Standards Insight

An Analysis of Health Information Standards Development Initiatives

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Estimating the Costs of NHIN Functions and Interoperability

Introduction

A recent study generated widespread attention with its estimate that a functional and interoperable National Health Information Network (NHIN) would require an investment of $156 billion over five years. The authors assured us that this is only 2 percent of total healthcare spending. In addition, the study estimated annual operating costs of $48 billion. Not stated is that if one amortized the capital expenses and added operating costs, total annual costs of the NHIN would be $79 billion, a number three times greater than current HIT spending estimates. A closer reading suggests that the "interoperability" component would cost $53 billion in the first year followed by annual operating costs of $21 billion. How should we interpret such estimates and what value do they bring toward moving forward the development and funding of the NHIN?

Some Details on the Study

The study, "The Costs of a National Health Information Network" by Rainu Kaushal et. al. was published in the *Annals of Internal Medicine* in August, 2005.[1] Its methodology created an NHIN model, used experts to estimate baseline adoption and costs by segment, and then projected the funds necessary to build the proposed NHIN model in five years. Key assumptions were that an NHIN consists of seven primary functions (results reporting, electronic health record, computerized provider order entry (CPOE), claims

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[1] Ann Intern Med. 2005; 143:165-173

and eligibility (apparently double counting HIPAA), patient communications and electronic prescribing. Unlike other estimates, discussed below, this study explicitly included estimates for skilled nursing facilities (SNF) and home health agencies, along with physician practices, hospitals and other providers such as labs and pharmacies. The study used the Santa Barbara County Care Data Exchange (SBCCDE) as the interoperability model. Finally the study noted its limitations, principally not having any primary data but relying on expert opinion as to costs and the model.

The study suggested that implementing the seven primary functions in all the provider segments would cost $103 billion in total capital given their assumptions of current adoption and then $27 billion a year in operating costs. The authors estimate that this exceeds "planned" investments by $79 billion and "planned" operating costs by $20 billion per year. Table 1 shows a breakdown of costs by segments.

Table 1. Costs of NHIN (From Kaushal et. al.)

In Billions	Total	Hospitals	Physician Practices	SNF	Others
Capital Costs					
Functions	$103	$51	$18	$31	$3
Interoperability	$53	$2	$31	$5	$15
	$156	$53	$49	$36	$18
Operating Costs					
Functions	$27	$13	$4	$8	$3
Interoperability	$21	$1	$11	$2	$7
	$48	$14	$15	$10	$10

To grow the SBCCDE model, which is a brokered peer to peer network, into the NHIN, the study estimated year 1 costs of $53 billion, and $21 billion in operating expenses thereafter. This model expects physician practices, because they are most numerous, to pay for more than half of the interoperability infrastructure and operating costs, based on Santa Barbara's experience. The model expects each physician practice, for example, to acquire and run a dedicated server to respond to queries for patient data. Here we begin to see some real problems with the model. Now we will compare it to two other estimates.

Comparisons

The Center for Information Technology Leadership (CITL) estimated that a Level 4 NHIN would cost $276 billion over 10 years and $17 billion in operating costs in subsequent years.[2] They too assumed that the NHIN would be adopted in five years but for their purpose used a ten year total to better match costs to expected benefits. The study also split its cost estimates between functions and interoperability. The study did

[2] J Walker et. al. The Value of Health Care Information Exchange and Interoperability. Health Affairs. Web Exclusive: January 19, 2005 W5 -10-18. We note that there is overlap in authors, affiliations, contributors, etc. with the Kaushal article, both from the Harvard school. The *Standards Insight* discussed the CITL study in the April 2004 edition.

not explicitly include skilled nursing facilities or home care agencies. In the case of functionality, the study projected that physician practices and hospitals would spend $190 billion in capital and $11 billion annually in operating costs for "functionality." In the case of interoperability, ten year roll-out costs were estimated at $76 billion (plus $10 billion from other stakeholders) and subsequent annual operating costs were $5 billion (plus $0.5 billion from other stakeholders).

