International Journal of Technology Assessment in Health Care, 30:6 (2014), 553–570.

doi:10.1017/S0266462314000701

USE OF VALUE OF INFORMATION IN UK HEALTH TECHNOLOGY ASSESSMENTS

Syed Mohiuddin
MCHE, Institute of Population Health, The University of Manchester

Katherine Payne
MCHE, Institute of Population Health, The University of Manchester

Elisabeth Fenwick
HEHTA, Institute of Health & Wellbeing, University of Glasgow

Objectives: The aim of this study was to identify and critically appraise the use of Value of Information (VOI) analyses undertaken as part of health technology assessment (HTA) reports in England and Wales.
Methods: A systematic review of National Institute for Health Research (NIHR) funded HTA reports published between 2004 and 2013 identified the use of VOI methods and key analytical details in terms of: (i) types of VOI methodology used; (ii) parameters and key assumptions; and (iii) conclusions drawn in terms of the need for further research.
Results: A total of 512 HTA reports were published during the relevant timeframe. Of these, 203 reported systematic review and economic modeling studies and 25 of these had used VOI method(s). Over half of the twenty-five studies ($n = 13$) conducted both EVPI (Expected Value of Perfect Information) and EVPPI (Expected Value of Partial Perfect Information) analyses. Eight studies conducted EVPI analysis, three studies conducted EVPI, EVPPI, and EVSI (Expected Value of Sampling Information) analyses and one study conducted EVSI analysis only. The level of detail reporting the methods used to conduct the VOI analyses varied.
Conclusions: This review has shown that the frequency of the use of VOI methods is increasing at a slower pace compared with the published volume of HTA reports. This review also suggests that analysts reporting VOI method(s) in HTA reports should aim to describe the method(s) in sufficient detail to enable and encourage decision-makers guiding research prioritization decisions to use the potentially valuable outputs from quantitative VOI analyses.

Keywords: Value of information, Health technology assessment, Systematic review, Decision making, Research prioritization

The use of health technology assessment (HTA) to inform reimbursement and healthcare resource allocation is well integrated into national decision-making processes in the United Kingdom (UK) and other countries (www.inahta.net). The use of HTA has evolved because of an environment of finite and constrained healthcare budgets where difficult choices at national and regional levels must be made regarding how best to use available resources. According to the EUnetHTA (www.eunethta.eu), the aim of HTA is to provide a systematic, transparent, unbiased, and robust summary of the available evidence base about the medical, social, economic, and ethical issues related to the use of a health technology to allow informed decision making. In the UK, HTA reports are commissioned by a national body, the National Institute for Health Research (NIHR), and used as a source of information to guide resource allocation from national through to regional and local service commissioning (www.hta.ac.uk). Methods of economic evaluation, and specifically decision-analytic model-based cost-effectiveness analysis, have become an integral component of a HTA (1).

Using a decision-analytic model allows the systematic assimilation of all available evidence in a structured format to identify the incremental costs and benefits of proposed technologies compared with current practice (2). A key component in any model-based cost-effectiveness study involves identifying and quantifying the uncertainty associated with the model structure, parameter inputs or methodological assumptions used within the analysis (3). Probabilistic Sensitivity Analysis (PSA) has now become a standard requirement to understand the joint effect of uncertainty in model input parameters (3). The inclusion of PSA is now generally viewed as a measure of the inherent quality of any published model-based economic analysis (3;4). In addition, a key advantage of PSA is that it allows an analyst to use Value of Information (VOI) methods to understand the need for future research. VOI methods first emerged in the health economics literature in 1999 when proposed by Claxton (5). Subsequently, the first example of the VOI methods being applied in the context of HTA was published in 2004 as a series of pilot case studies (6). The key strength of VOI methods is that they make it clear and explicit how current parameter uncertainty translates into the need for future research.

Once an analyst has identified and quantified the uncertainty in costs, probabilities, clinical effectiveness and health state utilities then decision-makers charged with resource allocation have to consider whether this available evidence is sufficiently robust to recommend the introduction of the new technology into clinical practice. Decision-makers faced with the findings of a HTA

S.M. is funded by the Healing Foundation as part of the National Centre for Cleft Research. The views expressed in this study are those of the authors and not the funding body.

report have to appraise the available evidence base and decide if a new technology should be adopted into clinical practice on the basis of existing information. Importantly, there are (opportunity) costs of making the wrong decision and introducing a new technology when the evidence base is not sufficiently certain (6). This appraisal of the evidence introduces four possible decisions that could be reached in terms of whether to adopt the new technology: (i) adopt but request more information to allow the technology to be re-assessed at some later date (sometimes called: coverage with evidence development); (ii) adopt with no request for more information; (iii) do not adopt and request more information; and (iv) do not adopt and do not request more information. Two of these decisions indicate the need for more information, which infers a need for further research. This need for further research could be based on subjective (synonymous with qualitative) or objective (synonymous with quantitative) criteria. Subjective criteria are likely to be the result of deliberative discussions with key stakeholders. In contrast, objective criteria are based on formal quantitative analysis such as VOI methods.

Largely, there are three types of methods that fall under the collective heading of VOI (6): (i) Expected Value of Perfect Information (EVPI) analysis; (ii) Expected Value of Partial Perfect Information (EVPPI); and (iii) Expected Value of Sample Information (EVSI). These methods offer a framework with a common aim to inform whether future research is necessary given the identified level of uncertainty in the available evidence base. Specifically, VOI methods offer a structured framework to estimate the amount that a decision-maker should be willing to pay to acquire further information to decrease decision uncertainty. Conducting a VOI analysis involves the calculation of a monetary value of an optimal strategy with further information compared with the optimal strategy without further information (i.e., with current information). Several published papers now clearly explain the key steps and applications of each type of VOI methods: EVPI and EVPPI (7–9) and EVSI (10). Using VOI methods has been suggested to be both a conceptually and quantitatively sound way for estimating the expected value of future research (9). In 2003, Coyle et al. (11) claimed that the VOI is the only method that unequivocally calculates the expected benefit of further research.

The first step for any VOI method involves calculating the EVPI, which estimates the difference between the expected value of a decision with perfect information and the expected value of a decision with the current evidence base. The EVPI represents the maximum possible improvement in the net benefit associated with the decision that could be achieved if the decision were to be made in a situation where there is perfect information rather than with the current level of information (6). EVPI can be determined either at the individual patient or population level, but ideally the latter as the societal value of research should ideally be estimated across the population of future patients for whom the decision is pertinent. A decision maker can then use the population EVPI to decide if further research is potentially worthwhile given the estimated cost of generating the information required in a research study. Further research is potentially worthwhile if population EVPI exceeds the expected cost for conducting further research.

