The Cost-Effectiveness of Improving Cancer Screening Compliance

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Background

- Cancer care spending in the US has increased dramatically over recent decades (from $13.1 billion in 1980 to $104.1 billion in 2006), albeit with much controversy over the sufficiency of the benefit.[1-3]
- Cancer screening may reduce cancer-related morbidity.[4,5] Improving preventive care, including cancer screening, has been proposed by the current administration as a way to reduce costs.[6]
- The Healthcare Effectiveness Data and Information Set (HEDIS), a group of evidence-based performance measures, are used by over 90% of US managed care health plans. The measures cover the majority of the most costly conditions in the US, include several cancer screening measures, and are used as the focus of many quality improvement (QI) programs.[7,8]
- We aimed to determine if money spent improving cancer screening would provide greater benefit than improving other aspects of healthcare.

Methods

- We developed a framework to incorporate both cost of QI and cost-effectiveness of interventions with a single measure, **the QI-adjusted incremental cost-effectiveness ratio (QI-adjusted ICER)**. We used this framework to examine 18 HEDIS 2010 quality measures.

Literature Review

- We reviewed cost-effectiveness analyses (CEAs) found in PubMed, the Tufts CEA Registry, and bibliographies of key articles.
  - We included English research articles published since 1998, that considered the cost-effectiveness of complying versus not complying with a HEDIS measure, and that reported results such that costs and benefits of compliance could be calculated.
  - From each accepted CEA, we abstracted total cost, effectiveness, cost-effectiveness, incremental cost-effectiveness, and per-treated person cost of the intervention.
- In a separate search, we identified the cost of QI initiatives to improve performance on HEDIS measures.

Model

- Using US Census data[9] and condition-specific incidence, we calculated total annual costs (2010 USD [$]) and benefits (quality-adjusted life years [QALYs]) associated with moving from 2010 HEDIS compliance rates to 95% compliance.
- **QI-adjusted ICER = [expected cost of alternative + expected QI cost – expected cost of status quo] ÷[expected benefit of alternative – expected benefit of status quo].**
- ICERs were reported for those measures representing a tradeoff (i.e., between greater cost and greater health, or cost savings and worse health).

Model Inputs for Cancer Screening Measures as an Example

Source	Model Element	Cervical	Breast	Colon
US Census data[9]	Eligible population	93,384,225	58,825,641	87,812,078
National Committee for Quality Assurance[7]	2010 HEDIS compliance	77.3%	71.3%	60.7%
Calculated	Persons needed for 95% compliance	16,529,008	13,941,677	30,119,543
Maxwell[10] (cervical), Stout[11] (breast), Macosiek[12] (colon)	Annual per person steady state cost[a]	$7.93[b]	$127.81[c]	$45.71[d]
Roetzheim[13] (cervical, breast, colon), Lairson[14] (colon)	Per-person QI cost (i.e., cost of program to improve screening)	$16.10	$63.25	$23.55
Calculated	Per-treated-person cost	$24.03	$191.06	$69.26
Calculated	Additional annual cost of 95% compliance	$397,141,458	$2,663,710,610	$2,085,969,788
Calculated	Annual benefit of 95% compliance	25,683 QALYs	41,267 QALYs	90,730 QALYs
Calculated	**QI-adjusted ICER**	**$15,463/QALY**	**$64,549/QALY**	**$22,991/QALY[c]**

[a]Calculation method for each measure differed depending on the elements available in the literature.
[b]Mean cost with screening ÷ Mean life expectancy with screening – Mean cost without screening ÷ Mean life expectancy without screening.
[c](Cost with screening – cost without screening over study population) ÷ Study population ÷ 10 year screening period discounted 3%.
[d]Cost per life year saved with screening X Life years saved with screening ÷ Number of life years above age 50 per 4 million birth cohort.

- We assumed per-person QI costs did not change with compliance and varied this in sensitivity analyses.

Results

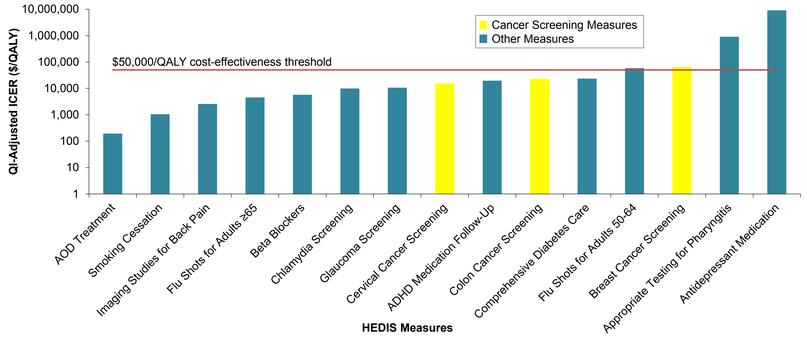
- The literature search yielded 1,901 CEAs; 1,629 were excluded, and the remaining 272 were reviewed.
- Reaching 95% compliance with the 3 cancer measures would cost $5.1 billion and add 160,000 QALYs ($32,641/QALY).
- Reaching 95% compliance with all 18 measures would cost $13.4 billion and add 5.8 million QALYs ($2,313/QALY).