We have also made estimates of the cost of enterprise and practice-based clinical information systems. The former is based on tracking announced contracts for enterprise clinical systems over the last several years. We found that, on average, such systems cost $60,000 per hospital bed (plus or minus $35,000 primarily reflecting the extent of included outpatient systems). Thus total hospital "functional" capital spending, based on total hospital beds, would be about $50 billion. We took a different approach to estimating physician practice' spending on electronic health record (EHR) and other clinical systems. The CITL study of ambulatory CPOE (e-prescribing) estimated that the five year costs of advanced (EHR-based) systems ranged from $36,000 per physician for groups with 50 or more physicians, to over $500,000 for physicians in solo practices. When multiplied through by the number of practices of the different sizes, the CITL estimate produces $92 billion in total 5 year costs for all practices. We believe that this approach is fatally flawed in expecting that such diseconomies of scale would result in any small practice adoption. We assume rather that smaller practices would pay no more than $10,000 per physician per year, a figure within the expected range of financial incentives, compared to large practices spending $7,000 per physician per year. This change reduces the 5 year total spending by physician practices to $20 billion. We could further estimate that of the $20 billion spent over 5 years, $10 billion is the capital amortization and $10 billion is total operating expenses to making our numbers comparable to Kaushal et. al. However, we have noted in past analyses that it is most unlikely that small practices, e.g., those with less than 10 physicians and accounting for 75 percent of all physicians, will invest in, operate and support their own clinical systems. Much more likely, they will subscribe to a shared service provider, who can offer full clinical functionality and interoperability based on economies of scale.

We have also estimated the costs of NHIN interoperability based on rough estimates of the costs of the Indiana Health Information Exchange, which is a more centralized data repository approach than the SBCCDE approach. We never attempted to explicitly call out capital and operating costs but calculated an average annual cost over five years. We estimated this annualized cost of national interoperability to be about $3 billion per year.

To compare the three NHIN estimates we only use hospital and physician practice costs as shown in Table 2. If one calculates the annual costs averaged over five years, i.e., amortizing capital expenses over 5 years plus the annual operating costs, we can see a range of estimates. The annual costs of functional systems range from our $27 billion and Kaushal's $31 billion to the $50 billion estimated by CITL. The annual costs of interoperability range from a nominal $3 billion in our estimate, to CITL's $15 billion to Kaushal's $19 billion. If one adjusted the CITL practice costs, as discussed above, and assumed that Kaushal's interoperability operating costs are too high, particularly as

applied to physician practices, we could narrow the range for total NHIN costs to around $30 to $35 billion a year for hospitals and physician practices.

Table 2. NHIN Costs to Hospitals and Physician Practices - Comparisons Between Models

	Kaushal			CITL*			Standards Insight		
	Hospitals	Physicans	Total	Hospitals	Physicans	Total	Hospitals	Physicans	Total
Capital Investment									
Functions	$51.0	$18.0	$69.0	$19.0	$92.0	$111.0	$50.0	$10.0	$60.0
Interoperabilty	$2.0	$31.0	$33.0	$25.0	$25.0	$50.0			$0.0
Total	$53.0	$49.0	$102.0	$44.0	$117.0	$161.0	$50.0	$10.0	$60.0
Annual 5 Yr Average	$10.6	$9.8	$20.4	$8.8	$23.4	$32.2	$10.0	$2.0	$12.0
Annual Operating Expenses									
Functions (Assume 25% of capital)	$13.0	$4.0	$17.0	$4.8	$23.0	$27.8	$12.5	$2.5	$15.0
Interoperability	$1.0	$11.0	$12.0	$2.5	$2.5	$5.0	$2.0	$1.0	$3.0
Annual Total Operating Expenses	$14.0	$15.0	$29.0	$7.3	$25.5	$32.8	$14.5	$3.5	$18.0
Annual Average (Capital + Operating)									
Functions	$23.2	$7.6	$30.8	$8.6	$41.4	$50.0	$22.5	$4.5	$27.0
Interoperability	$1.4	$17.2	$18.6	$7.5	$7.5	$15.0	$2.0	$1.0	$3.0
Total	$24.6	$24.8	$49.4	$16.1	$48.9	$65.0	$24.5	$5.5	$30.0

All Figures in Billions
*Author extraopolated or calculated some numbers to fit the comparative framework.