Once EVPI has been calculated then it is possible to use EVPPI to determine the most valuable input parameter(s) in terms of prioritizing further research. Importantly, EVPPI can provide information on whether to conduct research to inform a single parameter, or a set of parameters. The outputs of an EVPPI analysis, combined with the results of the EVPI, can also inform the type of research needed. A decision-maker must then be cognizant that the type of study required will impact on the cost of the study required to collect the data. This means that in practice, if further information on clinical effectiveness is required then the EVPPI will have to be higher, than if, for example, more data on utility values are needed. If the EVPPI indicates that clinical effectiveness is a key parameter then the gold standard method for assessing clinical effectiveness, the randomized controlled trial (RCT), should be designed and commissioned. However, if the utility value attached to a health state is identified as the key parameter driving EVPPI then a more reasonable study design might be a stated preference study to elicit utility values. If EVPI and EVPPI have indicated the potential worth for future research, then it is possible to use the third type of VOI method; EVSI (6). The EVSI puts into practice the concept of being able to estimate the societal value of research designs and establish the best possible sample sizes for primary data collection. The assumption here is that further research will be of value if the expected net benefit of sampling exceeds the cost of sampling (12).

The VOI methodological framework is potentially useful for the reason that it provides a quantitative technique to identify evidence gaps and prioritize future research in the context of national HTA, but it is not clear to what extent the priorities identified by this method are embedded into research. VOI methods have been criticized for not being presented in a way that is meaningful for decision-makers, who may have no formal training in the methods being used (13). Furthermore, it is not clear whether the use of VOI methods is accepted in practice as a feasible approach to prioritize further research. An important first step to understand the practical use and value of VOI methods is to identify if, and how, they are used as part of a national HTA program. This study, therefore, aimed to identify and critically appraise the use of VOI methods in nationally commissioned HTA reports in an example jurisdiction namely England and Wales.

METHODS

A systematic review of HTA reports, funded by the NIHR on behalf of NICE (National Institute for Health and Care Excellence) to inform its national clinical guidance to the NHS

https://doi.org/10.1017/S0266462314000701 Published online by Cambridge University Press

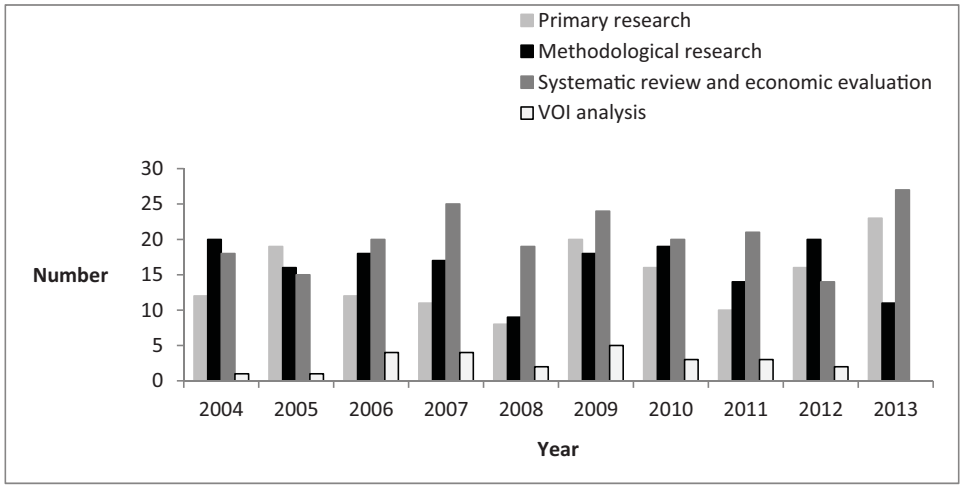

Figure 1. Type and number of published HTA reports showing the number that included a VOI analysis.

(National Health Service), published between January 2004 and December 2013 was conducted to identify all reports that had used some form of VOI methods. NIHR HTA reports that have included the formal analysis of VOI were identified by using a structured search of the NIHR database of published reports (www.hta.ac.uk/project/htapubs.asp) using the terms "value of information", "expected value of", "expected net benefit of sampling", "VOI", "EVI", "EVPI", "EVPPI", "PEVPI", "EVSI", and "ENBS".

Two reviewers (S.M. & K.P.) screened titles and executive summaries to identify potentially appropriate HTA reports for inclusion. For the purpose of this review, the definition of VOI methods provided by Claxton et al. (6) was used to guide the relevance of the methods used. The review only included completed NIHR HTA reports and excluded reports that were in progress or unpublished. All identified HTA reports that had used VOI method(s) were then summarized in terms of: (i) types of VOI methodology used; (ii) parameters and key assumptions used in the VOI method; and (iii) key findings and conclusions drawn from the VOI framework in terms of the need for further research. A data extraction form was created to systematically summarize the relevant information from each HTA report and the data are presented in tables together with a narrative summary.

RESULTS

A total of 512 NIHR-commissioned HTA reports were identified between January 2004 and December 2013. Of these, 147 reported primary studies, 162 reported methodological studies and 203 (40 percent) reported systematic review and model-based economic evaluation studies. Of the 203 systematic review and model-based studies, 25 (12 percent) had used some form of VOI analyses and were identified as relevant for inclusion in this review. Figure 1 shows the type and number of published HTA reports each year and the number of studies that included a VOI analysis. No studies that included a VOI analysis were published in 2013.

Table 1 summarizes the focus of the model-based economic evaluation and modeling methods used. Table 2 describes the types of VOI analysis conducted together with the key inputs and assumptions used in the analysis, which are needed to interpret the estimated value of information in terms of its relevance to a decision-makers context. All twenty-five HTA reports aimed to address the question of whether to adopt a proposed new technology based on analytic modeling and VOI considerations from the perspective of the UK NHS. The technologies being evaluated comprised medicines, surgical procedures, diagnostics and medical devices for a range of different conditions and study populations. There was no clear pattern in terms of the application of VOI methods regarding specific interventions or patient populations. The types of decision-analytic models used were either Markov models (eleven studies) (14–24), decision trees (five studies) (25–29), or a combination of a decision tree and Markov model (five studies) (30–34). In addition, one study used (35) discrete-event simulation model, one study (37) used individual patient-based state transition model, one study (38) used a simple (linear) mathematical model, and one study (36) did not specify the model type clearly within the main text.

The majority ($n = 19$) of the studies assumed a lifetime horizon for the baseline analysis. However, six studies used a shorter time horizon ranging between 12 months and 20 years. A variety of data sources were used including: RCTs; published studies; pooled data; and expert opinion. One study (25) did not state the data source explicitly. Only eight of the twenty-five HTA reports (15;18;19;26;29;32;35;37) used meta-analytic approaches to synthesize selected model parameters. In addition, twenty-two of the studies also stated explicitly that they used expert opinion to populate some of the model parameters.

