26,799	$26,799
Industry Benefits							
Basic Infrastructure							
Lab Results	$0	$17,663	$35,325	$35,325	$35,325	$35,325	$35,325
Medication History	$0	$12,322	$24,643	$24,643	$24,643	$24,643	$24,643
Discharge Summary	$0	$2,893	$5,787	$5,787	$5,787	$5,787	$5,787
Industry Maximum l Benefits	$0	$32,878	$65,755	$65,755	$65,755	$65,755	$65,755
Industry Annual Net Benefits	-$7,480	$29,078	$63,555	$63,555	$63,555	$63,555	$63,555

During 2008, the project has incurred $7.48 million in expenses, but has not produced any benefits during the development phase. In 2009, we expect the project to have operating products for half the year. If all providers participated, this would create benefits of $14.5 million for AHCCCS and $32 million for AHCCCS and the industry as a whole. Net benefits would be $10.7 million for AHCCCS and $29 million for the industry.

3.2.2. Implementation Strategies and Expected Actual Benefits

The Maximum Total Benefits figure provides an estimate of costs and benefits for the HIE project that would be realized if all records were available to all providers. However, since not all providers will contribute data and not all will be able to use the data, the design of the products themselves will determine which providers can contribute health data, and which will be able to access data. The proportion of potential benefits that can be realized in practice, based on the delivery and implementation strategies adopted, will be called the "Penetration Rate." Three factors will influence the penetration rate:

1. **Sources of Data**
   The proportion of health data available to users of the HIE depends on which providers contribute data. For example, if Sonora Quest laboratories provides 23 percent of the laboratory tests for AHCCCS members, under the best conditions we would not expect to realize more than 23 percent of the benefits potentially available from presentation of laboratory results on-line.

   It should be noted that The Health Information Exchange Utility Project has obtained participation from all PBMs that serve AHCCCS and AHCCCS health plans. Accordingly, 100% of the source data for medication history will be available to physicians.

   Hospitals participating in the Health Information Exchange Utility Project provide approximately 31 percent of AHCCCS members' inpatient and outpatient services. Unless other data sources are added prior to full implementation, thirty one percent of all discharge summaries for AHCCCS members will be available.

2. **User Access to Data**
   The penetration rate is further determined by the proportion of services delivered by providers who can access the HIE viewer. Like data sources, the percent users who have access to data will influence the proportion of benefits that can be expected.

Our assumptions regarding user access are as follows:

- Demonstration Phase

  The Health Information Exchange Utility Project will implement a demonstration Health Information Exchange utility for a targeted set of users in September, 2008. Approximately 2% of the physicians that serve AHCCCS members will have access to the utility during the demonstration phase.
- Pilot Phase

  After successful demonstration of the Health Information Exchange product, the product will become available to additional providers. We assume that Maricopa County, representing approximately 60% of AHCCCS providers, will have access to the Exchange during this project phase.

- Full Implementation

  After full implementation, all providers with internet access will have the Health Information Exchange product available.

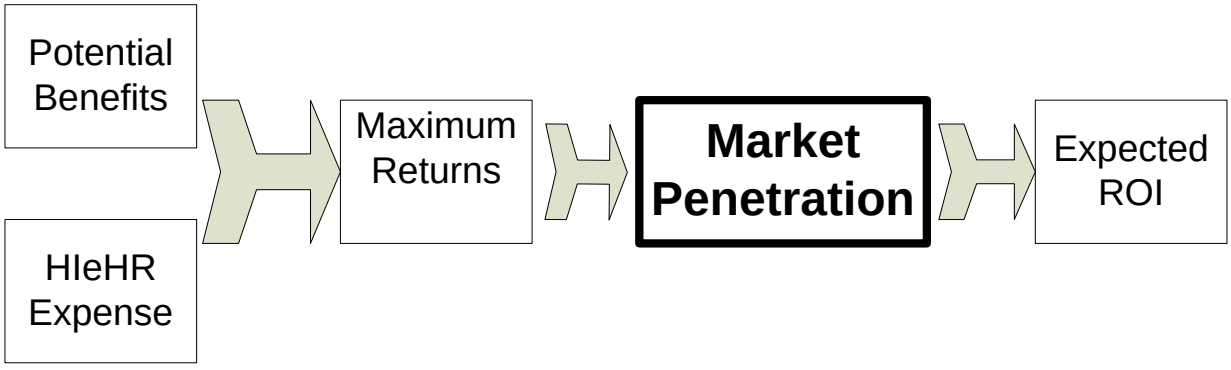
  The benefit model estimates reflect these assumptions, with the demonstration phase beginning in September, 2008, the Pilot Phase beginning in July 2010, and full implementation beginning about one year after Pilot.

3. Adoption Rates

The rate at which health care providers actually change practice to use the information available from the HIE Project. This factor has been discussed previously. There is an unknown factor regarding who will actually use the HIE viewer. As indicated in discussion of potential benefits, health data has a very limited useful life if it is to provide measurable benefits. Many duplicate prescriptions identified from claims and encounter data cover a week or less. Data that is older than two weeks may not be effective in preventing unnecessary prescriptions. The data sources must provide timely data if the HIE is to be useful in practice.

A second consideration in adoption rates will be a threshold factor. There is probably some penetration rate below which users will not bother to try to access data. For example, if physician experience with the Health Information Exchange indicates that attempts to find medication history succeed only 10 percent of the time, they may decide that the search is not a productive use of time.

3.2.3. Market Penetration and ROI for AHCCCS



In fact, the HIE model will not be available to all providers immediately Phase I uses a demonstration model with tightly controlled access to health data. A limited number of providers (less than two percent of active physicians) will initially have access to the data. Assuming that there are no adverse interactions between the subset of data

sources and data users, the penetration rate will be less than two percent for the initial Phase I demonstration.

Phase II will use a Web-based portal to access the HIE data, and will potentially be available to all providers with Internet access. We assume that an initial phase of implementation will be limited to Maricopa County, representing about 63 percent of services, but that at some point, the data will become accessible to all AHCCCS practitioners.

After the Pilot Phase, full implementation will introduce HIE products to health care providers Statewide. At that point, all providers with internet access will have access to the products provided by the HIE. We assume that Market Penetration will be 23% for electronic laboratory results, 90% for the electronic medication history, and 31% for discharge summaries.

Our assumptions are presented in Tables 11a, 11b and 11c.

Table 11a Estimated Penetration Rates for Demonstration

Estimated Market Penetration Rates – Demonstration Phase			
	Data Sources	User Access	Market Penetration
Laboratory Results	23.00%	2.00%	0.46%
Medication History	100.00%	2.00%	2.00%
Discharge Summary	31.00%	2.00%	0.62%

During the Demonstration Phase, data sources will include 23 percent of laboratory tests, 90-100 percent of PBMs, and 31 percent of inpatient days. However, only a small number of physicians will have access to the information in the initial phase. Accordingly, we expect less than two percent penetration of providers during the initial demonstration. Market penetration will be very low during the Demonstration Phase, with 2% or less penetration for each product. The purpose of Phase I is demonstration of the usefulness of the data rather than creation of a positive net return.

Table 11b: Estimated Penetration Rates for Pilot

Estimated Penetration Rates – Pilot Phase Maricopa County			
	Data Sources	User Access	Market Penetration

Laboratory Results	23.00%	63.00%	14.49%
Medication History	100.00	63.00%	63.00%
Discharge Summary	31.00%	63.00%	19.53%

Phase II will pilot the HIE to a limited set of users using a Web portal to provide electronic health information to providers. Because providers will be able to access the data over the Web, the Pilot phase will have a much broader penetration than Phase I. At this time, we expect the Pilot Phase to be implemented for Maricopa County providers, who represent approximately 63% of services provided to AHCCCS members. Penetration rates for Phase II should increase significantly during Phase II

Table 11C: Estimated Penetration Rates for Full Implementation

Estimated Penetration Rates – Full Implementation			
	Data Sources	User Access	Market Penetration
Laboratory Results	23.00%	90.00%	21.70%
Medication History	100%	90.00%	90.00%
Discharge Summary	31.00%	90.00%	28.80%

Finally, at full implementation, we expect the HIE data will be available Statewide to any provider with Internet access. The potential user availability at full implementation will approach 90 percent of all providers.

For Fiscal Year 2009, we assume that Phase I will deliver the HIE products in the second quarter of the year, and in the fourth quarter Phase II will begin to deliver the HIE products to a wider audience, though Phase I will continue to operate. The weighted penetration rates for 2009 are:

Laboratory Results	3.8%
Medication History	15%
Discharge Summary	5%

3.2.4. Estimated AHCCCS ROI

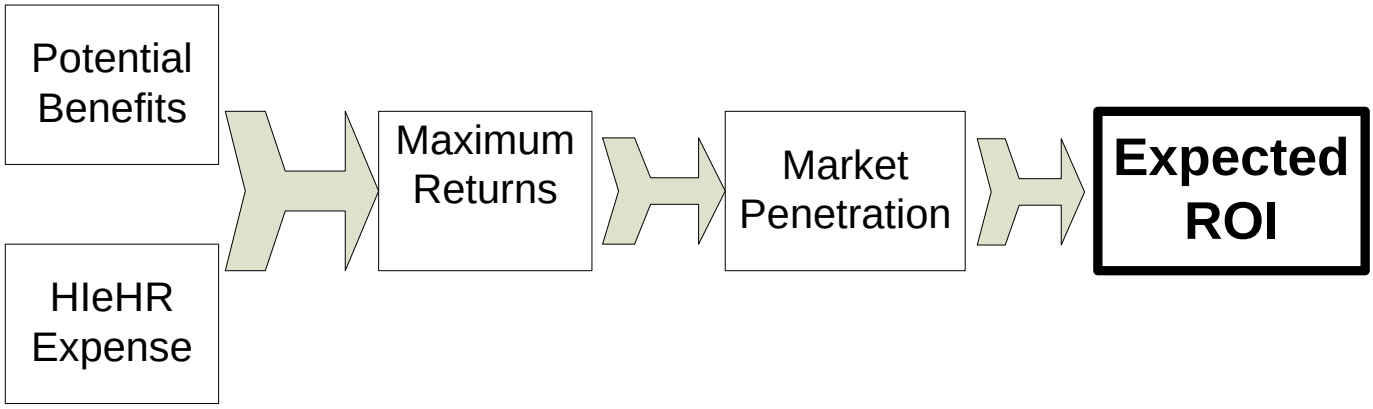


Table 12 presents the ROI model adjusted for penetration rates for each product. In that table:

- Total Expense is the cost of developing and operating the HIE Project in the referenced year.
- Cumulative Expense is the cost of developing and operating the HIE Project for the referenced year and all previous years.
- Market Penetration Rate represents the assumptions presented above. The Penetration rate is multiplied by Maximum Potential Benefits to obtain Expected Benefits
- Expected Benefits and Industry Expected Benefits are the total available benefits presented in Table 12, multiplied by the penetration rate – the market share that will be reached by the product in that year.
- AHCCCS Annual Benefits is the value of actual benefits expected from HIE given the assumed penetration rates.
- AHCCCS Annual Net Benefits is the Annual Benefit less HIE expenditures for the year.
- AHCCCS Cumulative Net Benefits is the sum of Annual Net Benefits for the referenced year and all past years.
- The AHCCCS ROI is the return on investment for AHCCCS, or the cumulative net benefits divided by the investment, the HIE Cumulative Expense.

