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1 **Appendix: Quality of Health Economic Studies Framework**

Number	Question text	Scoring
1	Was the study objectively presented in a clear, specific, and measurable manner?	Clear, specific, measurable =7 Any two = 5 Any one = 2 None = 0
2	Was the perspective of the analysis (societal, third party, payer, etc.) and reasons for its selection stated?	Perspective = 2 Reasons = 2 Both = 4
3	Were variable estimates used in the analysis from the best available source (i.e., randomized control trial - best, expert opinion - worst)?	Randomized control trial = 8 Non-Randomized control trial = 7 Cohort studies = 6 Case-control/case report /case series = 4 Expert opinion = 2
4	If estimates came from a subgroup analysis, were the groups prespecified at the beginning of the study?	Yes = 1 No = 0
5	Was uncertainty handled by (1) statistical analysis to address random events, (2) sensitivity analysis to cover a range of assumptions?	Statistical analysis = 4.5 Sensitivity analysis = 4.5 Both = 9
6	Was incremental analysis performed between alternatives for resources and costs?	Yes = 6 No = 0 CCA type of economic evaluation = NA
7	Was the methodology for data extraction (including the value of health states and other benefits) stated?	Yes = 5 No = 0

Number	Question text	Scoring
8	Did the analytic horizon allow time for all relevant and important outcomes? Were benefits and costs that went beyond 1 year discounted (3% to 5%) and justification given for the discount rate?	(1) Time horizon = 3 (2) Cost discounting = 1 (3) Benefit discounting = 1 (4) Justification = 2 All but justification = 5 All = 7
9	Was the measurement of costs appropriate and the methodology for the estimation of quantities and unit costs clearly described?	(1) appropriateness of cost measurement = 4 (2) clear description of methodology for the estimation of quantities = 2 (3) clear description of methodology for the estimation of unit costs = 2 All = 8
10	Were the primary outcome measure(s) for the economic evaluation clearly stated and did they include the major short-term? Was justification given for the measures/scales used?	(1) primary outcome clearly stated = 2 (2) include major short-term outcome = 2 (3) justification = 2 All = 6
11	Were the health outcomes measures/scales valid and reliable? If previously tested valid and reliable measures were not available, was justification given for the measures/scales used?	Yes = 7 No = 0

Number	Question text	Scoring
12	Were the economic model (including structure), study methods and analysis, and the components of the numerator and denominator displayed in a clear, transparent manner?	<p>(1) economic model = 2</p> <p>(2) study methods = 1.5</p> <p>(3) analysis = 1.5</p> <p>(4) components of numerator = 1.5</p> <p>(5) components of denominator = 1.5</p> <p>All = 8</p> <p>If not a modelling study, done for</p> <p>(1) study methods = 2</p> <p>(2) analysis = 2</p> <p>(3) components of numerator = 2</p> <p>(4) components of denominator = 2</p> <p>All=8</p>
13	Were the choice of economic model, main assumptions, and limitations of the study stated and justified?	<p>(1) economic model = 2</p> <p>(2) assumptions = 2.5</p> <p>(3) limitations = 2.5</p> <p>All = 7</p> <p>If not a modelling study, done (stated and justified) for</p> <p>(1) assumptions = 3.5</p> <p>(2) limitations = 3.5</p> <p>Both = 7</p>

Number	Question text	Scoring
14	Did the author(s) explicitly discuss direction and magnitude of potential biases?	(1) direction = 3 (2) magnitude = 3 Both = 6
15	Were the conclusions/recommendations of the study justified and based on the study results?	Yes = 8 No = 0
16	Was there a statement disclosing the source of funding for the study?	Yes = 3 No = 0

2

3

SEARCH 1: economic or evaluation or cost effect* or “cost saving” AND improv* or "behavior change" or "willingness to change" or accept* or "roll out" or change or adhere* AND "clinical guideline*" or "education outreach" or evidence or "evidence based" or "quality improv*" or "service improv*" or "local impl*" AND clinical or doctor or nurse or "allied health professionals" or clinician or pathway or "decision make*" or "local govern*" or "clinical commiss*" or "commissioners"

- Including Limited Related Terms

SEARCH 2: economic or evaluation or “cost effect*” or “cost saving” AND improv* or "behavior change" or "willingness to change" or accept* or "roll out" or change or adhere* AND "clinical guideline*" or "education outreach" or evidence or "evidence based" or "quality improv*" or "service improv*" or "local impl*" AND clinical or doctor or nurse or "allied health professionals" or clinician or pathway or "decision make*" or "local govern*" or "clinical commiss*" or "commissioners"

- Including related terms

SEARCH 3: search 1 without related terms

SEARCH 4: search 2 without related terms

Cost-consequences analysis (CCA): compares costs and multiple measures of patient outcome of alternatives under evaluation.