This still represents a significant increase from current HIT spending levels by hospitals and physicians. If hospitals average 2.5 percent of their operating costs on IT, then they are spending about $15 billion this year, more if one nets out current capital investment from historic depreciation. Several sources, including the HIMSS 2005 Annual Leadership Survey, suggest that two-thirds or more of hospitals have begun investing in enterprise clinical systems. However, it is unlikely that physicians are spending more than $2 to $3 billion a year, virtually none on clinical functions. Apparently we have a big gap, so where do we go from here?

Closing Thoughts

I would suggest three thoughts for consideration.

First, revising these estimates is unlikely to gain upfront commitments for funding the full NHIN. If this study is meant as a bargaining chip to show policy makers how much an NHIN will cost or how physician practices will bear the brunt, it is not likely to win over many supporters. We should focus on incentives for key functions and segments for which we have evidence of benefit and on gaining federal funding for the essential technical infrastructure. Unfortunately, we know more about system functions than we do about interoperability infrastructure. The Office of the National Coordinator of Health Information Technology (ONCHIT) wants to give precedence to interoperability over function but at the same time it is just starting three-year projects to evaluate possible approaches to create the interoperability infrastructure. No one would feel comfortable, based on a dozen operational data exchanges as described in the September eHealth Initiative report, about asking for $150 billion over the next ten years for a data exchange based infrastructure. By producing a large enough number and complex enough program, we will paralyze any meaningful action by Washington.

Second, we need to develop a consensus roadmap with phases and transition plans, recognizing that many hospitals and health systems are well on their way to implementing a fully functional system and that physician practices will begin adopting e-prescribing as Medicare rolls it out in 2006. A roadmap allows us to take on complex and costly investments in steps. As described above, we are moving into a period of trial projects that in most respects will freeze infrastructure investments for the next three years. We cannot let these projects or the lack of interoperability standards, stop current HIT investments that can save lives and reduce costs within organizations today, even if they cannot interoperate with other enterprises. If we are convinced that small physician practices will not or should not invest in clinical systems until all the data exchange infrastructure is in place, we will miss the chance to use the e-prescribing roll-out to implement medication and medical histories. If we think that without a complete EHR, fully encoded with standardized terminology we cannot have interoperable systems, we will miss the chance to better understand how to share results and documents among provider organizations. The roadmap guides the transitional steps from here to the NHIN.

Finally, we must take a hard look at what we want in terms of interoperability. Does interoperability between provider systems really cost $25 to $30 billion a year, or as much as we spend today on all of HIT? What type of new industry are we trying to create? Does every state and region have to reproduce the organization, staffing and resources of Santa Barbara County? Do we really expect to save $87 billion a year through automating data exchange? It would be hard to imagine that Health Level Seven (HL7), SNOMED, DICOM and all the other standards developers and implementers spend more than $100 million a year, even counting their volunteer members. How do we leverage and scale these investments into a self-operating medical Internet? And how do we do it in a phased, step-wise manner that can actually be implemented?

The $156 billion estimate is a good wake-up call even if it is not our capital and operating budget.

Please direct any questions, suggestions or comments regarding *Standards Insight* to Joyce Sensmeier, MS, RN, BC, CPHIMS, FHIMSS, vice president of informatics at HIMSS, via jsensmeier@himss.org or to its author Ed Larsen at erlarsen@erlinc.com.