The results in Table 12 indicate that even with the limited products and restrictive assumptions regarding adoption and penetration rates, the HIE project should generate a very positive return for AHCCCS. The return is negative for 2008 and is essentially a break-even point for 2009. Once the products have been implemented in 2010, however, the benefits should accrue very rapidly. By the fifth year of operation, AHCCCS should experience a 385.74 percent return on its investment in the HIE.

Table 12 AHCCCS HIE Return on Investment

HIE ROI Summary($000)								
Fiscal Year		2008	2009	2010	2011	2012	2013	2014
Expense								
	Basic Infrastructure	$7,480	$1,400	$1,100	$1,100	$1,100	$1,100	$1,100
	Lab Results	$0	$800	$400	$400	$400	$400	$400
	Medication History	$0	$800	$300	$300	$300	$300	$300
	Clinical Documents - Discharge Summary	$0	$800	$400	$400	$400	$400	$400
Total Expense		$7,480	$3,800	$2,200	$2,200	$2,200	$2,200	$2,200
	Cumulative Expense	$7,480	$11,280	$13,480	$15,680	$17,880	$20,080	$22,280
Benefits								
Penetration Rate								
	Lab Results	0.00%	0.46%	13.80%	20.70%	20.70%	20.70%	20.70%
	Medication History	0.00%	2.00%	60.00%	90.00%	90.00%	90.00%	90.00%
	Discharge Summary	0.00%	0.64%	19.20%	28.80%	28.80%	28.80%	28.80%
AHCCCS Expected Benefits								
	Basic Infrastructure							
	Lab Results	$0	$20	$601	$902	$902	$902	$902
	Medication History	$0	$493	$14,786	$22,179	$22,179	$22,179	$22,179
	Discharge Summary	$0	$0	$0	$0	$0	$0	$0
AHCCCS Annual Benefits		$0	$513	$15,387	$23,081	$23,081	$23,081	$23,081
AHCCCS Annual Net Benefits		-$7,480	-$3,287	$13,187	$20,881	$20,881	$20,881	$20,881
AHCCCS Cumulative Net Benefits		-$7,480	-$10,767	$2,420	$23,301	$44,182	$65,063	$85,943
AHCCCS ROI		-100.00%	-95.45%	17.95%	148.60%	247.10%	324.02%	385.74%

This model represents only an illustration of implementation strategy. If Phase II is delayed beyond 2009, the benefits and ROI will decline. Any changes in product or implementation that change the expected penetration rate will affect the ROI. The return can be increased by increasing either the number of data sources or the numbers of users beyond those assumed

We do not estimate the ROI for the industry as a whole. We have display the estimated benefits to the industry, including benefits expected for AHCCCS, the health plans, and medical providers in previous sections. However, providers and health plans may have to make separate investments to utilize the HIE or the data it provides, and we do not have information on those investments available.

3.3. Summary

The products identified for distribution through the HIE Transformation Project represent a strong initial offering that should be able to return three to four dollars in benefits to AHCCCS for every dollar invested. The strongest of the products is the medication history, which is an ideal candidate for several reasons:

- Data providers are concentrated in 10 organizations in the entire State
- Available claim and encounter data demonstrates the need for an on-line medication history
- The coordination of behavioral health and medical care prescriptions is widely advocated
- Providers appear to accept the value of an integrated record across all health plans and PBMs

Our analysis indicates an annual benefit of more than $20 million when fully implemented, and we believe that figure significantly underestimates the potential gain from controlling unnecessary prescriptions. AHCCCS should integrate the HIE project with the AHCCCS e-Prescribing initiative to maximize the benefits from both projects.

Strong evidence also exists to support the need for including an electronic laboratory test results record in the CCR. However, the potential for benefits is limited by the dispersion of providers and limited participation of providers. Increasing participation should be a high priority for Phase II of the project.

While the Discharge Summary product and on-line eligibility verification do not display explicit returns in our analysis, they represent information that will provide a high return to providers and encourage adoption of the HIE portal as an information source. The Discharge Summary may also demonstrate cost savings in production by supporting improved care and preventing unnecessary inpatient admissions. Phase II should focus on expanding data sources for the discharge summary to expand the scope of data offered.

4. Simulation Analysis

The ROI to this point has been calculated based on our best estimates of adoption and participation rates. If our assumptions about these rates are incorrect, the conclusions drawn from them will be wrong. The ROI model supports entering alternative assumptions to understand their effects on our conclusions.

The model is useful for several general types of alternative evaluations:

1. To identify the expected value of actions that can be taken to intentionally influence Return on Investment.
2. To develop alternative scenarios that indicate how sensitive our results are to changes in assumptions or parameters selected.
3. To explore the Return on Investment for additional products.

4.1. Changing Product Assumptions – The Case of Electronic Laboratory Results.

An example of changes made to influence the ROI would be use of the model to evaluating the effect of increasing the number of laboratories that provide laboratory results. Our initial assumption was that the HIE Project will include only Sonora Quest Laboratories as a data contributor. Sonora Quest provides about 23 percent of AHCCCS laboratory tests, so our Source Data Proportion is assumed to be 23 percent. If we were able to include Lab Corp and the laboratories of hospitals participating in the HIE Utility Project as data contributors, that proportion would rise to at least 55 percent. How much would expected benefits change, and how much would the ROI be increased from such a change?

To evaluate the change, we observe the original assumption that the electronic laboratory results will have a source data proportion of 23 percent. At that rate, the benefits expected from laboratory test results peak at $902,000 per year. The cumulative benefits over a five year implementation period would be $4.2 million.

Table 13 Additional Benefits from Adding Laboratories

Benefit Simulation: Participation of Additional Laboratory Sources ($000)							
Fiscal Year	2008	2009	2010	2011	2012	2013	2014
Laboratory Tests - Sonora Quest ONLY							
Source Data Proportion	0.00%	23.00%	23.00%	23.00%	23.00%	23.00%	23.00%
User Proportion		2.00%	60.00%	90.00%	90.00%	90.00%	90.00%
Penetration		0.46%	13.80%	20.70%	20.70%	20.70%	20.70%
AHCCCS Net Benefits	$0	$20	$601	$902	$902	$902	**$902**
AHCCCS Cumulative Net Benefits	$0	$20	$621	$1,523	$2,425	$3,326	**$4,228**
Laboratory Tests – Lab Corp and Hospitals							
Source Data Proportion	0.00%	55.00%	55.00%	55.00%	55.00%	55.00%	55.00%
User Proportion		2.00%	60.00%	90.00%	90.00%	90.00%	90.00%
Penetration		1.10%	33.00%	49.50%	49.50%	49.50%	49.50%
AHCCCS Net Benefits		$48	$1,437	$2,156	$2,156	$2,156	$2,156
AHCCCS Cumulative Net Benefits	$0	$48	$1,485	$3,642	$5,798	$7,954	**$10,110**
Cumulative Benefits Added	$0	$28	$864	$2,119	$3,373	$4,628	**$5,882**

If the additional commercial laboratory and the participating hospital laboratories are added as data contributors, the proportion of AHCCCS laboratory tests covered rises to 55%. These additions more than double the participation rate in each year. The penetration rates rise:

From .46% during the proof of concept period to 1.1%.
From 20.7% to 49.5% during Full Implementation

The annual net benefit after full implementation rises from $902,000 to $2,156,000 and the cumulative benefits over a five year life increase from $4.2 million to $10.1 million. Over the five year life, net benefits to AHCCCS increase by $5.88 million.

The simulation analysis provides information on the potential value of adding date sources to the laboratory results. If the sources can be added at a cost of less than $1.2 million per year, the net benefits from the addition will be positive and the return on investment will rise. If the cost exceeds $1.2 million, the return on investment for AHCCCS will fall.

4.2. Sensitivity Analysis – Assumptions required for Medication History to break even.

The second type of simulation explores the effect on our results of increasingly pessimistic assumptions. For example, we assume that if an electronic medication history is readily available, it would be used by 75 percent of physicians who have access to it. We have also assumed that the Project will be able to include all of the major PBMs in the State as data contributors to this record. These assumptions provide extremely positive net benefits to the HIE. How sensitive are the results to less optimistic assumptions?

We begin by changing assumptions regarding participation rates on the Laboratory Benefits page. Table 14 displays the results of our alternative assumptions

Table 14 Alternate Assumptions for Medication History

	Benefits	Adoption Rate	Penetration Rate	Annual AHCCCS Maximum Benefits	Five Year AHCCCS Benefit	AHCCCS Five Year ROI
1	Medication History	75%	90%	$24,643	$163,276	546%
2	Medication History	50%	90%	$16,429	$101,503	340%
3	Medication History	25%	90%	$8,214	$39,730	133%
4	Medication History	25%	70%	$8,214	$10,423	42%
5	Medication History	25%	50%	$8,214	$1,042	5.6%

Assumption Set 1 displays our original assumptions regarding the Medication History. The History use will be adopted by 75% of physicians who have access to it and penetration will reach 90%. Under these assumptions, the maximum annual benefit available from the medication history would be $24.6 million and AHCCCS five year benefits from the project would be $163 million. This creates an ROI of 546%

Assumption Set 2 assumes that only 50%. of physicians who have access to the medication history will use it, but that the number of physicians who have access and the data sources remain unchanged, so penetration is still 90%. Under these assumptions, the maximum annual benefit available from the medication history would be $16.4 million and AHCCCS five year benefits from the project would be $101.5 million. This creates an ROI of 340%

Assumption Set 3 assumes that only 25%. of physicians who have access to the medication history will use it, but that the number of physicians who have access and the data sources remain unchanged, so penetration is still 90%. Under these assumptions, the maximum annual benefit available from the medication history would be $8.2 million and AHCCCS five year benefits from the project would be $139.7million. This creates a five year ROI of 133%. Even with very low assumptions on adoption, then, the ROI for the project remains positive.

Assumption Set 4 assumes that only 25%. of physicians who have access to the medication history will use it, and that the number of physicians with access or the number of data sources declines so that penetration falls to 70%. Under these assumptions, the maximum annual benefit available from the medication history would be $8.2 million and AHCCCS five year benefits from the project would be $10.42 million. This creates an ROI of 42%.