Three studies (23;26;34) conducted EVPI, EVPPI and EVSI analyses, thirteen studies conducted EVPI and EVPPI analyses (15;17;19;21;22;25;27;30;32;33;35;36,38), eight studies

https://doi.org/10.1017/S0266462314000701 Published online by Cambridge University Press

Table 1. Summary of Economic Modelling Methods Used in HTA Reports Including a VOI analysis

Author/year	Disease/condition	Economic study aim	Intervention	Study population	Model type/ Time horizon/ Discounting/ Perspective/ Primary outcome	Primary data source/Expert opinion (yes/no)	ICER (£) per QALY gained	Future research recommendation
Bhattacharya et al (18) 2011	Heavy menstrual bleeding (HMB)	Evaluation of hysterectomy versus first- and second-generation ablative techniques and Mirena	Hysterectomy	Women who had treatment for HMB	*Model type* Markov *Time horizon* 10 years *Discounting* costs - yes benefits - not clear *Perspective* UK NHS *Primary outcome* QALY	Individual patient meta-analyses and data from national registers and follow-up of existing RCTs *Expert opinion* yes	Dominated (vs. first-generation ablation) £970 (vs. second-generation ablation) £1,440 (vs. Mirena)	Future research should focus on evaluation of the clinical effectiveness and cost-effectiveness of the best second-generation ablation technique under local anesthetic versus Mirena and types of hysterectomy such as laparoscopic supracervical hysterectomy versus conventional hysterectomy and second-generation ablation
Black et al (19) 2009	Osteo-arthritis (OA) of the knee	Evaluation of glucosamine sulphate/ hydrochloride and chondroitin sulphate in modifying the progression of OA of the knee	Glucosamine sulphate	Patients with mean age of 65 years	*Model type* Markov *Time horizon* lifetime *Discounting* yes *Perspective* not reported explicitly *Primary outcome* QALY	Pooled data from two previous RCTs and information from other published studies *Expert opinion* not clear	£21,335 (vs. current care)	Any future trial should aim to collect data using a generic preference-based quality of life instruments
Brush et al (28) 2011	Colorectal cancer	Evaluation of fluorine-18-deoxyglucose (FDG) positron emission tomography (PET)/ computerised tomography (CT) as an add-on test versus routinely used imaging modalities for pre-operative staging	FDG PET/CT	Adults with known or suspected primary cancer of the colon or rectum under-going pre-operative staging prior to curative surgery in a secondary care setting	*Model type* decision tree *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Published and unpublished studies including RCTs *Expert opinion* yes	£12,832 (vs. primary colon cancer) £21,409 (vs. recurrent rectal cancer) £6,189 (vs. recurrent colon cancer) £21,434 (vs. metastatic cancer)	Future research should focus on the use of FDG PET/CT for: staging recurrent colon cancer, staging recurrent rectal cancer and staging metastatic colorectal cancer

INTL. J. OF TECHNOLOGY ASSESSMENT IN HEALTH CARE 30:6, 2014

Table 1. Continued.

Author/year	Disease/condition	Economic study aim	Intervention	Study population	Model type/ Time horizon/ Discounting/ Perspective/ Primary outcome	Primary data source/Expert opinion (yes/no)	ICER (£) per QALY gained	Future research recommendation
Carlton et al (14) 2008	Amblyopia and strabismus	Evaluation of screening programme at different ages	Screening at 3, 4 and 5 years	Children up to the age of 5 years	*Model type* Markov *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS and other government departments *Primary outcome* QALY	Data from the ALSPAC study (a population-based RCT) and published studies *Expert opinion* yes	£16,544 (screening at 3 years vs. no screening) £21,957 (screening at 4 years vs. screening at 3 years) £316,463 (screening at 5 years vs. screening at 4 years)	Future research should include the utility effects of bullying in the analysis
Castelnuovo et al (30) 2006	Hepatitis C virus (HCV)	Evaluation of testing for HCV among former injecting drug users	Combination therapy with pegylated interferon and ribavirin	Hypothetical cohorts of people assumed to be aged 37 years at inception	*Model type* decision tree; Markov *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Published and unpublished data from the Trent HCV study *Expert opinion* yes	£16,514 (vs. case-finding)	Further research is required to specify different approaches to case-finding in appropriate settings and to evaluate their effectiveness and cost-effectiveness directly
Chen et al (29) 2012	Smoking	Evaluation of different electronic smoking cessation aids	Electronic aids (e1, e2, . . . , e5)	Adult smokers with committed and non-committed quit attempt	*Model type* decision-tree *Time horizon* lifetime *Discounting* yes *Perspective* health service cost *Primary outcome* QALY	Meta-analytic approaches were used to synthesize evidence from various RCTs identified from systematic review *Expert opinion* yes	Electronic aids as an adjuvant to pharmacotherapy plus brief advice (base-case cost scenario): £7,452 (e5 vs. e1) Electronic aids as an adjuvant to pharmacotherapy plus counseling (base-case cost scenario): £4,756 (e5 vs. e1)	Further research is needed on the relative benefits of different forms of delivery for electronic aids, the content of delivery, and the acceptability of these technologies for smoking cessation with subpopulations of smokers

https://doi.org/10.1017/S0266462314000701 Published online by Cambridge University Press

Table 1. Continued.

Author/year	Disease/condition	Economic study aim	Intervention	Study population	Model type/ Time horizon/ Discounting/ Perspective/ Primary outcome	Primary data source/Expert opinion (yes/no)	ICER (£) per QALY gained	Future research recommendation
Clegg et al (27) 2010	Earwax removal	Evaluation of methods of earwax removal	Softeners followed by self-irrigation and softeners followed by irrigation by nurse at primary care	Adults aged between 35 and 44 years with earwax	*Model type* decision tree *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Data from RCTs, controlled clinical trials, and cohort studies *Expert opinion* yes	Softeners followed by self-irrigation is £24,400 and softeners followed by nurse-led-irrigation is £32,100 (vs. no treatment)	Further research should focus on how the different interventions are delivered and to which patient groups
Colbourn et al (26) 2007	Group B streptococcal (GBS)	Evaluation of prenatal strategies for preventing GBS and other serious bacterial infections in early infancy	Strategy 1 (S1): intervention of interest, Strategy 2 (S2): next best intervention, . . . , Strategy 6 (S6)	Women in UK attending hospital for delivery	*Model type* decision tree *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Data from the NHS HES for England (2003–04), meta-analysis, and St Mary's maternity info system dataset (unpublished) *Expert opinion* yes	£10,000 (S1 vs. S2) £30,000 (S1 vs. S3) Dominated (S1 vs. S4) £20,000 (S1 vs. S5) £30,000 (S1 vs. S6)	Cost-effectiveness of vaccine compared with other interventions should be re-evaluated after Phase III trials
Collins et al (20) 2007	Metastatic hormone-refractory prostate cancer (MHPC)	Evaluation of docetaxel in combination with prednisone or prednisolone	Docetaxel with prednisone or prednisolone	Men with MHPC	*Model type* Markov *Time horizon* 15 years *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Data from seven RCTs, and patient-level data from the CCI-NOV22 and TAX 327 trials *Expert opinion* yes	£32,706 (mitoxantrone plus prednisone/prednisolone vs. docetaxel plus prednisone (3-weekly)	Future research should include the direct assessment of quality of life and utility gain associated with different treatments including the effect of adverse events of treatment, using generic instruments, which are suitable for the purposes of cost-effectiveness analyses

Table 1. Continued.