Cost-effectiveness analysis (CEA): compares costs and outcomes of alternatives using a single primary measure of patient outcome (e.g. life-years gained; cases of disease avoided; improvements in clinical functioning; improvements in quality of care experience).

Cost-utility analysis (CUA): compares costs and outcomes of alternatives with outcomes measured as quality-adjusted life years (QALYs) gained.

Cost-benefit analysis (CBA): compares costs and outcomes of alternatives, with patient outcomes valued monetarily.

Cost-analysis (CA): Costs implications only of relevant alternatives evaluated with no consideration of impact on quality of care and patient outcomes (not strictly a full economic evaluation).

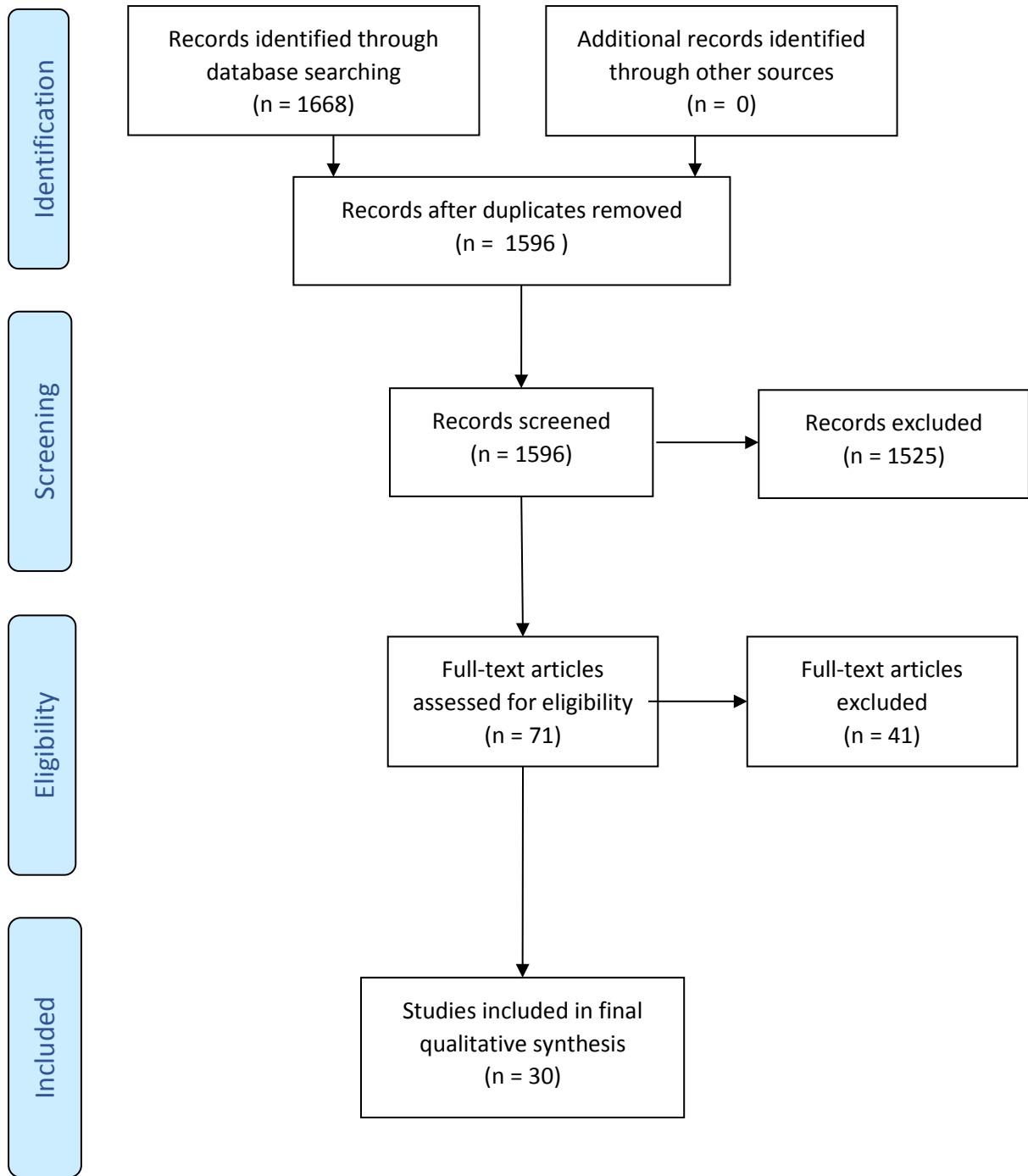


Table 1 – Panel 1a: improvement studies									
Author	Year	Country	Improvement or Implementation focus	Care setting	Improvement intervention focus	Sample size	Main study outcomes	Type of economic analysis	Quality appraisal score for economic modelling (out of 100)
Afzali et al	2013	Australia	Improvement	Endocrinology	Staff mix reformulation (Nurse-led)	3642	EQ-5D (EuroQol 5 dimension scale)	CEA	100
Albers-Heitner et al	2010	Netherlands	Improvement	Primary Care	Staff mix reformulation (Nurse-led)	384	EQ-5D	CEA	74
Bauer	2010	USA	Improvement	N/A	Staff mix reformulation (Nurse-led)	160	Resource use	CEA	N/A
Dawes et al	2007	UK	Improvement	Gynaecology	Staff mix reformulation (Nurse-led)	111	SF-36 (36-Item Short Form Health Survey), Length of Stay	CCA	66.5
Faulkener et al	2003	UK	Improvement	Primary Care	Improved referral	N/A	Review	Review	N/A

Furze et al	2011	UK	Improvement	Cardiology	Staff mix reformulation (peer support)	142	EQ-5D	CUA	84.5
Hernandez et al	2014	UK	Improvement	Intensive Care	Staff mix reformulation (Nurse-led)	286	EQ-5D	CUA	90.5
Karnon et al	2016	Australia	Improvement	Cardiology	Service Reconfiguration (funding sources)	603	N/A	CCA	44.5
Kilpatrick et al	2014	Canada	Improvement	Hospital General Medicine	Staff mix reformulation (Nurse-led)	2147	Review	CEA	N/A