Assumption Set 5 assumes that only 25%. of physicians who have access to the medication history will use it, and that the number of physicians with access or the number of data sources declines so that penetration falls to 50%. Under these assumptions, the maximum annual benefit available from the medication history would be $8.2 million but AHCCCS five year benefits from the project would be $1.042 million. This creates an ROI of 5.6%.

Assumption Set 5 brings the Project close to the break even point for The Health Information Exchange Utility. The extreme assumptions required to reach this point is that only half of the physicians have access to the product, and that only 25% of those that have access use it to coordinate prescribing of medications.

4.3. Implications of New Products for ROI – Imaging Results

An additional product discussed for Phase II of the Transformation Grant is the provision of imaging results on line to medical practitioners. Imaging results would be provided by participating providers through the HIE Viewer Participating providers would be able to search for patient records and view or print the imaging results.

4.3.1. Delivery

The delivery mechanism has not been finalized at this time, but plans for Phase II describe accessing CCR data through a Web portal. This would provide access to imaging results for authorized AHCCCS providers who have Internet access.

4.3.2. Conceptual Benefits

An on-line record of imaging test results will provide several benefits to medical providers and payers:

- Improved Information for Medical Treatment. Providers would be able to view results and in some cases diagnose medical conditions without repeating the imaging. The

result would be that urgent or emergency conditions could be treated with less delay, less complications (from risky procedures, e.g. cardiac catheterization), and more precision thereby improving medical outcomes.

- Reduced Duplication. Payers would experience a reduction in expenses for imaging tests because of the reduction in duplicate tests, complications and resultant hospitalizations.
- Improved Distribution. Imaging providers would experience fewer requests for imaging results, because those who require the information would have virtual access.

4.3.3. Concentration of Providers

The provision of medical imaging is much more dispersed than provision of laboratory tests. Table 15 displays the proportion of images provided by the top 20 image providers for the period from January 1, 2007 through June 30, 2007. The largest providers are hospitals, but even the largest of these delivers only 2 percent of total procedures. The top 20 providers deliver less than 20 percent of all imaging. The HIE will have to obtain participation from a large number of providers to obtain a reasonable participation rate.

Even with provision of imaging data through the hospitals that participate in Phase I, the Project would have to add 15 to 20 providers to obtain 20 percent of the images delivered for AHCCCS clients, and another 110 providers to access 50 percent of those images.

Table 15 Imaging Providers Ranked by Procedures

	Imaging Providers Ranked by Procedures				
	January 1, 2007 – Jun 30, 2007				
Rank	Servicing Provider Name	Procedures	Total Paid	Percent of Procedures	Cumulative Percent
Total		915884	$233,882,045	100.00%	
1	ST JOSEPH'S HOSPITAL-PHX	19417	$17,671,251	2.12%	2.12%
2	MARICOPA MEDICAL CENTER	14807	$7,789,006	1.62%	3.74%
3	TUCSON MEDICAL CENTER	13276	$7,160,149	1.45%	5.19%
4	YUMA REGIONAL MED CENTER	12486	$7,420,288	1.36%	6.55%
5	UNIVERSITY MED CTR-AZ	10245	$6,547,614	1.12%	7.67%
6	BANNER DESERT MEDICAL	9728	$6,651,181	1.06%	8.73%
7	BANNER ESTRELLA MEDICAL	8690	$8,478,239	0.95%	9.68%
8	CASA GRANDE REG MED CTR	8536	$4,502,348	0.93%	10.61%
9	BANNER GOOD SAM MEDICAL	8484	$8,330,083	0.93%	11.54%
10	BANNER THUNDERBIRD	8130	$6,710,314	0.89%	12.43%
11	MARYVALE HOSPITAL MED	7662	$4,566,230	0.84%	13.26%
12	JOHN C LINCOLN-DEER VLLY	7604	$5,823,102	0.83%	14.09%
13	PHOENIX BAPTIST HOSPITAL	7527	$4,161,562	0.82%	14.91%
14	KINGMAN REGIONAL MED CTR	7087	$3,388,381	0.77%	15.69%
15	NORTHWEST MEDICAL	7028	$2,728,492	0.77%	16.45%
16	PHOENIX CHILDREN'S HOSP	6854	$5,980,834	0.75%	17.20%
17	NAVAPACHE HOSPITAL	6790	$4,260,340	0.74%	17.94%
18	CHANDLER REGIONAL HOSP.	6219	$5,404,708	0.68%	18.62%
19	FLAGSTAFF MEDICAL CENTER	6012	$4,986,792	0.66%	19.28%
20	CARONDELET ST MARYS HOSP	5870	$3,830,185	0.64%	19.92%

4.3.4. Industry Estimates of Benefits

National studies of physician imaging orders have estimated that approximately four percent of imaging tests unnecessarily duplicate previous tests that would provide sufficient information. Based on a review of all imaging paid by AHCCCS or health plans in the first six months of 2007, we estimate that over $467 million per year are paid for

imaging services. If four percent of the tests are unnecessary, the excess cost to AHCCCS would be approximately $18.7 million.

4.3.5. Verification of Potential Benefits

Staff did not independently verify the industry standard estimate with AHCCCS claims and encounter data. We accepted the industry standard for the preliminary analysis, but the 4 percent figure should be confirmed before deciding to proceed with this product. This may be undertaken if product includes these records.

4.3.6. Pricing

Some imaging is conducted for MCO clients under capitated arrangements. In these cases, encounters indicate a negligible payment amount ($0, $0.01, etc.). We used encounters that reported a reasonable amount paid to estimate the average ratio of payment to charges. The average ratio was ratio at 28 percent for those encounters that included a reasonable payment amount. This 28 percent figure was multiplied by charged amount on each of the capitated encounters to estimate the market value of the potential duplicate service.

4.3.7. Estimated Benefits

Table 16 presents the implications of our findings for potential benefits from providing imaging test results on-line. These do not include patient safety savings. This may be undertaken if product includes these records. (See Recommendations.)

Table 16 maximum Imaging Results Benefits

Imaging Results Maximum Potential Benefits									
Stake holder	Savings	Units	Base Units	Unit Cost	% Savings	Maximum Potential Savings	Adoption Percent	Estimated Benefits	Total Benefits
AHCCCS/MCOs									
	Reduction in Duplicate Tests	Imaging Claims	1,832,768	$255.36	4.00%	$18,720,625	50%	$9,360,313	
	Reduction in Claims Processed	Imaging Claims	1,832,768	$4.29	4.00%	$314,503	50%	$157,251	
	Electronic Attachments	Claims Requiring Lab Documentation	148,196	$11.39	50.00%	$843,976	50%	$843,976	
Total AHCCCS/MCO									$10,361,540
Imaging Providers									
	Reduced Paper Distribution	Image Orders	1,832,768	$10.00	75.00%	$13,745,760	50%	$6,872,880	
	Reduced Requests for Results	Chart Requests	366,554	$14.00	75.00%	$3,848,813	50%	$1,924,406	
Imaging Providers									$8,797,286
Practitioners									
	Reduced Requests for Results	Chart Requests	366,554	$10.00	75.00%	$2,749,152	50%	$1,374,576	
Total Practitioners									$1,374,576
Industry Benefits									$20,533,403

Reduction in Duplicate Tests: In FY 2007, we estimate that AHCCCS programs paid for over 1.833 million images, at an average cost of $255 per test. A four percent duplication rate would suggest $18.728 million per year in potentially unnecessary expenses. The provision of actual images is necessary to prevent duplicates for some specialties, but if 50 percent change their practice to use existing results, AHCCCS programs would reduce expenditures by over $9.360 million annually.

Reduction in Claims Processed: Operational savings would be realized for AHCCCS and health plans by reducing the number of claims processed by 4 percent. AHCCCS staff estimates that the average cost of processing an electronic claim is $4.29. Assuming that most imaging claims are electronic, on-line access would save $157,251 in claims processing costs.

Electronic Attachments. In addition to a reduction in the number of claims processed, using the image results available on-line rather than requiring attachments for claims could save $948,454 per year for AHCCCS alone. A recent review found that AHCCCS currently processes 148,196 paper attachments for claims. We assume that half of the documentation is imaging test results. CITL has estimated that the average cost of processing a paper attachment for the industry is $11.39. Paper attachments also increase the probability that providers will bill using paper rather than electronic claims. If claims reviewers and prior authorization staff could view imaging results on-line rather than requiring paper results an estimated cost of $843,976 per year would be eliminated. We have no estimate of claim attachments required by health plans, so this figure probably underestimates the savings to be realized from elimination of attachments.

4.3.8. Other Industry Benefits

We expect image providers to experience reduced costs in distributing imaging results to requesting physicians and in processing subsequent requests for results from practitioners. Practitioners experience greater efficiency because they do not have to request results and receive and file the responses. These are not benefits that would accrue to AHCCCS directly, but they are benefits to be realized by the health care industry.

4.3.9. Imaging Providers

- If 20 percent of AHCCCS imaging results could be distributed electronically, 1,375,000 electronic image results would be available each year. At a distribution cost of $10 per procedure, the potential savings to laboratories would approximate $13.75 million. If 50 percent of practitioners change their practice to take advantage of electronic distribution, the savings would be $6.87 million.
- If on-line availability for 20 percent of image results were to eliminate follow-up requests for results, and the cost of collecting and distributing the record is $14 per request, potential savings available would be $3.848 million per year. If 50 percent of practitioners change their practice to take advantage of electronic distribution, the annual savings would be $1.924 million.

4.3.10. Medical Practitioners

We assume that on-line results for 20 percent of images could eliminate follow-up requests for results. If the cost of requesting follow-up results is $10 per request, practitioners would have $2.749 million in cost reductions available. If 50 percent of practitioners change their practice to take advantage of electronic distribution, the annual savings would be $1.375 million.

4.3.11. Expenses

A budget for adding image results to the HIE has not been formulated at this time, but we can formulate a hypothetical budget based on experience with Phase I. Based on the dispersion of imaging for AHCCCS members, we assume that 20 providers would have to be added as HIE participants to obtain 20 percent of image results. Even this penetration rate may be too low to create provider adoption of the HIE as an imaging data source. Experience in Phase I indicates a cost of $50-70,000 per provider added as a participant, so we expect the hardware, software, and support cost for 20 additional providers to approach $1,200,000. Staff support to negotiate and consult with these providers is estimated at $15,000 per provider or $300,000 for the group of 20. Salary and fringe benefits are estimated at 26 percent of salary and additional consulting fees of $200,000 are assumed. Table 17 summarizes these projected expenses.

We assume that development of the product and negotiations with imaging providers would begin in 2009 and the product would be implemented in January 2010. The implementation pattern would follow the Phase II pattern assumed for other products, and would be introduced in Maricopa in 2010 and the rest of the State in 2011.

Our costs estimate for the operational period of the Phase I project assumes a $2.2 million budget to administer the HIE system with less than 12 providers participating. We assume managing an additional 20 providers would require $60,000 per provider, or $1,200,000 per year. We add another $100,000 to manage imaging results from providers who participate in Phase I.

