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Economic evaluation alongside a multinational trial: The GALA study

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Outline

- Objectives
- The GALA trial
- Methods
- Results
- Discussion

Objectives

- Estimation of costs associated with carotid surgery
- Analysis of patient-level cost-effectiveness data
- Investigate LA vs GA is cost-effective

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The GALA trial

- *Multinational and multicentre trial*
- *Investigate LA vs GA for Carotid Endarterectomy*
- *Main outcome: 30-days event-free survival*

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Statistical issues in CEA

- *Correlation between costs and effects*
- *Skewed data*
- *Clustering*
- *Covariate adjustment*
- *Censored and missing data*

Analysis

- *Cost estimation*
  - *UK NHS perspective*
  - *Used 2003/2004 price levels*
- *Cost-effectiveness analysis*
  - *Intention-to-treat basis*
  - *Time horizon: 30 days*
  - *Costs and effects not discounted*

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Unit costs

Resource		Unit	Unit cost (£)	Source
Hospital 'hotel' costs	Ward	Day	170	CIPFA
	Intensive therapy Unit	hour	1328/24	Dept Health
	High dependency Unit	hour	584/24	Dept Health
Theatre & recovery room	Trainee	minute	0.7	PSSRU
	Consultant	minute	4.5	PSSRU
	Nurse Sister	minute	.68	PSSRU
	Theatre Nurse	minute	.88	PSSRU
	Overheads	minute	2.39	Sculpher et al.
Consumables & drugs	LA anaesthetics	Surgery	6.5	BNF
	GA anaesthetics	Surgery	22.5	BNF
	Shunts	Unit	65	Manufacturer
	Patches	Unit	40	Manufacturer

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Resource use

Resource		GA Endarterectomy (n=1753)	LA Endarterectomy (n=1773)
Hospital stay *(days)*		***(n=1737)***	***(n=1754)***
Mean (SD)		5.7 (5.4)	5.5 (5.5)
Time of surgery (minutes)		***(n=1711)***	***(n=1717)***
Mean (SD)		93 (33.6)	93.2 (36)
Post-surgery stay		***(n=1572)***	***(n=1567)***
Recovery room (hours)		***(n=1096)***	***(n=1081)***
Mean (SD)		6.4 (17.6)	5.5 (12.1)
ITU (hours)		***(n=377)***	***(n=340)***
Mean (SD)		27.8 (71.4)	23.9 (20.9)
HDU (hours)		***(n=529)***	***(n=542)***
Mean (SD)		24.9 (19.6)	23.7 (15.4)
Staff			
Consultant surgeon	n (%)	1476 (85.9%)	1515 (87.8%)
Consultant anaesthetist	n (%)	1325 (84.3%)	1356 (86.4%)
Consumables			
Shunts	n (%)	738 (42.9%)	248 (14.3%)
Patches	n (%)	861 (50.1%)	728 (42.1%)

Statistical methods

- ***System of seemingly unrelated regression equations*** *(Willan et al. 2004)*

$$C_{ik} = \beta_0^c + \beta_1^c t_k + \varepsilon_{ik}^c$$
$$E_{ik} = \beta_0^e + \beta_1^e t_k + \varepsilon_{ik}^e$$
$$\begin{pmatrix} \varepsilon_{ik}^c \\ \varepsilon_{ik}^e \end{pmatrix} \sim BVN\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_c^2 & \sigma_c\sigma_e \\ & \sigma_e^2 \end{pmatrix}\right)$$

- ***Applied inverse probability weighting to SUR*** *(Willan et al. 2005)*

- ***Incremental cost-effectiveness ratio:*** $$ICER = \frac{\overline{C}_t - \overline{C}_c}{E_t - E_c}$$