Latour et al	2007	Netherlands	Improvement	Hospital wards	Staff mix reformulation (Nurse-led)	208	SF-36, HADS (Hospital Anxiety and Depression Scale)	CEA	81.5
Mdege et al	2012	Sub-Saharan Africa	Improvement	HIV	Staff mix reformulation (multiple scenarios)	19767	N/A	Review	N/A
Tappenden et al	2012	UK	Improvement	Geriatrics	Staff mix reformulation (Nurse-led)	N/A	Review	CEA	N/A

Walsh et al	2005	UK	Improvement	General Medicine	Staff mix reformulation (Nurse-led)	238	Bed days	CA	65
Williams et al	2006	UK	Improvement	Gastroenterology	Staff mix reformulation (Nurse-led)	1500	EQ-5D	CEA	94
Williams et al	2005	UK	Improvement	Urology	Staff mix reformulation (Nurse-led)	3746	EQ-5D	CEA	51
Yarbrough et al	2015	USA	Improvement	General Medicine	New pathway	677	Resource use	CEA	N/A

Note: CEA: Cost-Effectiveness Analysis; CUA: Cost-Utility analysis; CCA: cost-consequences analysis; CA: cost analysis

Panel 1b: implementation studies									
Author	Year	Country	Improvement or Implementation focus	Care setting	Implementation intervention focus	Main study outcomes	Type of economic evaluation	Sample size	Quality appraisal score for economic modelling (out of 100)
Brunenberg et al	2005	Netherlands	Implementation	Orthopaedics	Pathway implementation	EQ-5D, Length of stay	CEA	160	71
Burr et al	2007	UK	Implementation	Ophthalmology	Screening programme implementation	EQ-5D	CUA	207-32918	89.5
Burr et al	2012	UK	Implementation	Ophthalmology	Surveillance programme implementation	EQ-5D, Willingness to pay	CUA	800	92.5
Judd et al	2014	USA	Implementation	Hospital wards	Early intervention implementation	Length of Stay	CA	181	37
Kifle et al	2010	Ethiopia	Implementation	All hospital specialities	Referral system implementation	Resource use	CEA	532	N/A
Maloney et al	2012	Australia	Implementation	Physiotherapy	Health professional education	Costs only	CEA	85	94.5
Mortimer et al	2013	Australia	Implementation	General Practice	Implementation methods (active vs guideline dissemination)	EQ-5D, X rays avoided	CEA	112	81.5