Author/year	Disease/condition	Economic study aim	Intervention	Study population	Model type/ Time horizon/ Discounting/ Perspective/ Primary outcome	Primary data source/Expert opinion (yes/no)	ICER (£) per QALY gained	Future research recommendation
Fox et al (21) 2007	Heart failure (HF)	Evaluation of cardiac resynchronisation therapy (CRT) versus CRT with devices (CRT-P) and CRT with defibrillation (CRT-D), each with optimal pharmaceutical therapy (OPT) and with each other	CRT-P	People with HF who have a marker of cardiac dyssynchrony	*Model type* Markov *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Data from five RCTs *Expert opinion* yes	£16,735 (vs. OPT) £40,160 (vs. CRT-D)	Further research is needed into the identification of those patients unlikely to benefit from this therapy, the appropriate use of CRT-D devices, the differences in mortality and heart failure hospitalization, as well as the long-term implications of using this therapy
Garside et al (22) 2006	Barrett's esophagus	Evaluation of surveillance of Barrett's esophagus	Surveillance programmes monitoring for dysplastic change	Hypothetical cohort of men aged 55 years	*Model type* Markov *Time horizon* 20 years *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Data from published sources, but no RCT *Expert opinion* yes	£19,318 (vs. no surveillance)	Future research should target both the overall effectiveness of surveillance and the individual elements that contribute to a surveillance programme
Grant et al (15) 2008	Gastro-esophageal reflux	Evaluation of early laparoscopic surgery compared with continued medical management	Laparoscopic fundoplication	Patients (mean aged 46 years) with reasonable symptom control on anti-reflux medications	*Model type* Markov *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Data from the REFLUX trial and meta-analyses of published studies *Expert opinion* yes	Base-case: £180 (surgery vs. medical management) Patients according to intention to treat and followed up for 1 year: £19,288 (surgery vs. medical management) Patients receiving randomised treatment per protocol and followed up for 1 year: £23,284 (surgery vs. medical management)	Uncertainty about cost-effectiveness would be greatly reduced by more reliable information about relative longer-term costs and benefits of surgical and medical policies

Table 1. Continued.

Author/year	Disease/condition	Economic study aim	Intervention	Study population	Model type/ Time horizon/ Discounting/ Perspective/ Primary outcome	Primary data source/Expert opinion (yes/no)	ICER (£) per QALY gained	Future research recommendation
Harris et al (35) 2011	Obesity	Evaluation of adaptive e-learning interventions versus standard treatment for dietary behavior change	e-learning	Patients were assumed to be non-smokers with no prior history of either type 2 diabetes or cardio-vascular disease, systolic blood pressure levels, cholesterol ratios and a starting age of 50 years unless otherwise stated	*Model type* discrete-event simulation *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Pooled evidence from various RCTs identified from systematic review *Expert opinion* yes	Scenario A (lowest ICER): £102,112 (vs. dietary advice) Scenario G (highest ICER): £232,911 (vs. dietary advice)	Further clinical trials of individual e-learning interventions should not be carried out until theoretically informed work that addresses the question of which characteristics of the target population, target behaviour, content and delivery of the intervention is completed
Hewitt et al (25) 2009	Postnatal depression (PND)	Evaluation of methods to identify PND in improving maternal and infant outcomes	Structured psychological therapy (SPT) Listening home visits (LHV) Usual care (UC)	Women during pregnancy or the postnatal period	*Model type* decision tree *Time horizon* 12 months *Discounting* no *Perspective* UK NHS and personal social services *Primary outcome* QALY	Not reported explicitly	£17,481 (SPT vs. UC) £66,275 (LHV vs. UC)	The Edinburgh postnatal depression scale should not be used as a screening tool until more research is conducted into its potential for routine use in screening for PND
McKenna et al (23) 2009	Angina and heart failure	Evaluation of enhanced external counterpulsation (EECP) versus usual care and placebo	EECP	Patients with chronic stable angina or heart failure	*Model type* Markov *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Published data including one RCTs *Expert opinion* yes	£18,643 (vs. no treatment)	Investigation of adverse effects should be an important outcome in any future RCT

Table 1. Continued.

Author/year	Disease/condition	Economic study aim	Intervention	Study population	Model type/ Time horizon/ Discounting/ Perspective/ Primary outcome	Primary data source/Expert opinion (yes/no)	ICER (£) per QALY gained	Future research recommendation
McKenna et al (16) 2010	Post-myocardial infarction heart failure (post-MI HF)	Evaluation of spironolactone and eplerenone versus standard care	Spironolactone Eplerenone	Patients with symptoms and/or signs of HF and left ventricular dysfunction	*Model type* Markov *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS and personal social services *Primary outcome* QALY	Data were derived from RCTs and observational studies *Expert opinion* yes	Lifetime treatment: £7,893 (eplerenone vs. standard care) Spironolactone was extendedly dominated by eplerenone	Future RCTs should directly compare spironolactone and eplerenone to provide more robust evidence on the optimal management of post-MI HF patients
Pandor et al (36) 2004	Inborn errors of metabolism	Evaluation of (i) tandem mass spectrometry (MS)-based neonatal screening; (ii) extending the conditions to be screened to include medium-chain acyl-coenzyme A dehydrogenase (MCAD) and others in addition to phenylketonuria	Tandem mass spectrometry	(i) Number of specimens from neonates varied in the analysis (ii) 100,000 screened cohort	*Model type* not reported explicitly *Time horizon* lifetime *Discounting* yes *Perspective* societal *Primary outcome* QALY	Published and routine data, and data from two RCTs *Expert opinion* yes	(i) Range of costs reported depending on assumption; (ii) Addition of MCAD resulted in a cost saving at -£23,312 with a gain of 59 life-years for each cohort. Other ICERs were reported for addition of more conditions in screening programme	Further research is needed to ascertain the natural history of the conditions, and the economic impact, for the other metabolic disorders

https://doi.org/10.1017/S0266462314000701 Published online by Cambridge University Press

Table 1. Continued.

