Estimating Costs in a Cost-effectiveness Analysis: Adherence to Health Technology Assessment Guidance

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BACKGROUND

- The results of a cost-effectiveness analysis (CEA) may be sensitive to the disease-related cost inputs used in the analysis.
- The National Institute for Health and Care Excellence guidance for performing CEAs recommends a systematic search for costing sources. This guidance also recommends providing the rationale for the selection of the costs used for the analysis from among the data identified in the systematic search or obtained from a primary data source.[1]
- Similar guidance is given in the United States (US) Academy of Managed Care Pharmacy guidelines, which recommend that "the process for identifying, evaluating, and selecting all of the data in the model should be clear and systematic."[2]

OBJECTIVES

- To determine the extent to which a systematic approach was used to select disease-related cost estimates for inclusion in CEAs in the US for hepatitis C virus (HCV) screening or treatments.
- To determine whether a rationale was provided for the selected costs for the base-case and sensitivity analyses.

METHODS

- Systematic literature searches were performed to identify the following:
  - Primary costing studies for different stages of liver disease among those with chronic HCV infection in the US
  - Cost-effectiveness analyses for HCV screening or treatment in a US population
- The MEDLINE, EconLit, Embase, BIOSIS, and Cochrane Library electronic databases were searched for English-language articles published between January 1, 1995 and April 30, 2014. Bibliographic searches of all full-text documents reviewed were also searched for further studies.
- Search terms included medical subject heading (MeSH) terms including Hepatitis C, Cost and Cost Analysis, Cost-Benefit Analysis, and Economics, as well as related free-text terms.
- Two reviewers performed both a level 1 screening of the titles and abstracts identified in the electronic or bibliographic searches and a level 2 screening of the full-text articles that passed the level 1 screening.
- The included articles presented estimates of the US costs of care for compensated liver disease (Metavir fibrosis stages F0-F4), decompensated liver disease, hepatocellular carcinoma, and liver transplantation among those with chronic HCV infection.

RESULTS

- The systematic literature searches and screening identified 1,574 abstracts for level 1 screening, 279 full text articles for level 2 screening, and 46 articles for inclusion in the review, of which 29 were US CEAs (Table 1).
- In the studies reviewed that presented primary cost data, there was a wide range of values for the cost of care by disease stage, especially for compensated liver disease.
  - Earlier estimates of annual incremental costs for compensated liver disease ranged from $97 to $425;[3,4] later estimates ranged from $2,228 to $3,211.[5]
- In none of the CEAs was a systematic review described as the method used to identify available primary cost data sources; however, a literature review was reported in five studies.
- No rationale for the cost data source chosen was given in seven of the CEAs, and the rationale given in six other studies indicated only "published studies" without any indication of their quality.
- In 15 of the CEAs, the cost estimates used were either taken directly or derived from a single recent primary cost study.
- In 10 of the CEAs, some cost estimates were taken from studies not restricted to those with HCV infection.
- Primary cost estimates were adjusted to current values in most of the CEAs. Four CEAs made other adjustments including subtracting pharmacy costs from a database study for those with compensated disease stages to avoid double counting the costs of antiviral treatment; adjusting the reported allowable hospital costs for the commercial plans down using a cost-to charge ratio; and converting a single estimate of F0 through F3 costs to differential costs by F0/F1, F2, and F3 based on proportions presented in a second database study. In three other studies, the derivation of the costs from the sources cited was not clear.
- In 23 of the CEAs, sensitivity analyses assumed arbitrary ranges for at least some of the cost estimates (for example, 50% to 150%); only eight of the CEAs used ranges from alternative studies for at least some of the cost estimates in the sensitivity analysis.

CONCLUSIONS

- Health technology assessment guidelines for disease-related cost input data do not appear to be followed in US cost-effectiveness studies of screening or treatment for HCV infection.
  - Very little detail is provided about the methods used to identify primary disease-related cost studies in most studies.
  - A rationale for selection of the cost data sources is not provided in all studies.
  - Arbitrary ranges for the costs are frequently used in the sensitivity analyses.
- Although the results of a CEA may be sensitive to the disease-related costs included in the model, systematic approaches have generally not been used when selecting input cost values.

REFERENCES

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Presented at:
ISPOR 17th Annual European Congress
November 8-12, 2014
Amsterdam, The Netherlands

Table 1. Summary of Derivation of Hepatitis C Virus Disease-Related Cost Data in US Cost-effectiveness Studies