Table 17 Imaging Results Product Expense

Imaging Results Product Expense ($000)								
Fiscal Year		2008	2009	2010	2011	2012	2013	2014
Expenses								
	Wages and Salaries		$ 300					
	Benefits		$ 78					
	Hardware		$1200					
	Software							
	Facilities							
	Consulting Fees		$ 200					
	Other			$1300	$1300	$1300	$1300	$1300
Total AHCCS Expenses			$1778	$1300	$1300	$1300	$1300	$1300

4.3.12. Return on Investment

Table 18 summarizes our estimates of ROI for placing imaging results on-line. The table assumes the expense estimates defined above, and assumes that the product will be implemented in 2010 in Maricopa County. The penetration rate with 20 percent of image results and approximately 60 percent of members represented by Maricopa County would be 12.6 percent. Statewide implementation would raise the penetration rate to 20 percent in 2011.

Table 18 HIE Return on Investment

HIE Return on Investment ($000)							
Fiscal Year	2008	2009	2010	2011	2012	2013	2014
Expense							
Imaging Results @ .20% of Total		$1,778	$1,300	$1,300	$1,300	$1,300	$1,300
Total Expense	$0	$1,778	$1,300	$1,300	$1,300	$1,300	$1,300
Cumulative Total Expense	$0	$1,778	$3,078	$4,378	$5,678	$6,978	$8,278
AHCCCS Benefits							
Penetration			12.60%	20.00%	20.00%	20.00%	20.00%
Imaging Results	$0	$0	$1,306	$2,072	$2,072	$2,072	$2,072
AHCCCS Annual Net Benefits	$0	-$1,778	$6	$772	$772	$772	$772
AHCCCS Cumulative Net Benefits	$0	-$1,778	-$1,772	-$1,000	-$228	$544	$1,317
AHCCCS Return on Investment		-100%	-58%	-23%	-4%	8%	16%
Industry Benefits							
Imaging Results			$2,587	$4,107	$4,107	$4,107	$4,107
Industry Annual Net Benefits		-$1,778	$1,287	$2,807	$2,807	$2,807	$2,807
Industry Cumulative Net Benefits		-$1,778	-$491	$2,316	$5,123	$7,929	$10,736

The cost of adding 15 imaging providers as HIE participants would create a significant initial cost if the Phase I architecture is used to include new providers. The Net benefits for AHCCCS would be negative in 2009 and slightly positive by 2010 according to the assumptions made. However, the effects of heavy development and implementation expenses would not be offset until 2013, when the Cumulative Net Benefit and ROI become positive. The rate of return would reach 16 percent in 2014. This low rate of return makes the ROI for imaging very sensitive to our assumptions. If provider adoption varies by only 5 percent from our assumptions, the net ROI would become negative.

The results indicate that the product is risky using the methodology for adding provider data to the HIE that is to be used in Phase I.

- The task of obtaining participation from 15 to 20 additional providers will require considerable effort.
- There is no guarantee that a 20 percent data penetration rate will meet the needs of providers and make the HIE an effective source of imaging results.
- The return on this product is well below that for the HIE in general for AHCCCS. The 16-percent ROI over five years of operation is a marginal result that will be very sensitive to minor deviations from our assumptions.
- Finally, financing for the hardware and software required to implement this option cannot be financed with 90 percent Federal funding through a MITA initiative. Funding would have to be obtained through user fees or appropriations.

These results are dependent on our assumption that the technology used to obtain data from sources in Phase II is similar to the technology used in Phase I. If an alternative method for collecting imaging results is identified, the cost of obtaining an adequate data proportion could be reduced.

There are some benefits to imaging providers and practitioners that may justify implementation of the product from a general industry perspective. Reduction in the cost of requesting and distributing image results may provide significant saving to those providers who do not currently have electronic distribution systems.

5. Sustainability

The analysis of initial products from the HIE project indicate that they will produce a very positive return on the original investment. However, the long-term viability of the HIE model is dependent upon the ability to turn those net benefits into sustainable funding. Like Phase II products and budget design, a strategy for long-term funding of the HIE project has not been finalized. Rather than demonstrate financial sustainability, this presentation will describe how funding sources could support the HIE systems.

5.1. Funding Sources

Several funding sources have been identified as potential long-term support for the HIE project. These include:

- Federal Title XIX System Development Funds
- User Fees
- Redistribution of State appropriation for Staffing
- Redistribution of State appropriation for Program Expenditures.
- Grants and Co-development

Table 19 presents and illustration of possible funding sources and their contribution to a hypothetical sustainability model.

Table 19: HIE Sustainability Model

HIE Financing Summary ($000)							
Fiscal Year	2008	2009	2010	2011	2012	2013	2014
Project Expense							
Basic Infrastructure	$7,480	$1,400	$1,100	$1,100	$1,100	$1,100	$1,100
Lab Results	$0	$800	$400	$400	$400	$400	$400
Discharge Summary	$0	$800	$300	$300	$300	$300	$300
Medication History	$0	$800	$400	$400	$400	$400	$400
Total Expenses	$7,480	$3,800	$2,200	$2,200	$2,200	$2,200	$2,200
Revenues							
Federal Funds			$180				
Appropriations - State Matching Funds			$20				
Fees @ $.15 PMPM	$0	$0	$0	$1,746	$1,746	$1,746	$1,746
Re-Distribution of Operations Funding			$600	$600	$600	$600	$600
Net Program Savings Shared through Appropriation @5%	$0	$0	$0	$1,044	$1,044	$1,044	$1,044
Grants	$7,480	$3,800	$1,400				
Total Revenue	$7,480	$3,800	$2,200	$3,390	$3,390	$3,390	$3,390

AHCCCS Net Revenue and Savings	$0	$0	$0	$1,190	$1,190	$1,190	$1,190

5.1.1. Federal Title XIX System Development Funds

CMS provides a 90 percent share of expenses for system development projects that meet their requirements. The development projects must support the basic mission of Title XIX operations, they must be development as opposed to purchase of software, and they must be approved through the APD process. A major initiative within CMS is MITA adoption, designed to strengthen the administration and systems of State Medicaid agencies. CMS has expressed interest in electronic health records and health information exchanges as potentially advancing MITA compliance. By developing a strategy to integrate the HIE project with the Department's MITA objectives, it should be possible to obtain 90 percent federal funding for development of future products.

The advantage of enhanced Federal funding is that projects are supported with federal (federal is not a proper name, never capped) rather than State funds, and approval for such projects is relatively easy to obtain. The disadvantages of such funds are listed below:

- They require a matching State appropriation, which may be difficult to obtain given the current budget shortfalls.
- They can be used only for development. Operational funding is matched at a lower rate.

Table 20 illustrates the use of federal 90 percent funds and matching State funds for development of new products in 2010.

5.1.2. Fees

User fees have been used to support electronic health data exchanges in States such as Indiana and Utah. Fees have the advantage of allocating the cost of operating electronic information systems to those who benefit most from the systems. They also provide an independent source of income that would demonstrate the value of HIE products. Most of the HIE benefits quantified in this evaluation accrue to payers, such as health plans and AHCCCS itself. On-line laboratory test results, reductions in hospitalizations and unnecessary prescriptions, and clinical editing all produce significant benefits for payers. Table 20 indicates that a very minor fee of $0.15 to $0.20 PMPM would fund the projected level of activity required to sustain the HIE operations.

The major disadvantage of fees charged to payers is that AHCCCS has no way to receive and use cash payments. It may be necessary to establish operation of HIE projects in an outside organization that can receive fees and apply them to support HIE operations. Since MCOs cannot use AHCCCS capitation payments for medical services to fund operations, the source of contributions would have to be carefully documented. A reduction in expense for medical services might not be easily converted into payment for operational service fees.

Using an outside agency to operate systems developed with Title XIX may raise questions regarding compliance with federal regulations. Finally, those being asked to support the project with fees may resist unless they believe that the products will be useful to their own operations.

To date, the HIE project has not involved health plans or other payers as potential participants.
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5.1.3. Redistribution of State Appropriation for Staffing

Our analysis has suggested that the HIE products may produce savings in AHCCCS administrative expenses, particularly in claims processing. Improvements in AHCCCS operations that result from HIE products could produce operational savings for the Department. Examples of such improvements would include:

- Increased submission of electronic claims
- Submission of electronic attachments
- Expedited adjudication

Any such improvements could reduce operations costs that could be used to support operation of the HIE. Our estimates are that as much as $1,500,000 could be saved annually from administrative expenses by HIE products. This level of funding may supplement other sources, but it will not entirely support HIE operations.

5.1.4. Redistribution of State Appropriation for Program Expenditures

The benefits expected from the HIE project should produce significant reductions in program expenses for AHCCCS. AHCCCS could ask that operations funding required to maintain or increase program cost reductions be appropriated to support the HIE.

The advantage of considering diversion of savings to support HIE operations is that the beneficiaries of the products fund ongoing operation. Using appropriations also obviates the need for an external agency to manage operation of HIE systems. If our projected benefits are realized, 10 to 15 percent of the savings realized could fund a major portion of HIE operations.

The disadvantage of using program savings to support HIE systems is that program dollars cannot be used for operations without specific appropriation, and Arizona's fiscal crisis makes this type of diversion unlikely. In the best of times, diversion of program funding to operations represents a growth in State employment that is politically unattractive to some. In times of budget crisis, even a very high tradeoff between program and operations funding will be unpopular.

5.1.5. Grants

A CMS Transformation grant has provided the funding for the HIE project during its first three years. While this funding has provided a stable financial base for designing, developing, and implementing the HIE system, CMS Transformation grants are not likely to continue. Table illustrates the role of grants in funding 2008 and 2009 without the need to obtain funding from other sources. Private grants and contributions from stakeholders may be possible in the future.

A possible source of funding that is analogous to grant funding is the possibility of co-development of HIE products with interested private companies. The project has discussed cooperative ventures with Microsoft and CISCO. These sources may assist with future

development, but reliance on such sources for ongoing funding of the core project is not advisable.

Table 20 HIE Financing Summary

HIE Financing Summary ($000)							
Fiscal Year	2008	2009	2010	2011	2012	2013	2014
Project Expense							
Basic Infrastructure	$7,480	$1,200	$1,000	$1,000	$1,000	$1,000	$1,000
Lab Results	$0	$800	$400	$400	$400	$400	$400
Discharge Summary	$0	$800	$300	$300	$300	$300	$300
Medication History	$0	$800	$400	$400	$400	$400	$400
Eligibility	$0	$200	$100	$100	$100	$100	$100
New Product			$1,100				
Total Expenses	$7,480	$3,800	$3,200	$2,200	$2,200	$2,200	$2,200
Revenues							
Appropriation – 90% Federal Funds			$900				
Appropriations - State Matching Funds			$100				
Grants	$7,480	$3,800					
Fees @ $.15 PMPM	$0	$0	$1,980	$1,980	$1,980	$1,980	$1,980
Program and Operations Savings Shared through Appropriation @1%	$0	$0	$780	$782	$856	$856	$856
Total Revenue	$7480	$3,800	$3,860	$2,762	$2,836	$2,836	$2,836
AHCCCS Net Revenue and Savings	$0	$0	$660	$662	$736	$736	$736

5.2. Conclusion

If the potential benefits expected from the HIE can be demonstrated and maintained, several possible alternatives exist to fund the continuing operation of the HIE. However, all of the possible funding streams are assured, and each will require time to make the case for funding and actually receive additional funds. AHCCCS may obtain funding from more than one source to sustain the HIE.