Purshouse et al	2013	UK	Implementation	Public Health	Screening programme implementation	EQ-5D	CEA	N/A	82
Rachev	2015	USA	Implementation	Public Health	General methods of health service transformation	Resource use	CEA	N/A	N/A
Robertson et al	2011	UK	Implementation	Oncology	Surveillance programme implementation	EQ-5D	CUA	N/A	94
Tappenden et al	2013	UK	Implementation	Oncology	Resource allocation decision making	EQ-5D	CUA	N/A	84
Umscheid et al	2010	Canada	Implementation	N/A	Comparative effectiveness centre	None	Review	N/A	N/A
Vestergaard et al	2015	Denmark	Implementation	Cardiology	Guideline adherence vs observed treatment	EQ-5D	CEA	N/A	57.5
Yee & Shafie	2013	Malaysia	Implementation	Respiratory	Asthma management implementation	EQ-5D	Review	N/A	N/A

Improvement or Implementation interventions across studies (N of studies & %)		
Staffing reconfiguration	13	43%
Pathway implementation	4	14%
Review of practice	3	10%
Improvement in patient screening	3	10%
Service reconfiguration	2	7%
Improvement in follow up procedures	2	7%
Monitoring activity	1	3%
Guideline adherence	1	3%
Education	1	3%

Study	Costs considered	Scenarios considered	Conclusion: Intervention cost-effective?
Furze et al 2011	Training costs	None	Yes
Judd et al 2014	None	Scaling scenarios	Yes
Kifle et al 2010	Indirect costs of patients and carers; Project costs; Impacts on staff	None	Yes
Maloney et al 2012	Training and set up costs	Roll out scenarios	Yes
Mdege et al 2012	Training costs	Roll out scenarios	Yes
Mortimer et al 2013	Development costs; Amortisation; Delivery costs; Roll out costs	Roll out scenarios	No
Purshouse et al 2013	None	Roll out scenarios	Yes, although sensitive to rollout costs
Rachev 2015	Outlining of costs	None	Inconclusive
Tappenden et al 2013	None	Funding scenarios	N/A

QHES Dimension	Average score	Highest possible score	Percentage achieving highest possible score
Was the study objective presented in a clear, specific, and measurable manner?	6.0	7	65%
Were the perspective of the analysis (societal, thirdparty, payer, etc.) and reasons for its selection stated?	2.4	4	28%
Were variable estimates used in the analysis from the best available source (i.e., randomized control trial - best, expert opinion - worst)?	7.4	8	83%
If estimates came from a subgroup analysis, were the groups prespecified at the beginning of the study?	0.4	1	33%
Was uncertainty handled by (1) statistical analysis to address random events, (2) sensitivity analysis to cover a range of assumptions?	5.8	9	33%
Was incremental analysis performed between alternatives for resources and costs?	5.4	6	94%
Was the methodology for data extraction (including the value of health states and other benefits) stated?	4.0	5	78%
Did the analytic horizon allow time for all relevant and important outcomes? Were benefits and costs that went beyond 1 year discounted (3% to 5%) and justification given for the discount rate?	4.7	7	39%
Was the measurement of costs appropriate and the methodology for the estimation of quantities and unit costs clearly described?	3.9	8	0%
Were the primary outcome measure(s) for the economic evaluation clearly stated and did they include the major short-term? Was justification given for the measures/scales used?	4.7	6	67%
Were the health outcomes measures/scales valid and reliable? If previously tested valid and reliable measures were not available, was justification given for the measures/scales used?	5.0	7	72%
Were the economic model (including structure), study methods and analysis, and the components of the numerator and denominator displayed in a clear, transparent manner?	6.7	8	83%

Were the choice of economic model, main assumptions, and limitations of the study stated and justified?	5.6	7	78%
Did the author(s) explicitly discuss direction and magnitude of potential biases?	3.9	6	56%
Were the conclusions/recommendations of the study justified and based on the study results?	8.0	8	100%
Was there a statement disclosing the source of funding for the study?	2.4	3	78%