Reference[a]	Method Used to Identify Cost Sources	Rationale for Cost Data Source(s) Chosen	Cost Data Source(s) Used	Changes Made to Data Source Costs	Sensitivity Analyses Ranges and Distributions
Brogan et al. (2014)	Not stated	National guidelines and published studies of managed care claims data	Primary data—treatment algorithms using national guidelines Secondary data—database studies specific to HCV	Inflated to year of study	One-way 75% to 150% PSA—triangular
Campos et al. (2007)	Not stated	Published source	Secondary data—treatment algorithms	Inflated to year of study	No sensitivity analyses for costs
Chan et al. (2013)	Not stated	Published or unpublished VA data or published treatment algorithms	Primary data—VA database Secondary data—treatment algorithms	Inflated to year of study	One-way 50% to 150% PSA—Gaussian
Chhatwal et al. (2013)	Not stated	Large database study	Secondary data—database study specific to HCV	Cost year not stated Subtracted pharmacy costs for CD; multiplied hospital costs by 0.329; second database study used to differentiate costs in F0/F1, F2, and F3 Metavir stages	One-way 75% to 125% PSA—gamma
Coffin et al. (2012)	Not stated	Treatment algorithms from expert panel and analyses of large public databases; chose lowest estimates	Secondary data, multiple sources cited—treatment algorithms; transplant costs from databases not specific to HCV	Inflated to year of study	One-way range from cited studies or 80% to 120% PSA—gamma
Del Rio et al. (2006)	Not stated	Previously published sources	Secondary data—treatment algorithms	Inflated to year of study	One-way 50% to 200% PSA—gamma
Eckman et al. (2013)	Not stated	Large database study	Secondary data—database study specific to HCV	Inflated to year of study; subtracted pharmacy costs for compensated cirrhosis	One-way 95% confidence limits of bootstrapped means PSA—not costs
Ferrante et al. (2013)	Not stated	Large retrospective database study with matched cohort	Secondary data—database study specific to HCV	Cost year not stated Subtracted pharmacy costs for CD; multiplied hospital costs by 0.329; second database study used to differentiate costs in F0/F1, F2, and F3 Metavir stages	One-way 75% to 125% PSA—gamma
Hagan et al. (2014)	Used data from recent CEAs	Recent CEAs included comprehensive reviews of cost data	Secondary data, multiple sources cited—treatment algorithms; transplant costs from databases not specific to HCV	Inflated to year of study	No sensitivity analysis for costs
Hagan et al. (2013)	Used data from recent CEAs	Recent CEAs included comprehensive reviews of cost data	Secondary data, multiple sources cited—treatment algorithms; transplant costs from databases not specific to HCV	Inflated to year of study	One-way range from cited studies or 80% to 120%
Kim et al. (1997)	Not stated	Analyses of large public databases	Secondary data—from databases not specific to HCV; supplemented with institutional data	Cost year not stated	One-way 50% to 150%
Lin et al. (2004)	Published sources not used	Primary costs represent true costs	Primary data—hospital cost accounting system Secondary data—database studies not HCV specific	Secondary data inflated to year of study	One-way 50% to 200%
Liu et al. (2011)	Extensive review of published literature and expert opinion	None provided	Secondary data—from mix of database specific to HCV and treatment algorithms	Inflated to year of study; derivation of values from cited studies not clear	One-way 50% to 150%; for CD range from published study PSA—triangular
Liu et al. (2012)	Not stated	None provided	Secondary data—from mix of database specific to HCV and treatment algorithms	Inflated to year of study; derivation of values from cited studies not clear	One-way 50% to 150%; for CD range from published study PSA—normal
Liu et al. (2013)	Not stated	None provided	Secondary data—from mix of database specific to HCV and treatment algorithms	Inflated to year of study; derivation of values from cited studies not clear	One-way 50% to 150%; for CD range from published study PSA—normal
McEwan et al. (2013)	Not stated	Costs from contemporary US sources	Secondary data—treatment algorithm for F0-F4 and database specific to HCV for advanced liver disease	Inflated to year of study	No analyses presented but standard deviations and gamma distributions
McGarry et al. (2012)	Not stated	None provided	Secondary data—treatment algorithm for F0-F4 and database specific to HCV for advanced liver disease	Inflated to year of study	No sensitivity analysis for costs
Patel et al. (2005)	MEDLINE searches and literature review	None provided	Secondary data—from mix of database and treatment algorithm studies; also mix of HCV-specific and non–HCV-specific studies	Inflated to year of study	One-way ranges from published values PSA—not stated
Rein et al. (2012)	Literature review	CD—guidelines were available DD—strongest available empirical studies	Primary—guidelines from Cleveland clinic Secondary—database studies not specific to HCV or treatment algorithms	Inflated to year of study Used 0.5 < APRI < 1.5 for moderate HCV for DD and hepatocellular carcinoma costs	One-way 50% to 150% PSA—log-normal
Saab et al. (2010)	Not stated	From published studies	Secondary—from treatment algorithms	Inflated to year of study	One-way 50% to 200%
Salomon et al. (2003)	Not stated	Published study with detailed resource use data; consistent with other studies	Secondary—from treatment algorithms	Inflated to year of study	One-way 50% to 150%
Singer et al. (2001)	Not stated	Rates from previous studies	Secondary—from database study not specific to HCV and treatment algorithms	Inflated to year of study	One-way 50% to 200%
Spiegel et al. (2005)	Not stated	Published study with detailed itemized resource data	Secondary—from treatment algorithms	Inflated to year of study	One-way varying ranges between 25% and 500% PSA—triangular
Sullivan et al. (2004)	Not stated	From published studies	Secondary—from database study not specific to HCV and treatment algorithms	Inflated to year of study	One-way 50% to 200%
Tan et al. (2008)	MEDLINE search of published literature	From the literature	Secondary—from treatment algorithms	Inflated to year of study	One-way 50% to 200%
Wong et al. (2000)	Not stated	Previously published actual variable costs for patients with HCV	Secondary—from treatment algorithms	Inflated to year of study	One-way 70% to 130% PSA—log-normal
Yeh et al. (2007)	Not stated	Expert panel of hepatologists estimated resource use for HCV patients	Secondary—from treatment algorithms	Inflated to year of study	One-way 50% to 200%
Younossi et al. (1999)	Not stated	None provided	Primary—treatment algorithm Secondary—database studies not specific to HCV or treatment algorithms	Inflated to year of study	One-way 50% to 200%
Younossi et al. (2014)	Not stated	None provided	Primary—treatment algorithms Secondary—database study specific to HCV	Inflated to year of study	One-way 50% to 150% PSA—normal

[a] Full reference citations are available from the authors upon request.

APRI = aspartate aminotransferase to platelet ratio index; CD = compensated disease; DD = decompensated disease; PSA = probabilistic sensitivity analysis; VA = Department of Veterans Affairs.