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7. Appendix A: Examples of Drug Interactions in Medication History

Consumer #1

Multi-Drug Interaction Checker

Patient Regimen

PAROXETINE HCL ORAL
OXYBUTYNIN CHLORIDE ORAL
TRAMADOL ORAL
FLOVENT HFA INHL
LONOX ORAL
POTASSIUM CHLORIDE ORAL
VERAPAMIL ORAL
PROTONIX ORAL
METOPROLOL TARTRATE ORAL
TEMAZEPAM ORAL
PREMARIN ORAL
ASACOL ORAL
ALBUTEROL INHL
PROCHLORPERAZINE MALEATE ORAL
METFORMIN ORAL
METOLAZONE ORAL
SINGULAIR ORAL
LEVSIN ORAL
PERPHENAZINE-AMITRIPTYLINE ORAL
ALPRAZOLAM ORAL
SEROQUEL ORAL

Interactions

Contraindicated Drug Combination
SOLID ORAL POTASSIUM CHLORIDE/ANTICHOLINERGICS
Potassium Chloride Oral and Oxybutynin Chloride Oral may interact based on the potential interaction between SOLID ORAL POTASSIUM CHLORIDE and ANTICHOLINERGICS.
SOLID ORAL POTASSIUM CHLORIDE/ANTICHOLINERGICS
Potassium Chloride Oral and Lonox Oral may interact based on the potential interaction between SOLID ORAL POTASSIUM CHLORIDE and ANTICHOLINERGICS.
SOLID ORAL POTASSIUM CHLORIDE/ANTICHOLINERGICS
Potassium Chloride Oral and Levsin Oral may interact based on the potential interaction between SOLID ORAL POTASSIUM CHLORIDE and ANTICHOLINERGICS.

Severe Interaction

TRAMADOL/SSRI'S; DULOXETINE; VENLAFAXINE

Tramadol Oral and Paroxetine HCl Oral may interact based on the potential interaction between TRAMADOL and SSRI'S; DULOXETINE; VENLAFAXINE.

TRAMADOL/TRICYCLIC COMPOUNDS; CARBAMAZEPINE

Tramadol Oral and Perphenazine-Amitriptyline Oral may interact based on the potential interaction between TRAMADOL and TRICYCLIC COMPOUNDS; CARBAMAZEPINE.

Moderate Interaction

NARCOTICS/PHENOTHIAZINES

Lonox Oral and Prochlorperazine Maleate Oral may interact based on the potential interaction between NARCOTICS and PHENOTHIAZINES.

SELECTED BETA-BLOCKERS/SELECTED CALCIUM CHANNEL BLOCKERS

Metoprolol Tartrate Oral and Verapamil Oral may interact based on the potential interaction between SELECTED BETA-BLOCKERS and SELECTED CALCIUM CHANNEL BLOCKERS.

SSRI'S; DULOXETINE/TRICYCLIC COMPOUNDS; TRAZODONE

Paroxetine HCl Oral and Perphenazine-Amitriptyline Oral may interact based on the potential interaction between SSRI'S; DULOXETINE and TRICYCLIC COMPOUNDS; TRAZODONE.

PHENOTHIAZINES/ANTICHOLINERGICS

Prochlorperazine Maleate Oral and Oxybutynin Chloride Oral may interact based on the potential interaction between PHENOTHIAZINES and ANTICHOLINERGICS.

PHENOTHIAZINES/ANTICHOLINERGICS

Prochlorperazine Maleate Oral and Levsin Oral may interact based on the potential interaction between PHENOTHIAZINES and ANTICHOLINERGICS.

PHENOTHIAZINES/ANTICHOLINERGICS

Perphenazine-Amitriptyline Oral and Lonox Oral may interact based on the potential interaction between PHENOTHIAZINES and ANTICHOLINERGICS.

PHENOTHIAZINES/ANTICHOLINERGICS

Perphenazine-Amitriptyline Oral and Levsin Oral may interact based on the potential interaction between PHENOTHIAZINES and ANTICHOLINERGICS.

PHENOTHIAZINES/ANTICHOLINERGICS

Perphenazine-Amitriptyline Oral and Oxybutynin Chloride Oral may interact based on the potential interaction between PHENOTHIAZINES and ANTICHOLINERGICS.

PHENOTHIAZINES/ANTICHOLINERGICS

Prochlorperazine Maleate Oral and Lonox Oral may interact based on the potential interaction between PHENOTHIAZINES and ANTICHOLINERGICS.

TRAMADOL/NEUROLEPTICS

Tramadol Oral and Seroquel Oral may interact based on the potential interaction between TRAMADOL and NEUROLEPTICS.

TRAMADOL/NEUROLEPTICS

Tramadol Oral and Prochlorperazine Maleate Oral may interact based on the potential interaction between TRAMADOL and NEUROLEPTICS.

TRAMADOL/NEUROLEPTICS

Tramadol Oral and Perphenazine-Amitriptyline Oral may interact based on the potential interaction between TRAMADOL and NEUROLEPTICS.

INHALED SYMPATHOMIMETICS/TRICYCLIC COMPOUNDS

Albuterol Inhl and Perphenazine-Amitriptyline Oral may interact based on the potential interaction between INHALED SYMPATHOMIMETICS and TRICYCLIC COMPOUNDS.

Consumer #2

Multi-Drug Interaction Checker

Patient Regimen

TRAMADOL ORAL
ACETAMINOPHEN-CODEINE ORAL
TRICOR ORAL
GABAPENTIN ORAL
LIPITOR ORAL
PERPHENAZINE ORAL
LISINOPRIL ORAL
KLOR-CON M20 ORAL
ASPIRIN ORAL
CHLORTHALIDONE ORAL
RANITIDINE HCL ORAL
PROMETHAZINE-CODEINE ORAL
LORATADINE ORAL
LONOX ORAL
ACTOS ORAL
METRONIDAZOLE ORAL
BETHANECHOL CHLORIDE ORAL
FUROSEMIDE ORAL
ROXICET ORAL
WARFARIN ORAL
GLIPIZIDE ORAL

Interactions

Contraindicated Drug Combination
SOLID ORAL POTASSIUM CHLORIDE/ANTICHOLINERGICS
Klor-Con M20 Oral and Lonox Oral may interact based on the potential interaction between SOLID ORAL POTASSIUM CHLORIDE and ANTICHOLINERGICS.

Severe Interaction
ANTICOAGULANTS/SALICYLATES
Warfarin Oral and Aspirin Oral may interact based on the potential interaction between ANTICOAGULANTS and SALICYLATES.
ANTICOAGULANTS/FIBRATES
Warfarin Oral and Tricor Oral may interact based on the potential interaction between ANTICOAGULANTS and FIBRATES.
ANTICOAGULANTS/METRONIDAZOLE; TINIDAZOLE
Warfarin Oral and Metronidazole Oral may interact based on the potential interaction between ANTICOAGULANTS and METRONIDAZOLE; TINIDAZOLE.
SELECTED HMG-COA REDUCTASE INHIBITORS/FENOFIBRATE
Lipitor Oral and Tricor Oral may interact based on the potential interaction between SELECTED HMG-COA REDUCTASE INHIBITORS and FENOFIBRATE.

Moderate Interaction
NARCOTICS/PHENOTHIAZINES
Lonox Oral and Promethazine-Codeine Oral may interact based on the potential interaction between NARCOTICS and PHENOTHIAZINES.
ANTIDIABETICS, ORAL/SALICYLATES

Glipizide Oral and Aspirin Oral may interact based on the potential interaction between ANTIDIABETICS, ORAL and SALICYLATES.

ACE INHIBITORS; ARB'S/POTASSIUM PREPARATIONS

Lisinopril Oral and Klor-Con M20 Oral may interact based on the potential interaction between ACE INHIBITORS; ARB'S and POTASSIUM PREPARATIONS.

THIAZIDES/ANTIDIABETICS

Chlorthalidone Oral and Glipizide Oral may interact based on the potential interaction between THIAZIDES and ANTIDIABETICS.

SELECTED ANTICOAGULANTS/PROPOXYPHENE; TRAMADOL

Warfarin Oral and Tramadol Oral may interact based on the potential interaction between SELECTED ANTICOAGULANTS and PROPOXYPHENE; TRAMADOL.

ACE INHIBITORS; ANGIOTENSIN II RECEPTOR ANTAGONISTS/LOOP

Lisinopril Oral and Furosemide Oral may interact based on the potential interaction between ACE INHIBITORS; ANGIOTENSIN II RECEPTOR ANTAGONISTS and LOOP.

PHENOTHIAZINES/ANTICHOLINERGICS

Perphenazine Oral and Lonox Oral may interact based on the potential interaction between PHENOTHIAZINES and ANTICHOLINERGICS.

PHENOTHIAZINES/ANTICHOLINERGICS

Promethazine-Codeine Oral and Lonox Oral may interact based on the potential interaction between PHENOTHIAZINES and ANTICHOLINERGICS.

TRAMADOL/NEUROLEPTICS

Tramadol Oral and Perphenazine Oral may interact based on the potential interaction between TRAMADOL and NEUROLEPTICS.

TRAMADOL/NEUROLEPTICS

Tramadol Oral and Promethazine-Codeine Oral may interact based on the potential interaction between TRAMADOL and NEUROLEPTICS.

ACE INHIBITORS/ASPIRIN

Lisinopril Oral and Aspirin Oral may interact based on the potential interaction between ACE INHIBITORS and ASPIRIN.

SELECTED ANTICOAGULANTS/ACETAMINOPHEN

Warfarin Oral and Roxicet Oral may interact based on the potential interaction between SELECTED ANTICOAGULANTS and ACETAMINOPHEN.

SELECTED ANTICOAGULANTS/ACETAMINOPHEN

Warfarin Oral and Acetaminophen-Codeine Oral may interact based on the potential interaction between SELECTED ANTICOAGULANTS and ACETAMINOPHEN.

8. APPENDIX B: THE RETURN ON INVESTMENT MODEL

The ROI Model is made of four distinct sections.