Overall Value of Improving HEDIS Compliance

Measure	Cost-Effectiveness of Intervention	Additional Annual Cost (Savings) of 95% Compliance	Annual Benefit (Decrement) of 95% Compliance	QI-Adjusted ICER[a]
	$/QALY	$ Millions/Year	QALYs	$/QALY
Overuse				
Appropriate Upper Respiratory Infection (URI) Treatment		(65)	n/a[b]	
Antibiotics for Acute Bronchitis		(11)	n/a[b]	
Appropriate Testing for Pharyngitis	(911,271)	(82)	(90)	911,271[c]
Imaging Studies for Back Pain	(2,750)	(455)	(176,915)	2,570[c]
All Overuse Measures		**(613)**	**(177,005)**	**3,465[c]**
Cancer Screening				
Cervical Cancer Screening	5,102	397	25,683	15,463
Breast Cancer Screening	43,180	2,664	41,267	64,549
Colon Cancer Screening	15,173	2,086	90,730	22,991
All Cancer Screening Measures		**5,147**	**157,680**	**32,641**
Immunization				
Childhood Immunizations		(368)	4,357	
Flu Shots for Adults ≥65	1,245	211	46,385	4,544
Flu Shots for Adults 50-64	35,616	1,348	23,075	58,420
All Immunization Measures		**1,191**	**73,817**	**16,128**
Other Screening				
Chlamydia Screening	2,985	176	17,762	9,910
Glaucoma Screening	10,634	24	2,212	10,634
All Other Screening Measures		**200**	**19,974**	**9,990**
Other Treatment				
Alcohol or Drug (AOD) Treatment	195	890	4,560,579	195
Smoking Cessation	1,051	1,034	983,162	1,051
Beta Blockers	5,733	9	1,534	5,733
Antidepressant Medication	16,274	1,402	154	9,075,868
Attention Deficit/Hyperactivity Disorder (ADHD) Medication Follow-Up	19,669	12	618	19,669
Comprehensive Diabetes Care	23,523	4,141	176,033	23,523
All Other Treatment Measures		**7,487**	**5,722,080**	**1,308**
Total		**13,411**	**5,796,546**	Overall **2,314**
				Median **15,463**

[a]ICER reported only for measures with either cost and health benefit, or savings and health decrement.
[b]No clinical benefit identified.
[c]Negative benefit (i.e., $ saved per QALY lost).

QI-Adjusted ICERs for 15 HEDIS Measures



Conclusions

- Published studies of the cost-effectiveness of cancer screening have not considered QI costs—the cost of activities needed to actually change practice—and therefore have provided unrealistically low estimates of cost-effectiveness.
- Accurate assessment of the cost of increasing cancer screening requires integration of both the cost-effectiveness of the screening tests and the cost of the QI programs needed to change practice. We developed a model which allows this assessment.
- QI costs were substantial, resulting in an increase of 50-200% in the ICER for the cancer screening measures. However, even after incorporating QI costs, the mean QI-adjusted ICER for the these three measures was $32,641/QALY, suggesting that improving cancer screening compliance is cost-effective at a $50,000/QALY willingness-to-pay threshold.
- Our analysis shows that complying with cancer screening measures is cost-effective, even considering the resources required to change established practices.
- Other findings:
  - Improving care on HEDIS measures overall is very cost-effective with a mean QI-adjusted ICER of $2,314/QALY.
  - Improving compliance with the measures that address overuse of care may save money. The addition of HEDIS measures that address other overused procedures may be an effective approach for reducing healthcare spending.

Limitations

- Our finding that cancer screening is cost-effective is, at least in part, a function of the specific cancer screens included in HEDIS. For example, prostate-specific antigen screening for prostate cancer, which is not included in HEDIS, has an ICER of $262,758 per life-year saved, suggesting that our results could overestimate the true cost-effectiveness of cancer screening.[5]
- Incremental costs and effects of compliance with HEDIS measures are based on a set of simplifying assumptions, the most important one being that costs increase linearly with increasing compliance. We varied this assumption in sensitivity analysis, and found the mean QI-adjusted ICERs among the cancer screening measures ranged from $16,966/QALY to $70,890/QALY.
- Estimates of QI cost were derived from small studies. These costs may vary widely from institution to institution or across regions.

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