Author/year	Disease/condition	Economic study aim	Intervention	Study population	Model type/ Time horizon/ Discounting/ Perspective/ Primary outcome	Primary data source/Expert opinion (yes/no)	ICER (£) per QALY gained	Future research recommendation
Robinson et al (31) 2005	Acute coronary syndrome (ACS)	Evaluation of alternative strategies for the initial medical management of non-ST elevation ACS	Clopidogrel Low molecular weight heparin Hirudin Intravenous glycoprotein antagonists (GPAs)	Patients with non-ST elevation ACS in England and Wales	*Model type* decision tree; Markov *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Data from the PRAIS-UK, Leeds PCI audit, and RCTs *Expert opinion* yes	£5,738 (Strategy 1 vs. 4) Dominated (Strategy 2 vs. 4) £25,811 (Strategy 3 vs. 4)	Future research should compare GPAs with clopidogrel as an adjunct to standard care
Rodgers et al (32) 2006	Atrial fibrillation (AF) and typical atrial flutter	Evaluation of radio frequency catheter ablation (RCFA) for the curative treatment	RFCA	Adults with symptomatic AF or adults with typical atrial flutter	*Model type* decision tree; Markov *Time horizon* 12 months and lifetime *Discounting* yes *Perspective* UK NHS and personal social services *Primary outcome* QALY	Meta-analytic approaches were used to synthesize evidence from three RCTs and data from other sources *Expert opinion* yes	Ranged from £23,000 to £38,000 (vs. antiarrhythmic drug therapy)	Any future RCT comparing RFCA with antiarrhythmic drug therapy for the treatment of AF or typical atrial flutter should collect quality of life and symptom scores

Table 1. Continued.

Author/year	Disease/condition	Economic study aim	Intervention	Study population	Model type/ Time horizon/ Discounting/ Perspective/ Primary outcome	Primary data source/Expert opinion (yes/no)	ICER (£) per QALY gained	Future research recommendation
Rogowski et al (33) 2009	Non-ST-elevation acute coronary syndrome (NSTE-ACS)	Evaluation of optimal duration of clopidogrel treatment	Clopidogrel for 12 months	Patients with NSTE-ACS	*Model type* decision tree; Markov *Time horizon* 12 months and lifetime *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Data from the CURE study, published sources, and RCTs *Expert opinion* yes	ICER of 12 months' duration ranged between £13,380 and £20,661 across the different scenarios and ICER of 12 months' treatment with clopidogrel ranged between £49,436 and £58,691	Future RCT should determine optimal duration of clopidogrel treatment and compare different durations of clopidogrel treatment in patients with NSTE-ACS
Soares et al (34) 2012	Severe sepsis and septic shock	Evaluation of intravenous immunoglobulin (IVIG)	IVIG	Adults with severe sepsis or septic shock	*Model type* decision tree; Markov *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS and personal social services *Primary outcome* QALY	Data from the ICNARC CMP database, survey data on management of admissions with severe sepsis, and from sixteen RCTs *Expert opinion* yes	£20,850 (vs. standard care)	Future research should focus on filling the knowledge gaps to inform a future multicentre RCT prior to recommending its immediate design and conduct

Table 1. Continued.

Author/year	Disease/condition	Economic study aim	Intervention	Study population	Model type/ Time horizon/ Discounting/ Perspective/ Primary outcome	Primary data source/Expert opinion (yes/no)	ICER (£) per QALY gained	Future research recommendation
Speight et al (17) 2006	Oral cancer	Evaluation of alternative oral cancer screening programmes (strategies B to H) versus no screening (strategy A)	(B) invitational screen – general medical practice (GMP); (C) invitational screen – general dental practice (GDP); (D) opportunistic screen – GMP; (E) opportunistic screen – GDP; (F) opportunistic high-risk screen – GMP; (G) opportunistic high-risk screen – GDP; (H) invitational screen specialist	Hypothetical population over the age of 40 years	*Model type* Markov *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Data from published sources and observational datasets *Expert opinion* yes	Whole population aged 70–79 years: £15,790 (G vs. A) £16,443 (F vs. G) £18,046 (D vs. F) Strategies B, C, E and H were ruled out by dominance or extended dominance	Further study is needed on malignant transformation rates of oral potentially malignant lesions and to determine the outcome of treatment of oral potentially malignant lesions

Table 1. Continued.

Author/year	Disease/condition	Economic study aim	Intervention	Study population	Model type/ Time horizon/ Discounting/ Perspective/ Primary outcome	Primary data source/Expert opinion (yes/no)	ICER (£) per QALY gained	Future research recommendation
Stevenson et al (37) 2009	Osteo-porotic fractures	Evaluation of vitamin K versus placebo or no treatment	Vitamin K	Postmenopausal women with osteoporosis/ osteopenia	*Model type* individual patient-based state transition model *Time horizon* 10-year *Discounting* yes *Perspective* not reported *Primary outcome* QALY	Data from RCTs, published sources, and meta-analysis *Expert opinion* not clear	Women aged 50–54 years with a T-score of –2.5 SD and no previous fracture: £15,239 (vitamin K vs. no treatment) £17,653 (alendronate vs. no treatment) Women aged 50–54 years with a T-score of –2.5 SD and with a previous fracture: £7,500 (vitamin K vs. no treatment) £8625 (alendronate vs. no treatment)	Further research is required to reduce the uncertainty over whether vitamin K is more cost-effective than alendronate
Stevenson et al (38) 2010	Postnatal depression (PND)	Evaluation of group cognitive behavioural therapy (CBT)	CBT eight weekly 2-hour sessions	Women in the postpartum period up to 1 year	*Model type* simple (linear) mathematical model *Time horizon* 12 months *Discounting* no *Perspective* not reported explicitly *Primary outcome* QALY	Published studies including one RCTs *Expert opinion* not clear	£46,462 (vs. routine primary care)	Further research is required to compare group CBT with individual treatment as this may be preferable or more efficacious in some cases, and with other psychological therapies
Thompson-Coon et al (24) 2007	Cirrhosis to detect hepato-cellular carcinoma (HCC)	Evaluation of surveillance using periodic serum alfafetoprotein (AFP) testing and/or liver ultrasound (US) examination	AFP and/or liver US	People aged 70 years or less with a diagnosis of compensated cirrhosis who were also eligible to enter a surveillance programme	*Model type* Markov *Time horizon* lifetime *Discounting* yes *Perspective* UK NHS *Primary outcome* QALY	Published studies including RCTs *Expert opinion* yes	Ranged between £20,700 and £27,900 (vs. no surveillance), but some options were dominated when an extended incremental analysis was performed	Alternative modelling methods should be used to account for heterogeneity in the patient population

https://doi.org/10.1017/S0266462314000701 Published online by Cambridge University Press