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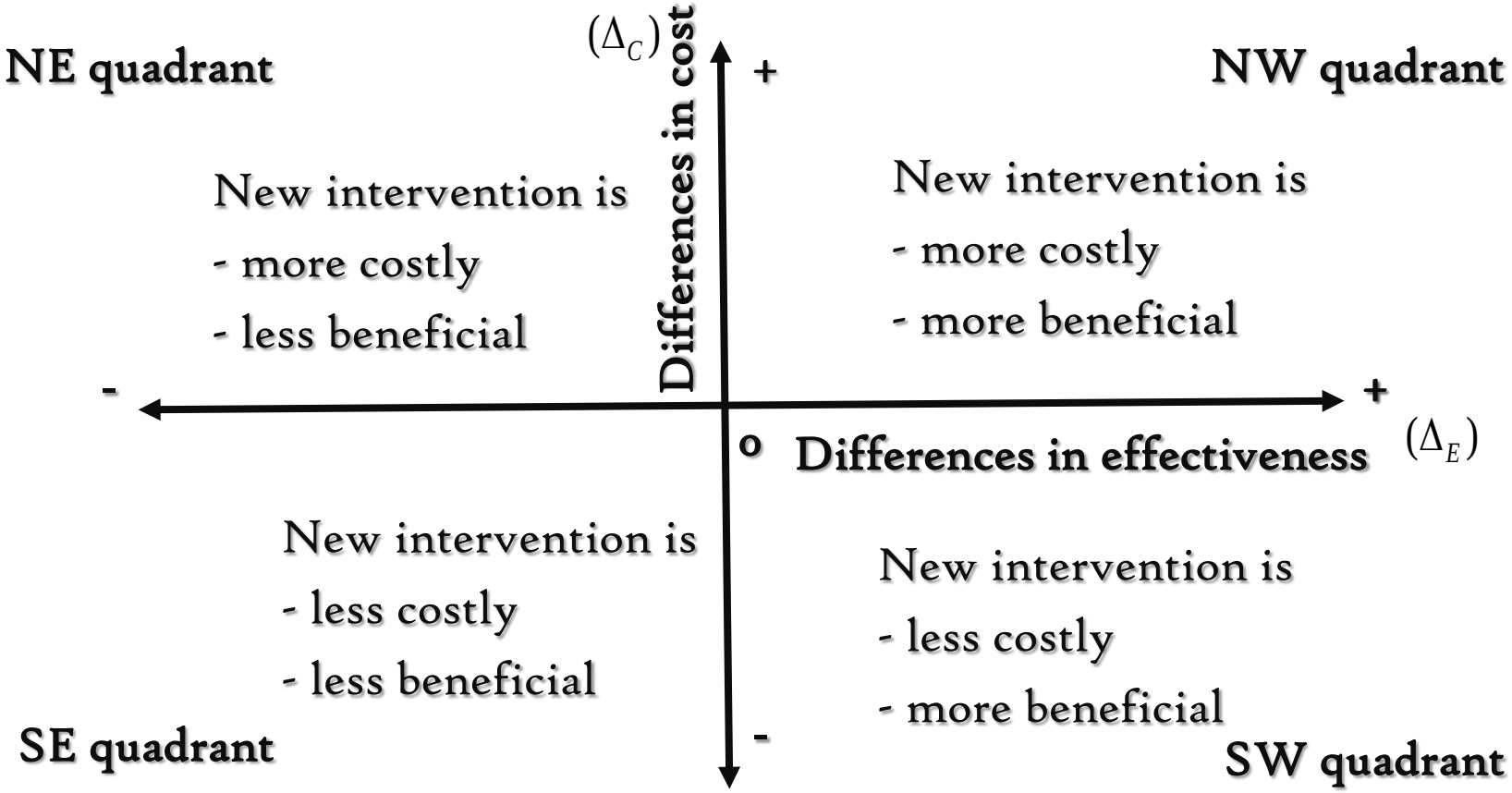
Cost-effectiveness plan



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Results: SUR estimates

Expected costs and effects differences of LA vs GA	Costs (£) [95% CI]	Effects (days) [95% CI]
Anaesthesia (LA)	**-178** [-289, -67]	**0.156** [-0.1, 0.4]
Age (>75years)	**-224** [-437. -10]	**0.42** [-0.07, 0.9]
Country (UK)	**-152** [-309, 4]	**0.351** [-0.02, 0.72]
Baseline surgical risk		
High	**-149** [-531, 233]	**-0.01** [-0.89, 0.87]
Medium	**-215** [-388, -41]	**0.22** [-0.18, 0.6]
Contralateral carotid occlusion	**-161** [-536, 215]	**1.4** [0.54, 1.4]
Trainee surgeon	**-170** [-475, 135]	**-0.12** [-0.82, 0.58]
Trainee anaesthetist	**-93** [-402, 206]	**-0.1** [-0.78, 0.59]
Symptomatic	**-201** [-342, -60]	**0.21** [-0.12, 0.53]