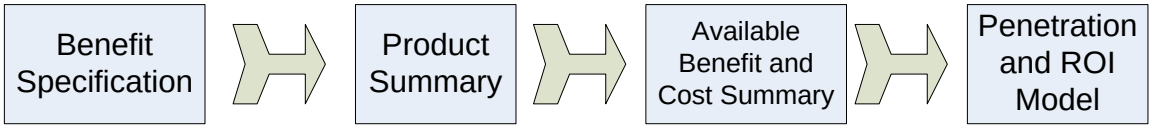

Figure 3 The ROI Model

The Benefit Specification section defines the product and estimates the global benefits expected for the product. The result is the total single year benefit to be expected from the product.

The Product Summary section creates a multi-year definition of each product's costs and benefits. The benefits for each product are filled from the benefit specification sheet.

The Available Benefit and Cost Summary section summarizes the results from the product summary page for all of the products included in the HIE. This creates a multi-year flow of costs and benefits for the project as a whole.

The Penetration and ROI Model enters assumptions regarding the penetration potential for each product and project an expected ROI for the Project as a whole.

8.1. Brief Explanation of the AMIE ROI Model

The AMIE Return on Investment (ROI) Model is comprised of eleven EXCEL worksheets that are linked together to automatically integrate data. The structure of the model is as follows:

1. Product Sheets

Four sheets describe the nature of each product, the budget for producing the product, and summarize the maximum benefits that could be realized from the product. The sheets include:

- Infrastructure – the expense required to build the basic information structure for AMIE. There are no direct benefits from the infrastructure, so this page is on description and budget.
- Laboratory Results – The budget and expected benefits for on-line access to laboratory test results.
- Medication History – The budget and expected benefits for on-line access to medication history
- Discharge Summary – The budget and expected benefits for on-line access to discharge summaries

Enter the descriptive and budget data on the Product Pages. Additional budget categories can be added by inserting the new categories between existing lines or re-labeling existing lines. Benefit estimation is entered on the Benefit Pages and inherited by the Product Pages.

2. Benefit Estimation Pages

The benefit estimation pages documents expected benefits from each product. The fields to be entered are:

- Stakeholder: The Group that will benefit from having the product available
- Savings: The conceptual category of savings expected from the product
- Units: The unit of measure used to calculate benefits. This may be the number of tests or transaction involved, the dollar value of expenditures, etc.
- Base Units: The total number of units that were identified in the base period. For example, this might be the number of hospital admissions in the six month base period during 2007.
- Unit Cost: The expenditure per unit during the base period.
- % Saving: The percent reduction expected in expenditures as a result of implementing the product.
- Potential Savings: The maximum possible savings from product implementation, assuming that all users make effective use of the product.
- Practice Adoption: The percent of users who have the product available who will make effective use of the product in their practice.
- Estimated Benefits: The maximum possible savings from one conceptual category assuming the practice adoption rate specified above.
- Total Benefits: The maximum possible savings from all conceptual categories assuming the practice adoption rate specified above.

Enter data in the green fields to document assumptions regarding benefits. The Potential Savings, Estimated Benefits and Total Benefits will be calculated. New savings categories can be added by inserting them between existing categories.

3. Summary Page

The summary page summarizes budget and estimated benefits assuming 100% penetration rates. No entry is possible on this page.

4. Penetration Page

The Penetration Page estimates market penetration for each product given the data sources and proportion of users that will participate in a give year. The data sources percent and user percents can be entered to calculate the penetration rate for each product in each year.

5. ROI

The Return on Investment Page summarizes budgets and expected benefits to create ROI estimates, and provides entry of revenue sources to evaluate and plan for sustainability of the AMIE product set. The page is separated into two parts

AMIE ROI Summary

The Return on Investment Page integrates the Summary Page and the Penetration Page to produce a budget estimate and expected benefits summaries. It uses the budget and benefit estimates to produce an estimate of net benefits and expected return on investment. Data entry is not possible on this section of the page.

- Total Expense summarizes the budget for all products in each year.
- Cumulative Total Expense displays the total expected budget for the project do date.
- AHCCCS Annual Benefits displays the expected benefits to AHCCCS from all AMIE products in each year, given assumptions regarding penetration rates.
- AHCCCS Annual Net Benefits displays the expected benefits for the year less Total Expense for the year
- Cumulative Net Benefits is the sum of all net benefits for years up to and including the subject year.
- AHCCCS ROI is the cumulative Net benefits for the project for the subject year divided by Cumulative Total Expense for that year.

AMIE Financing Summary
The Financing Summary section of the page inherits expense estimates from the ROI section of the ;page and allows entry of expected revenues for each year. Additional revenue sources can be added by inserting new sources between existing lines.

- Total Revenue is the sum of all revenue for the subject year
- AHCCCS Net Revenue and Savings is the Total Revenue for the year less Total Expense for the year. Sustainability requires that this figure be greater than or equal to zero.

6. Present Value Page.
The Present Value Page restates the ROI after adjusting for:

- Expected Medical Inflation. Medical inflation will increase spending above the 2007 levels measured for the base period. Medical inflation usually exceeds general inflation and increases the value of savings from AMIE products. We inflate from 2007 because that is the base year for measuring expenditures. The rate of inflation assumed can be entered on this page.
- IT Inflation. IT inflation will influence the cost of maintaining the AMIE products and the cost of developing new products. We apply IT inflation from 2008 forward because 2008 is the base year for our budgeted expenses. The rate of inflation assumed can be entered on this page.
- Growth Factor. The Growth factor is the rate of growth from program expansion for AHCCCS. Growing programs will increase the benefits expected from AMIE products. We project growth from 2007 because that is the base year for our expenditure data. The rate of inflation assumed can be entered on this page.

- The Discount Rate. The Discount Rate converts all cost data to present values. Seven percent is the federal governments long term discount rate, but the rate may be higher for the private sector based on the internal rate of return for company projects. Alternative discount rates can be entered on this page.

All other field are inherited from the ROI page and are as defined on that page.

Medical Inflation Factor
IT Inflation Factor
Discount Rate
Growth Factor

Benefit Specification

Laboratory Orders

Table 2: Laboratory Orders and Results Benefits

Stake holder	Savings	Units	Base Units	Unit Cost	% Savings	Maximum Potential Savings	Practice Adoption	Estimated Benefits	Total Benefits
AHCCCS/MCOs									
	Reduction in Duplicate Tests	Laboratory Claims	5,580,000	$27.18	4.00%	6,066,576	50%	$3,033,288	
	Reduction in Claims Processed	Laboratory Claims	5,580,000	$4.29	4.00%	957,528	50%	$478,764	
	Electronic Documents with Claims	Claims Requiring Lab Documentation	148,196	$11.39	50.00%	843,976	100%	$843,976	
Total AHCCCS/MCO									$4,356,028
Laboratories									
	Reduced Paper Distribution	Lab Orders	5,580,000	$10.00	75.00%	41,850,000	50%	$20,925,000	
	Reduced Requests for Results	Chart Requests	1,116,000	$14.00	75.00%	11,718,000	50%	$5,859,000	
Total Laboratories									$26,784,000
Practitioners									
	Reduced Requests for Results	Chart Requests	1,116,000	$10.00	75.00%	8,370,000	50%	$4,185,000	
Total Practitioners									$4,185,000
Industry Benefits									$35,325,028

Medication history

Table 4: Pharmacy Record Potential Benefits									
Stakeholder	Savings	Units	Base Units	Unit Cost	% Savings	Maximum Potential Savings	Practice Adoption	Estimated Benefits	Total Benefits
AHCCCS/MCOs									
	Reduction in Adverse DrugReactions	ED Visits	656,378	$338.00	2.00%	4,437,115	75%	$3,327,836	
	Reduction in Adverse DrugReactions	Hospital Admissions	226,934	$5,283.00	2.00%	23,977,846	75%	$17,983,385	
	Reduced Drug Costs for Duplicate Scripts	Duplicate Expense	$4,443,000	$1.00	100.00%	4,443,000	75%	$3,332,250	
	Reduced Hospital Claims	Hospital Claims	883,312	$4.29	2.00%	75,788	75%	$56,841	
	Reduced Pharmacy Claims	Duplicate Pharmacy Claims	56,500	$4.29	100.00%	242,385	75%	$181,789	
Total AHCCCS						0		$0	$24,643,471

Discharge Summary

Discharge Summary Potential Benefits										
Stakeholder		Savings	Units	Base Units	Unit Cost	% Savings	Potential Savings	Practice Change	Estimated Benefits	Total Benefits
AHCCCS/MCOs										
Practitioners										
		Reduction in Discharge Summary Requests	Discharges	226,934	$10.00	100.00%	2,269,340	75%	$1,702,005	
		Reduction in Processing Summaries Received	Discharges	226,934	$10.00	100.00%	2,269,340	75%	$1,702,005	
	Total Practitioners									$3,404,010
Hospitals										
		Reduced Response to Discharge Summary Requests	Discharges	226,934	$14.00	100.00%	3,177,076	75%	$2,382,807	
	Total Hospitals									$2,382,807
Total Industry										$5,786,817

Product Summary

Laboratory Results

Laboratory Results ($000)							
Fiscal Year	2008	2009	2010	2011	2012	2013	2014
Expenses							
Wages and Salaries							
Benefits							
Hardware							
Software							
Facilities							
Consulting Fees							
Other		800	400	400	400	400	400
Provider Support							
Health Network Support							
Total AHCCS Expenses		800	400	400	400	400	400
Stakeholder Expenses							
EHI Partners							
Laboratories							
MCO							
Practitioners							
Hospitals							
Nursing Homes							
Total Stakeholder Expenses			0	0	0	0	0
Total Expenses		800	400	400	400	400	400
Potential Benefits							

Laboratory Results ($000)								
	AHCCCS/MCO		4,356	4,356	4,356	4,356	4,356	4,356
	Laboratories		26,784	26,784	26,784	26,784	26,784	26,784
	Practitioners		4,185	4,185	4,185	4,185	4,185	4,185
	Hospitals							
Total Benefits		$0	$35,325	$35,325	$35,325	$35,325	$35,325	$35,325

Medication History

Medication History ($000)							
Fiscal Year	2008	2009	2010	2011	2012	2013	2014
Expenses							
Wages and Salaries							
Benefits							
Hardware							
Software							
Facilities							
Consulting Fees							
Other		600	300	300	300	300	300
Provider Support							
Health Network Support							
Total AHCCS Expenses	0	600	300	300	300	300	300
Stakeholder Expenses							
EHI Partners							
MCO							
Practitioners							
Hospitals							
Nursing Homes							
Pharmacies							
Total Stakeholder Expenses		0	0	0	0	0	0
Total Expenses	0	600	300	300	300	300	300
Potential Benefits							
AHCCCS/MCO		$24,643	$24,643	$24,643	$24,643	$24,643	$24,643
Total Benefits		$24,643	$24,643	$24,643	$24,643	$24,643	$24,643