Table 2. Summary of VOI Methods Used in HTA Reports

Author/year	VOI analysis type	Lifetime of technology	Reason for lifetime	Assumed sample size	Individual EVPI	Population EVPI	Ceiling ratio	Conclusion including VOI suggestion
Bhattacharya et al (18) 2011	EVPI	5 years	Based on NICE CG44 Guideline	Not reported	£426	Not reported	Not reported	No
Black et al (19) 2009	EVPI EVPPI	10 years	Not reported	500,000	Not reported	£60m (from graph)	£30,000	Not reported explicitly
Brush et al (28) 2011	EVPI	2 years	Expert opinion	13,315	Less than £2	£70,000	£30,000	Not reported explicitly
Carlton et al (14) 2008	EVPI	10 years	Not reported	2,600,000	Not reported	Plotted on graph	Various ratios	No
Castelnuovo et al (30) 2006	EVPI EVPPI	15 years	Not reported	10,000	Not reported	£16.9m	£30,000	No
Chen et al (29) 2012	EVPI	10 years	Not reported	Ranged between 50,000 and 500,000	Not reported explicitly	Ranged between £14.4m and £144.5m[a] and between £979m and £9.8b[b]	£20,000	Yes
Clegg et al (27) 2010	EVPI EVPPI	10 years	Expert opinion	2,000,000	Not reported	£3m (from graph)	£30,000	No
Colbourn et al (26) 2007	EVPI EVPPI EVSI	10 years	Not reported	680,000	Not reported	Ranged between £35.4m and £63.5m	£30,000	Yes
Collins et al (20) 2007	EVPI	1.5 years	In line with NICE technology appraisal	2,748	Not reported	£13.4m	£30,000	No
Fox et al (21) 2007	EVPI EVPPI	7 years	Expert opinion	6,300	£157	£6.2m	£30,000	Not reported explicitly
Garside et al (22) 2006	EVPI EVPPI	10 years	Not reported	5,692	£148	£6.5m	£30,000	Yes
Grant et al (15) 2008	EVPI EVPPI	5 years	Not reported	160,000	£15,106	£300m	£30,000	Yes

Table 2. Continued.

Author/year	VOI analysis type	Lifetime of technology	Reason for lifetime	Assumed sample size	Individual EVPI	Population EVPI	Ceiling ratio	Conclusion including VOI suggestion
Harris et al (35) 2011	EVPI EVPPI	10 years	Not reported	308,000	Not reported explicitly	£37m £170m	£20,000 £30,000	No
Hewitt et al (25) 2009	EVPI EVPPI	10 years	Not reported	5,676,459	Not reported	£40.1m	£30,000	No
McKenna et al (23) 2009	EVPI EVPPI EVSI	10 years	Not reported	68,088	£440.16	£48.7m	£30,000	Yes
McKenna et al (16) 2010	EVPI	10 years	Not reported	258,465	£3,172 £4,893 £6,764	£820m £1.3b £1.7b	£10,000 £20,000 £30,000	Yes
Pandor et al (36) 2004	EVPI EVPPI	5 years	Not reported	700,000	Not reported	£91,416	£1,000	No
Robinson et al (31) 2005	EVPI	5 years	Not reported	59,756	£42.97	£11.5m	£30,000	Yes
Rodgers et al (32) 2006	EVPI EVPPI	10 years	Not reported	1,000	£2.02	£17,288	£30,000	No
Rogowski et al (33) 2009	EVPI EVPPI	10 years	Not reported	515,000	Not reported	£108.5m	£30,000	Not reported explicitly
Soares et al (34) 2012	EVPI EVPPI EVSI	10 years	Not reported	33,160	Ranged between £1,377 and £4,791	Ranged between £393m and £1.4b	£20,000	Yes
Speight et al (17) 2006	EVPI EVPPI	10 years	Not reported	800,000	Not reported	Ranged between £8m and £462m	£20,000	Yes
Stevenson et al (37) 2009	EVSI	10 years	Not reported	50,000	Not applicable	Not applicable	Not applicable	Yes
Stevenson et al (38) 2010	EVPI EVPPI	10 years	Not reported	1,200,000	£53.5	£64m	£30,000	Yes
Thompson-Coon et al (24) 2007	EVPI	Not reported	Not reported	Not reported	Less than £27	Not reported	Not reported	No

[a]Single electronic aids treatment effects.
[b]Multiple electronic aids treatment effects.

(14;16;18;20;24;28;29;31) conducted EVPI analysis alone, and one study (37) conducted EVSI analysis alone. The description of the VOI method(s) used was then assessed in terms of whether the following key assumptions were reported explicitly: assumed lifetime of the technology, stated size of the relevant population to estimate population EVPI and the stated threshold value of cost per quality-adjusted life-year (QALY) (ceiling cost-effectiveness ratio).

More than half of the studies ($n = 16$) assumed a 10-year lifetime for the technology in the EVPI calculation. The range of assumed lifetime for the technologies was between 1.5 and 15 years, and 5 studies (18;20;21;27;28) gave some reason for the selection of the lifetime used. One study (24) did not report the assumed lifetime of the technology. Of the five studies that gave some reason for the selection of the lifetime used, these were based on expert opinion in three cases (21;27;28) and in one case to keep the analysis in line with a published NICE technology appraisal (20). One case did cite a reference in support of the assumed value (18).

Two studies (18;24) did not report the EVPI at population level. The individual level EVPI was reported explicitly by ten studies. One study (36) assumed a ceiling ratio of just £1,000 per QALY gained as the willingness to pay threshold, while the majority of the studies ($n = 17$) assumed a ceiling ratio of £30,000 per additional QALY gained. This value is the upper limit of the threshold range of ceiling ratios (£20,000 to £30,000 per QALY gained) used in the context of NICE decision making to interpret whether an intervention is a cost-effective use of NHS resources. Of interest, only eleven of the twenty-five HTA reports (15–17;22;23;26;29;31;34;37;38) that had used VOI method(s) reported clear recommendations regarding the interpretation of the analysis presented.

DISCUSSION

This review has shown that VOI methods are used in NIHR-commissioned HTA reports using model-based economic evaluations to identify and quantify the incremental costs and benefits of new healthcare technologies. We focused on the application of VOI methods in the context of nationally funded-research under the jurisdiction of England and Wales. It would be interesting to compare the identified use of VOI methods with other jurisdictions, across Europe, in the United States and Australasia, but this aim was beyond the scope of this current study and in some instances would involve language-translation of reports to extract the data needed.