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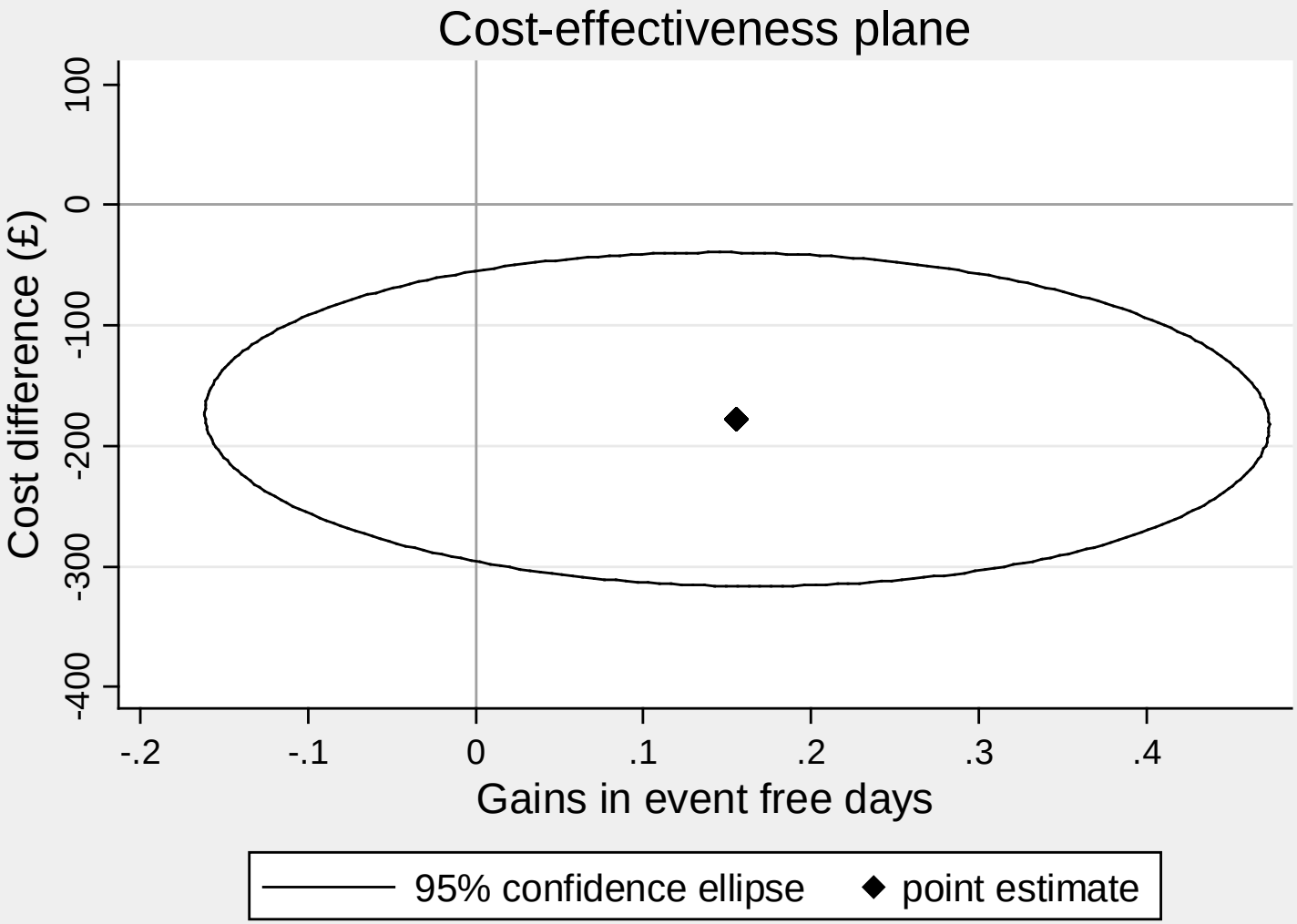
Confidence ellipse curve