Discharge Summary

Discharge Summary ($000)								
Fiscal Year		2008	2009	2010	2011	2012	2013	2014
Expenses								
	Wages and Salaries							
	Benefits							
	Hardware							
	Software							
	Facilities							
	Consulting Fees							
	Other		$800	$400	$400	$400	$400	$400
	Provider Support							
	Health Network Support							
	Total AHCCS Expenses		$800	$400	$400	$400	$400	$400
Stakeholder Expenses								
	EHI Partners							
	MCO							
	Practitioners							
	Hospitals							
	Nursing Homes							
	Total Stakeholder Expenses							
	Total Expenses							
Benefits								
	AHCCCS/MCOs		$0	$0	$0	$0	$0	$0

Discharge Summary ($000)								
	Hospitals		$2,383	$2,383	$2,383	$2,383	$2,383	$2,383
	Practitioners		$3,404	$3,404	$3,404	$3,404	$3,404	$3,404
Total Benefits			$5,787	$5,787	$5,787	$5,787	$5,787	$5,787

Available Benefit and Cost Summary

Table 7:HIE Value Summary - Maximum Benefits ($000)							
Fiscal Year	2008	2009	2010	2011	2012	2013	2014
Expense							
Basic Infrastructure	$7,480	$1,400	$1,100	$1,100	$1,100	$1,100	$1,100
Lab Results	$0	$800	$400	$400	$400	$400	$400
Medication History	$0	$800	$300	$300	$300	$300	$300
Clinical Documents - Discharge Summary	$0	$800	$400	$400	$400	$400	$400
Eligibility	$0	$0	$0	$0	$0	$0	$0
Total Expense	$7,480	$3,800	$2,200	$2,200	$2,200	$2,200	$2,200
AHCCCS Benefits							
Basic Infrastructure	$0	$0	$0	$0	$0	$0	$0
Lab Results	$0	$4,356	$4,356	$4,356	$4,356	$4,356	$4,356
Medication History		$24,643	$24,643	$24,643	$24,643	$24,643	$24,643
Discharge Summary	$0	$0	$0	$0	$0	$0	$0
Eligibility	$0	$0	$0	$0	$0	$0	$0
AHCCCS Maximum Total Benefits	$0	$28,999	$28,999	$28,999	$28,999	$28,999	$28,999
AHCCCS Annual Net Benefits	-$7,480	$25,199	$26,799	$26,799	$26,799	$26,799	$26,799
Total Industry Benefits							
Basic Infrastructure							
Lab Results	$0	$34,565	$36,127	$36,728	$36,728	$36,728	$36,728
Medication History	$0	$24,643	$24,643	$24,643	$24,643	$24,643	$24,643
Discharge Summary	$0	$5,787	$5,787	$5,787	$5,787	$5,787	$5,787
Eligibility	$0	$0	$0	$0	$0	$0	$0
Industry Maximum Total Benefits	$0	$64,995	$66,558	$67,159	$67,159	$67,159	$67,159
Industry Annual Net Benefits	-$7,480	$61,195	$64,358	$64,959	$64,959	$64,959	$64,959

Market Penetration Rates

Table 9: Estimated Market Penetration Rates							
Fiscal Year	2008	2009	2010	2011	2012	2013	2014
Laboratory Tests							
Source Data Proportion	0.00%	23.00%	23.00%	23.00%	23.00%	23.00%	23.00%
User Proportion		2.00%	60.00%	90.00%	90.00%	90.00%	90.00%
Market Penetration		0.46%	13.80%	20.70%	20.70%	20.70%	20.70%
Medication History							
Source Data Proportion		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
User Proportion		2.00%	60.00%	90.00%	90.00%	90.00%	90.00%
Market Penetration		2.00%	60.00%	90.00%	90.00%	90.00%	90.00%
Discharge Summary							
Source Data Proportion		32.00%	32.00%	32.00%	32.00%	32.00%	32.00%
User Proportion		2.00%	60.00%	90.00%	90.00%	90.00%	90.00%
Market Penetration		0.64%	19.20%	28.80%	28.80%	28.80%	28.80%

HIE Penetration and ROI Model

HIE ROI Summary($000)								
Fiscal Year		2008	2009	2010	2011	2012	2013	2014
Expense								
	Basic Infrastructure	$7,480	$1,400	$1,100	$1,100	$1,100	$1,100	$1,100
	Lab Results	$0	$800	$400	$400	$400	$400	$400
	Medication History	$0	$800	$300	$300	$300	$300	$300
	Clinical Documents - Discharge Summary	$0	$800	$400	$400	$400	$400	$400
Total Expense		$7,480	$3,800	$2,200	$2,200	$2,200	$2,200	$2,200
	Cumulative Expense	$7,480	$11,280	$13,480	$15,680	$17,880	$20,080	$22,280
Benefits								
Penetration Rate								
	Lab Results	0.00%	0.46%	13.80%	20.70%	20.70%	20.70%	20.70%
	Medication History	0.00%	2.00%	60.00%	90.00%	90.00%	90.00%	90.00%
	Discharge Summary	0.00%	0.64%	19.20%	28.80%	28.80%	28.80%	28.80%
AHCCCS Expected Benefits								
	Basic Infrastructure							
	Lab Results	$0	$20	$601	$902	$902	$902	$902
	Medication History	$0	$493	$14,786	$22,179	$22,179	$22,179	$22,179
	Discharge Summary	$0	$0	$0	$0	$0	$0	$0
AHCCCS Annual Benefits		$0	$513	$15,387	$23,081	$23,081	$23,081	$23,081
AHCCCS Annual Net Benefits		-$7,480	-$3,287	$13,187	$20,881	$20,881	$20,881	$20,881
AHCCCS Cumulative Net Benefits		-$7,480	-$10,767	$2,420	$23,301	$44,182	$65,063	$85,943
AHCCCS ROI		-100.00%	-95.45%	17.95%	148.60%	247.10%	324.02%	385.74%
Industry Expected Benefits								

Basic Infrastructure							
Lab Results	$0	$159	$4,986	$7,603	$7,603	$7,603	$7,603
Medication History	$0	$493	$14,786	$22,179	$22,179	$22,179	$22,179
Discharge Summary	$0	$37	$1,111	$1,667	$1,667	$1,667	$1,667
Eligibility	$0						
Industry Annual Benefits	$0	$689	$20,883	$31,449	$31,449	$31,449	$31,449
Industry Annual Net Benefits	-$7,480	-$3,111	$18,683	$29,249	$29,249	$29,249	$29,249
Industry Cumulative Net Benefits	-$7,480	-$10,591	$8,092	$37,340	$66,589	$95,837	$125,086

Sustainability

HIeHR Financing Summary ($000)							
Fiscal Year	2008	2009	2010	2011	2012	2013	2014
Project Expense							
Basic Infrastructure	$7,480	$1,400	$1,100	$1,100	$1,100	$1,100	$1,100
Lab Results	$0	$800	$400	$400	$400	$400	$400
Discharge Summary	$0	$800	$300	$300	$300	$300	$300
Medication History	$0	$800	$400	$400	$400	$400	$400
Total Expenses	$7,480	$3,800	$2,200	$2,200	$2,200	$2,200	$2,200
Revenues							
Federal Funds			$180				
Appropriations - State Matching Funds			$20				
Fees @ $.15 PMPM	$0	$0	$0	$1,746	$1,746	$1,746	$1,746
Re-Distribution of Operations Funding			$600	$600	$600	$600	$600
Net Program Savings Shared through Appropriation @5%	$0	$0	$0	$1,044	$1,044	$1,044	$1,044
Grants	$7,480	$3,800	$1,400				
Total Revenue	$7,480	$3,800	$2,200	$3,390	$3,390	$3,390	$3,390
AHCCCS Net Revenue and Savings	$0	$0	$0	$1,190	$1,190	$1,190	$1,190

9. Appendix C: Top 100 Laboratory Tests Reviewed as Potential duplicates.

Procedure Code Description	Duplicate Procedure Count	Cost of Second Procedure	Cost/ procedure	Day Limit	Multiple Laborator
84443 - THYROID STIMULATING HORMONE (TSH)	2,593	$47,531.59	18.33073	30	No
80061 - LIPID PANEL	2,091	$42,796.73	20.46711	30	No
87880 - INFECTIOUS AGENT DETECTION BY IMMUNOASSAY WITH DIRECT OPTICAL OBSERVATION;	2,563	$34,046.45	13.28383	30	No
82728 - FERRITIN	1,272	$26,809.09	21.07633	30	No
83036 - HEMOGLOBIN; GLYCOSYLATED (A1C)	1,300	$23,072.69	17.74822	30	No
87522 - INFECTIOUS AGENT DETECTION BY NUCLEIC ACID (DNA OR RNA); HEPATITIS C,	160	$21,315.54	133.2221	30	No
88112 - CYTOPATHOLOGY, SELECTIVE CELLULAR ENHANCEMENT TECHNIQUE WITH INTERPRETATION	284	$18,429.61	64.89299	30	No
80050 - GENERAL HEALTH PANEL	354	$17,818.54	50.33486	30	No
83550 - IRON BINDING CAPACITY	1,376	$15,525.18	11.28283	30	No
87536 - INFECTIOUS AGENT DETECTION BY NUCLEIC ACID (DNA OR RNA); HIV-1, QUANTIFICATION	112	$14,119.47	126.0667	30	No
83540 - IRON	1,582	$14,068.16	8.892642	30	No
83615 - LACTATE DEHYDROGENASE (LD), (LDH);	1,859	$13,352.53	7.182641	30	No
84439 - THYROXINE; FREE	514	$13,187.08	25.6558	30	No
87497 - INFECTIOUS AGENT DETECTION BY NUCLEIC ACID (DNA OR RNA); CYTOMEGALOVIRUS,	104	$12,826.66	123.3333	30	No
86300 - IMMUNOASSAY FOR TUMOR ANTIGEN, QUANTITATIVE; CA 15-3 (27.29)	297	$12,578.13	42.35061	30	No
87800 - INFECTIOUS AGENT DETECTION BY NUCLEIC ACID (DNA OR RNA), MULTIPLE ORGANISMS;	178	$12,299.80	69.1	30	No
84550 - URIC ACID; BLOOD	1,491	$9,877.49	6.624742	30	No
87070 - CULTURE, BACTERIAL; ANY OTHER SOURCE EXCEPT URINE, BLOOD OR STOOL, AEROBIC,	848	$9,294.82	10.96087	30	No
83880 - NATRIURETIC PEPTIDE	361	$7,565.94	20.95828	30	No