Broadly, the identified VOI methods were based on the assumption that quantitative prioritization could help assist the performance of research to address the research gaps. The number of HTA reports that had used some form of VOI methods is, however, still very small compared with the number of published reports. In March 2014, when the search was conducted there were some 512 published HTA reports listed on the HTA Web site but just two-fifths of these studies used systematic review and model-based evaluations and thus, potentially eligible for using the VOI method(s).

Of the 203 systematic review and model-based evaluation HTA reports just 25 had used some form of VOI methods. This finding of relatively low levels of use of VOI method(s) in practice has to be interpreted in the context that VOI has only been recognized as a method potentially relevant for using in a national research prioritization context since 2004, when Claxton et al. (6) published the first pilot study that explored if, and how, to apply the methods. The frequency of the use of VOI methods in HTA reports in England and Wales does not appear to be increasing at a faster pace over time. The reason for the observed lack of increase in the use of VOI is not known and is a possible topic for further research. Suggested reasons could be a reflection of a constant number of VOI studies been funded for completion by existing research groups familiar with the method or alternatively, could indicate a note of caution on the part of the NIHR funding body in terms of the volume of commissioned studies including VOI.

The most common types of VOI methods used were EVPI and EVPPI. There were very few examples of using EVSI in the context of HTA reports, which is undoubtedly a reflection of the level of computation and technical complexity associated with this analysis. Very few studies reported clear recommendations regarding the interpretation of the VOI analysis presented. The studies differed in terms of their style of reporting and it was not always transparent in relation to which assumptions had been used when conducting the VOI method(s). The omission of explicit reporting of these key assumptions has clear implications for decision makers wanting to understand if the VOI method(s) presented is relevant to their view of clinical practice in their locality in terms of the lifetime of the technology and the assumed population size. Of interest, there seemed to be no standard assumption regarding the lifetime of the technology. This lack of standardization may be appropriate and a reflection of the types of technologies included in the analysis covering a wide range such as medicines, surgical procedures, diagnostics, and devices.

Two arguments could be put forward for the choice of ceiling ratio. The choice of the £30,000 per QALY gained threshold is based on experience of decision making in the context of NICE technology appraisals. The most surprising omission from the majority of the HTA reports was a section that provided decision makers with a clear interpretation of the meaning of the VOI analyses for future research. Only a few studies put the estimated values of information in the context of the predicted cost of future research studies or provided a process by which the VOI analyses could be used to inform future research prioritization. It seems that although VOI methods are being included in HTA reports in the United Kingdom, they are not always

https://doi.org/10.1017/S0266462314000701 Published online by Cambridge University Press

being reported explicitly and in a way that decision-makers find accessible. This is a topic for further research requiring qualitative exploration of the relevance and use of VOI methods in clinical and policy practice.

Notwithstanding the interesting results, our analysis has some limitations. First, we excluded economic analyses that proposed priorities for further research based on sensitivity analysis, but which did not include any VOI analysis. Second, we did not attempt to assess the quality of the included HTA reports owing to the fact that we are not aware of any validated system to value reports of research prioritization methods. Third, we did not verify whether any of the HTA reports implemented the research gaps identified through a VOI analysis.

CONCLUSION

This review has shown that VOI is used as a method in NIHR-funded HTA reports albeit in a relatively small number. Importantly, the level of detail of reporting of the VOI methods varied and in some instances key aspects of the assumptions underpinning the analysis were not reported explicitly. We argue that this may limit the ability of a decision maker reading the published HTA to interpret and assess the relevance of the results of the VOI to their own funding decisions. Further research is necessary to understand if, and how, VOI methods are used in different jurisdictions and whether decision-makers can and have interpreted the findings of the published VOI analyses. The relevance and use of VOI methods to inform research prioritization in the context of HTA is an important topic for further research.

CONTACT INFORMATION

Syed Mohiuddin, BSc (Hons), MSc, PhD, Research Fellow in Health Economics, Manchester Centre for Health Economics, Institute of Population Health, The University of Manchester, Oxford Road, Manchester M13 9PL, UK

Elisabeth Fenwick, BA, MSc, MSc, PhD, Professor of Health Economics, Health Economics and Health Technology Assessment, Institute of Health and Wellbeing, University of Glasgow, Glasgow G12 8RZ, Scotland

Katherine Payne, BPharm (Hons), DipClinPharm, MSc, PhD (katherine.payne@manchester.ac.uk), Professor of Health Economics, Manchester Centre for Health Economics, Institute of Population Health, The University of Manchester, Oxford Road, Manchester M13 9PL, UK

CONFLICTS OF INTEREST

The authors report no conflicts of interest.

REFERENCES

1. Akehurst RL. Making decisions on technology availability in the British National Health Service–why we need reliable models. *Value Health*. 2003;6:3-5.
2. Brennan A, Chick SE, Davies R. A taxonomy of model structures for economic evaluation of health technologies. *Health Econ*. 2006;15:1295-1310.
3. Claxton K. Exploring uncertainty in cost-effectiveness analysis. *Pharmacoeconomics*. 2008;26:781-798.
4. NICE. *Guide to the methods of technology appraisal*. 2004. http://www.nice.org.uk/niceMedia/pdf/TAP_Methods.pdf (accessed November 28, 2013).
5. Claxton K. Bayesian approaches to the value of information: Implications for the regulation of new pharmaceuticals. *Health Econ*. 1999;8:269-274.
6. Claxton K, Ginnelly L, Sculpher M, Philips Z, Palmer S. A pilot study on the use of decision theory and value of information analysis as part of the NHS Health Technology Assessment programme. *Health Technol Assess*. 2004;8:1-103, iii.
7. Felli JC, Hazen GB. Sensitivity analysis and the expected value of perfect information. *Med Decis Making*. 1998;18:95-109.
8. Strong M, Oakley JE. An efficient method for computing single-parameter partial expected value of perfect information. *Med Decis Making*. 2013;33:755-766.
9. Groot Koerkamp B, Myriam Hunink MG, Stijnen T, Weinstein MC. Identifying key parameters in cost-effectiveness analysis using value of information: A comparison of methods. *Health Econ*. 2006;15:383-392.
10. Ades AE, Lu G, Claxton K. Expected value of sample information calculations in medical decision modeling. *Med Decis Making*. 2004;24:207-227.
11. Coyle D, Buxton MJ, O'Brien BJ. Measures of importance for economic analysis based on decision modeling. *J Clin Epidemiol*. 2003;56:989-997.
12. Claxton K, Thompson KM. A dynamic programming approach to the efficient design of clinical trials. *J Health Econ*. 2001;20:797-822.
13. Myers E, Sanders GD, Ravi D, et al. *Evaluating the potential use of modeling and value-of-information analysis for future research prioritization within the evidence-based practice center program*. Rockville (MD): Agency for Healthcare Research and Quality (US); 2011. http://www.ncbi.nlm.nih.gov/books/NBK62134/ (accessed December 20, 2013).
14. Carlton J, Karnon J, Czoski-Murray C, Smith KJ, Marr J. The clinical effectiveness and cost-effectiveness of screening programmes for amblyopia and strabismus in children up to the age of 4–5 years: A systematic review and economic evaluation. *Health Technol Assess*. 2008;12:iii, xi-194.
15. Grant A, Wileman S, Ramsay C, et al. The effectiveness and cost-effectiveness of minimal access surgery amongst people with gastro-oesophageal reflux disease - a UK collaborative study. The REFLUX trial. *Health Technol Assess*. 2008;12:1-181, iii-iv.
16. McKenna C, Burch J, Suekarran S, et al. A systematic review and economic evaluation of the clinical effectiveness and cost-effectiveness of aldosterone antagonists for postmyocardial infarction heart failure. *Health Technol Assess*. 2010;14:1-162.
17. Speight PM, Palmer S, Moles DR, et al. The cost-effectiveness of screening for oral cancer in primary care. *Health Technol Assess*. 2006;10:1-144, iii-iv.
18. Bhattacharya S, Middleton LJ, Tsourapas A, et al. Hysterectomy, endometrial ablation and Mirena® for heavy menstrual bleeding: A systematic review of clinical effectiveness and cost-effectiveness analysis. *Health Technol Assess*. 2011;15:iii-xvi, 1-252.
19. Black C, Clar C, Henderson R, et al. The clinical effectiveness of glucosamine and chondroitin supplements in slowing or arresting