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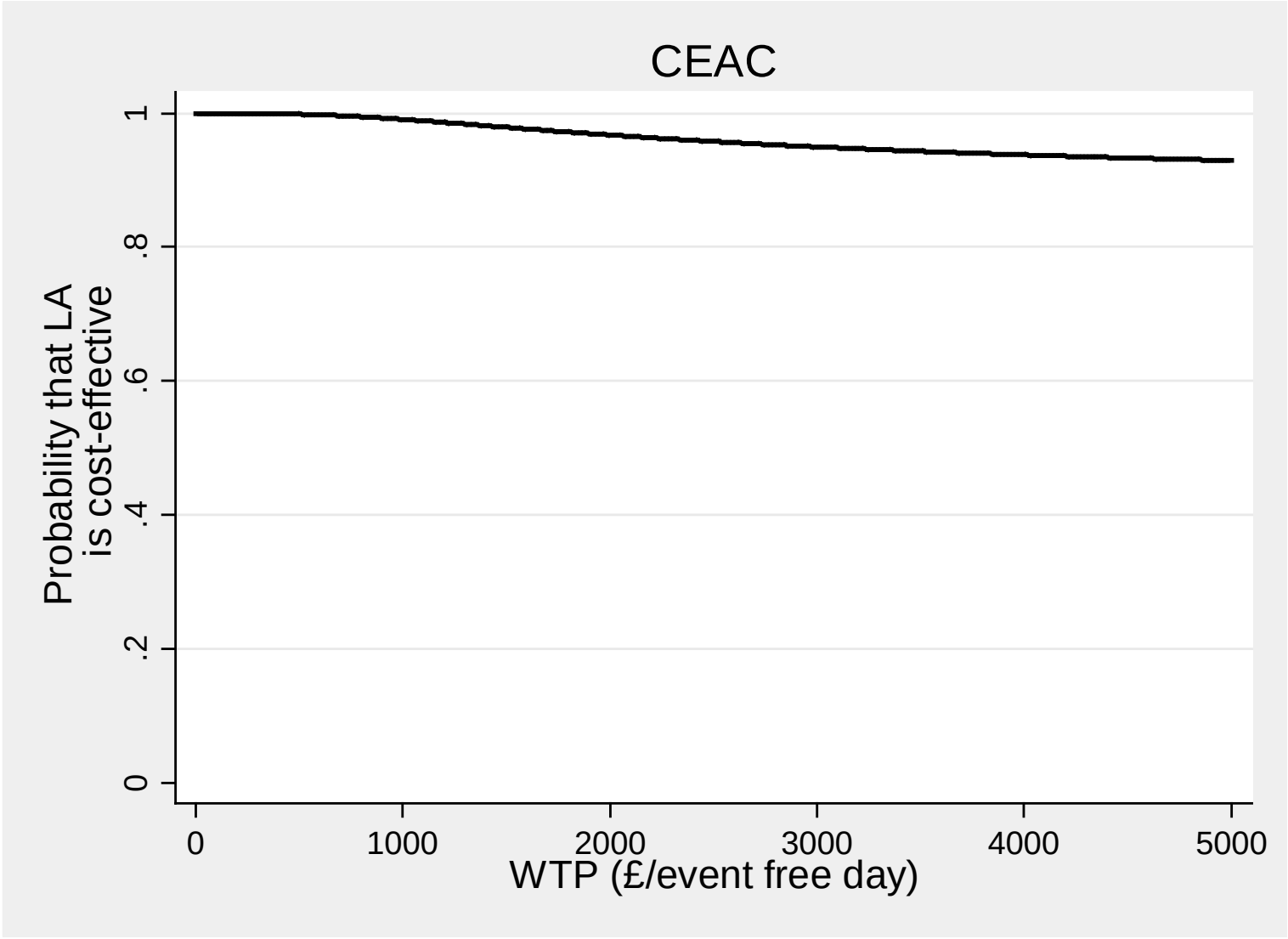
Cost-effectiveness acceptability curve



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Discussion

- **LA vs GA is cost-effective** (ICER=£1113/event-free day)
- **Unadjusted analysis** (ICER almost tripled)
- **LA likely to be more cost-effective**
  - UK
  - Over 75 years old
  - Symptomatic stenosis

Discussion

- Extrapolation for long-term CEA of LA vs GA
- Cost-utility analysis (one year)
- Normality (Alternative: GLMM or WinBUGS)
- Country-specific estimates (Multilevel analysis)

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