87088 - CULTURE, BACTERIAL; WITH ISOLATION AND PRESUMPTIVE IDENTIFICATION OF EACH ISOLAT	1,071	$7,144.11	6.670504	30	No
84703 - GONADOTROPIN, CHORIONIC (HCG); QUALITATIVE	1,342	$6,252.92	4.659404	30	No
84153 - PROSTATE SPECIFIC ANTIGEN (PSA); TOTAL	215	$6,179.02	28.73963	30	No
84134 - PREALBUMIN	258	$6,049.83	23.44895	30	No
82570 - CREATININE; OTHER SOURCE	554	$5,867.83	10.59175	30	No
86850 - ANTIBODY SCREEN, RBC, EACH SERUM TECHNIQUE	578	$5,418.45	9.374481	30	No
82607 - CYANOCOBALAMIN (VITAMIN B-12);	197	$5,212.79	26.46086	30	No
86901 - BLOOD TYPING; RH (D)	1,392	$4,956.73	3.560869	30	No
80074 - ACUTE HEPATITIS PANEL	44	$4,900.48	111.3745	30	No
87209 - SMEAR, PRIMARY SOURCE WITH INTERPRETATION; COMPLEX SPECIAL STAIN (EG, TRICHROME,	326	$4,849.77	14.8766	30	No
86038 - ANTINUCLEAR ANTIBODIES (ANA);	237	$4,659.98	19.66236	30	No
84478 - TRIGLYCERIDES	462	$4,614.79	9.988723	30	No
84156 - PROTEIN, TOTAL, EXCEPT BY REFRACTOMETRY; URINE	391	$4,450.48	11.3823	30	No
85060 - BLOOD SMEAR, PERIPHERAL, INTERPRETATION BY PHYSICIAN WITH WRITTEN REPORT	191	$4,405.45	23.06518	30	No
82677 - ESTRIOL	84	$4,175.46	49.70786	30	No
85007 - BLOOD COUNT; BLOOD SMEAR, MICROSCOPIC EXAMINATION WITH MANUAL DIFFERENTIAL WBC	1,066	$4,010.19	3.761904	30	No
87177 - OVA AND PARASITES, DIRECT SMEARS, CONCENTRATION AND IDENTIFICATION	347	$4,008.64	11.55228	30	No
87040 - CULTURE, BACTERIAL; BLOOD, AEROBIC, WITH ISOLATION AND PRESUMPTIVE	701	$3,977.89	5.674593	30	No
84436 - THYROXINE; TOTAL	302	$3,778.50	12.51159	30	No
82465 - CHOLESTEROL, SERUM OR WHOLE BLOOD, TOTAL	332	$3,593.46	10.82367	30	No
84146 - PROLACTIN	77	$3,529.72	45.84052	30	No
84403 - TESTOSTERONE; TOTAL	83	$3,429.22	41.3159	30	No
80055 - OBSTETRIC PANEL	29	$3,348.72	115.4731	30	No
84450 - TRANSFERASE; ASPARTATE AMINO (AST) (SGOT)	858	$3,151.09	3.672599	30	No
87205 - SMEAR, PRIMARY SOURCE WITH INTERPRETATION; GRAM OR GIEMSA STAIN FOR BACTERIA,	492	$3,016.00	6.130081	30	No
82306 - CALCIFEDIOL (25-OH VITAMIN D-3)	44	$2,873.51	65.30705	30	No

82550 - CREATINE KINASE (CK), (CPK); TOTAL	2,813	$2,866.40	1.018983	30	No
86701 - ANTIBODY; HIV-1	121	$2,822.36	23.32529	30	No
82784 - GAMMAGLOBULIN; IGA, IGD, IGG, IGM, EACH	163	$2,774.46	17.02123	30	No
82542 - COLUMN CHROMATOGRAPHY/MASS SPECTROMETRY (EG, GC/MS, OR HPLC/ MS), ANALYTE NOT	111	$2,727.73	24.57414	30	No
83001 - GONADOTROPIN; FOLLICLE STIMULATING HORMONE (FSH)	62	$2,480.20	40.00323	30	No
82746 - FOLIC ACID; SERUM	105	$2,436.06	23.20057	30	No
84481 - TRIIODOTHYRONINE T3; FREE	63	$2,280.46	36.19778	30	No
85390 - FIBRINOLYSINS OR COAGULOPATHY SCREEN, INTERPRETATION AND REPORT	127	$2,273.06	17.89811	30	No
82232 - BETA-2 MICROGLOBULIN	38	$2,254.94	59.34053	30	No
84479 - THYROID HORMONE (T3 OR T4) UPTAKE OR THYROID HORMONE BINDING RATIO (THBR)	169	$2,238.62	13.24627	30	No
84466 - TRANSFERRIN	137	$1,911.27	13.95088	30	No
82533 - CORTISOL; TOTAL	59	$1,899.55	32.19576	30	No
86225 - DEOXYRIBONUCLEIC ACID (DNA) ANTIBODY; NATIVE OR DOUBLE STRANDED	53	$1,854.64	34.99321	30	No
86301 - IMMUNOASSAY FOR TUMOR ANTIGEN, QUANTITATIVE; CA 19-9	46	$1,766.95	38.41196	30	No
86677 - ANTIBODY; HELICOBACTER PYLORI	37	$1,758.02	47.51405	30	No
84520 - UREA NITROGEN; QUANTITATIVE	660	$1,694.32	2.567152	30	No
83002 - GONADOTROPIN; LUTEINIZING HORMONE (LH)	42	$1,685.04	40.12	30	No
87621 - INFECTIOUS AGENT DETECTION BY NUCLEIC ACID (DNA OR RNA); PAPILLOMAVIRUS, HUMAN,	22	$1,558.86	70.85727	30	No
85025 - BLOOD COUNT; COMPLETE (CBC), AUTOMATED (HGB, HCT, RBC, WBC AND PLATELET COUNT)	52,281	$283,879.81	5.429885	7	Yes
80053 - COMPREHENSIVE METABOLIC PANEL	25,664	$199,083.10	7.75729	7	No
84702 - GONADOTROPIN, CHORIONIC (HCG); QUANTITATIVE	4,065	$82,614.46	20.32336	7	Yes
87491 - INFECTIOUS AGENT DETECTION BY NUCLEIC ACID (DNA OR RNA); CHLAMYDIA TRACHOMATIS,	945	$34,629.04	36.64449	7	Yes
87591 - INFECTIOUS AGENT DETECTION BY NUCLEIC ACID (DNA OR RNA); NEISSERIA GONORRHOEAE,	912	$33,897.53	37.16834	7	Yes
80202 - VANCOMYCIN	1,331	$31,735.77	23.84355	7	No

81001 - URINALYSIS, BY DIP STICK OR TABLET REAGENT FOR BILIRUBIN, GLUCOSE, HEMOGLOBIN,	7,831	$17,962.25	2.293736	7	Yes
84100 - PHOSPHORUS INORGANIC (PHOSPHATE);	2,457	$13,932.84	5.670672	7	Yes
81003 - URINALYSIS, BY DIP STICK OR TABLET REAGENT FOR BILIRUBIN, GLUCOSE, HEMOGLOBIN,	6,609	$11,863.62	1.79507	7	Yes
80185 - PHENYTOIN; TOTAL	990	$11,362.76	11.47754	7	Yes
86140 - C-REACTIVE PROTEIN;	1,018	$11,290.55	11.09091	7	Yes
81000 - URINALYSIS, BY DIP STICK OR TABLET REAGENT FOR BILIRUBIN, GLUCOSE, HEMOGLOBIN, K	2,978	$10,124.18	3.399657	7	Yes
82977 - GLUTAMYLTRANSFERASE, GAMMA (GGT)	900	$9,282.50	10.31389	7	Yes
85730 - THROMBOPLASTIN TIME, PARTIAL (PTT); PLASMA OR WHOLE BLOOD	2,347	$9,189.24	3.915313	7	Yes
85652 - SEDIMENTATION RATE, ERYTHROCYTE; AUTOMATED	1,428	$8,970.10	6.281583	7	Yes
87340 - INFECTIOUS AGENT ANTIGEN DETECTION BY ENZYME IMMUNOASSAY TECHNIQUE, QUALITATIVE	673	$8,744.87	12.99386	7	Yes
87902 - INFECTIOUS AGENT GENOTYPE ANALYSIS BY NUCLEIC ACID (DNA OR RNA); HEPATITIS C	25	$8,501.15	340.046	7	Yes
81025 - URINE PREGNANCY TEST, BY VISUAL COLOR COMPARISON METHODS	3,424	$8,183.99	2.390184	7	Yes
80076 - HEPATIC FUNCTION PANEL	989	$7,831.92	7.919029	7	Yes
85027 - BLOOD COUNT; COMPLETE (CBC), AUTOMATED (HGB, HCT, RBC, WBC AND PLATELET COUNT)	2,502	$6,617.51	2.644888	7	Yes
85045 - BLOOD COUNT; RETICULOCYTE, AUTOMATED	679	$4,118.41	6.065405	7	Yes
84460 - TRANSFERASE; ALANINE AMINO (ALT) (SGPT)	533	$2,485.03	4.662345	7	Yes
86580 - SKIN TEST; TUBERCULOSIS, INTRADERMAL	263	$2,274.95	8.65	7	Yes
86635 - ANTIBODY; COCCIDIOIDES	84	$2,116.80	25.2	7	Yes
84402 - TESTOSTERONE; FREE	27	$1,641.46	60.79481	7	Yes
87798 - INFECTIOUS AGENT DETECTION BY NUCLEIC ACID (DNA OR RNA), NOT OTHERWISE	26	$1,610.05	61.925	7	Yes
86803 - HEPATITIS C ANTIBODY;	57	$1,563.62	27.43193	7	Yes
86592 - SYPHILIS TEST; QUALITATIVE (EG, VDRL, RPR, ART)	263	$1,461.07	5.555399	7	Yes
83655 - LEAD	59	$1,454.59	24.65407	7	No

87210 - SMEAR, PRIMARY SOURCE WITH INTERPRETATION; WET MOUNT FOR INFECTIOUS AGENTS (EG,	486	$1,421.82	2.925556	7	Yes
86800 - THYROGLOBULIN ANTIBODY	48	$1,386.28	28.88083	7	Yes
87521 - INFECTIOUS AGENT DETECTION BY NUCLEIC ACID (DNA OR RNA); HEPATITIS C, AMPLIFIED	12	$1,380.78	115.065	7	Yes
86706 - HEPATITIS B SURFACE ANTIBODY (HBSAB)	62	$1,290.82	20.81968	7	Yes
86431 - RHEUMATOID FACTOR; QUANTITATIVE	92	$1,193.90	12.97717	7	Yes
86696 - ANTIBODY; HERPES SIMPLEX, TYPE 2	27	$1,152.52	42.68593	7	Yes
87081 - CULTURE, PRESUMPTIVE, PATHOGENIC ORGANISMS, SCREENING ONLY;	1,139	$11,272.26	9.896629	1	Yes
87184 - SUSCEPTIBILITY STUDIES, ANTIMICROBIAL AGENT; DISK METHOD, PER PLATE (12 OR	462	$3,769.34	8.158745	1	Yes