https://doi.org/10.1017/S0266462314000701 Published online by Cambridge University Press

progression of osteoarthritis of the knee: A systematic review and economic evaluation. *Health Technol Assess*. 2009;13:1-148.
20. Collins R, Fenwick E, Trowman R, et al. A systematic review and economic model of the clinical effectiveness and cost-effectiveness of docetaxel in combination with prednisone or prednisolone for the treatment of hormone-refractory metastatic prostate cancer. *Health Technol Assess*. 2007;11:iii-iv, xv-xviii, 1-179.
21. Fox M, Mealing S, Anderson R, et al. The clinical effectiveness and cost-effectiveness of cardiac resynchronisation (biventricular pacing) for heart failure: Systematic review and economic model. *Health Technol Assess*. 2007;11:iii-iv, ix-248.
22. Garside R, Pitt M, Somerville M, Stein K, Price A, Gilbert N. Surveillance of Barrett's oesophagus: Exploring the uncertainty through systematic review, expert workshop and economic modelling. *Health Technol Assess*. 2006;10:1-142, iii-iv.
23. McKenna C, McDaid C, Suekarran S, et al. Enhanced external counterpulsation for the treatment of stable angina and heart failure: A systematic review and economic analysis. *Health Technol Assess*. 2009;13:iii-iv, ix-xi, 1-90.
24. Thompson Coon J, Rogers G, Hewson P, et al. Surveillance of cirrhosis for hepatocellular carcinoma: Systematic review and economic analysis. *Health Technol Assess*. 2007;11:1-206.
25. Hewitt C, Gilbody S, Brealey S, et al. Methods to identify postnatal depression in primary care: An integrated evidence synthesis and value of information analysis. *Health Technol Assess*. 2009;13:1-145, 147-230.
26. Colbourn T, Asseburg C, Bojke L, et al. Prenatal screening and treatment strategies to prevent group B streptococcal and other bacterial infections in early infancy: Cost-effectiveness and expected value of information analyses. *Health Technol Assess*. 2007;11:1-226, iii.
27. Clegg AJ, Loveman E, Gospodarevskaya E, et al. The safety and effectiveness of different methods of earwax removal: A systematic review and economic evaluation. *Health Technol Assess*. 2010;14:1-192.
28. Brush J, Boyd K, Chappell F, et al. The value of FDG positron emission tomography/computerised tomography (PET/CT) in pre-operative staging of colorectal cancer: A systematic review and economic evaluation. *Health Technol Assess*. 2011;15:1-192, iii-iv.
29. Chen Y-F, Madan J, Welton N, et al. Effectiveness and cost-effectiveness of computer and other electronic aids for smoking cessation: A systematic review and network meta-analysis. *Health Technol Assess*. 2012;16:1-205, iii-v.
30. Castelnuovo E, Thompson-Coon J, Pitt M, et al. The cost-effectiveness of testing for hepatitis C in former injecting drug users. *Health Technol Assess*. 2006;10:iii-iv, ix-xii, 1-93.
31. Robinson M, Palmer S, Sculpher M, et al. Cost-effectiveness of alternative strategies for the initial medical management of non-ST elevation acute coronary syndrome: Systematic review and decision-analytical modelling. *Health Technol Assess*. 2005;9:iii-iv, ix-xi, 1-158.
32. Rodgers M, McKenna C, Palmer S, et al. Curative catheter ablation in atrial fibrillation and typical atrial flutter: Systematic review and economic evaluation. *Health Technol Assess*. 2008;12:iii-iv, xi-xiii, 1-198.
33. Rogowski W, Burch J, Palmer S, et al. The effect of different treatment durations of clopidogrel in patients with non-ST-segment elevation acute coronary syndromes: A systematic review and value of information analysis. *Health Technol Assess*. 2009;13:iii-iv, ix-xi, 1-77.
34. Soares MO, Welton NJ, Harrison DA, et al. An evaluation of the feasibility, cost and value of information of a multicentre randomised controlled trial of intravenous immunoglobulin for sepsis (severe sepsis and septic shock): Incorporating a systematic review, meta-analysis and value of information analysis. *Health Technol Assess*. 2012;16:1-186.
35. Harris J, Felix L, Miners A, et al. Adaptive e-learning to improve dietary behaviour: A systematic review and cost-effectiveness analysis. *Health Technol Assess*. 2011;15:1-160.
36. Pandor A, Eastham J, Beverley C, Chilcott J, Paisley S. Clinical effectiveness and cost-effectiveness of neonatal screening for inborn errors of metabolism using tandem mass spectrometry: A systematic review. *Health Technol Assess*. 2004;8:iii, 1-121.
37. Stevenson M, Lloyd-Jones M, Papaioannou D. Vitamin K to prevent fractures in older women: Systematic review and economic evaluation. *Health Technol Assess*. 2009;13:iii-xi, 1-134.
38. Stevenson MD, Scope A, Sutcliffe PA, et al. Group cognitive behavioural therapy for postnatal depression: A systematic review of clinical effectiveness, cost-effectiveness and value of information analyses. *Health Technol Assess*. 2010;14:1-107, iii-iv.

https://doi.org/10.1017/S0266462314000701 Published online by Cambridge University Press