J.32 Abdominal surgery (excluding bariatric surgery)

Study	[National Clinical Guideline Centre 2010[666]]			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost-effectiveness**
Economic analysis: CUA (health outcome: QALYs) **Study design**: Decision analytic model **Approach to analysis:** A decision tree model was developed based on the	**Population:** Adult (18 years or older) admitted for elective abdominal surgery to hospitals in England. **Cohort settings:** Start age: 60 years Male: 50%	**Total costs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): NR (95% CI: NR; p=NR)	**QALYs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): NR (95% CI: NR; p=NR)	**Incremental net benefit (INB)** (pa) **Intervention 1: £**488 **Intervention 2:** £464 **Intervention 3:** £408 **Intervention 4:** £348 **Intervention 5:** £347 **Intervention 6:** £314

results of a systematic literature review and a network meta-analysis. **Perspective:** UK NHS and PSS **Time horizon:** VTEs and major bleeding events modelled for the acute period 10 days). QALYs and health service costs arising from these events are modelled over the patient's lifetime **Treatment effect duration:**[(a)] 10 days **Discounting:** Costs: 3.5% ; Outcomes: 3.5%	**Interventions:** 1. AES 2. IPCD-FID 3. UFH+ AES 4. LMWH+ AES 5. LMWH 6. Aspirin high dose 7. UFH 8.Fondaparinux+ IPCD-FID 9.Fondaparinux 10.VKA 11.No prophylaxis 12.UFH+ Aspirin high dose	**Currency & cost year:** 2009 UK pounds **Cost components incorporated:** Pharmacological prophylaxis costs, prophylaxis testing, nurse time, VTE diagnosis and treatment costs, other events treatment costs (i.e. stroke, PTS, CTEPH, major bleeding, reoperation)		**Intervention 7:** £241 **Intervention 8:** £127 **Intervention 9:** £104 **Intervention 10:** £75 **Intervention 11:** £0 **Intervention 12:** -£694 Probability cost-effective (£20K threshold): **Intervention 1:** 38.3% **Intervention 2:** 24.5% **Intervention 3:** 4.1% **Intervention 4:** 10.1% **Intervention 5:** 0.3% **Intervention 6:** 0.7% **Intervention 7:** 0.0% **Intervention 8:** 0.2% **Intervention 9:** 0.5% **Intervention 10:** 0.0% **Intervention 11:** 0.0% **Intervention 12:** 21.3% **Analysis of uncertainty:** Deterministic and probabilistic sensitivity analyses were performed. The deterministic SAs explored the impact of changing the incidence of CTEPH and PTS and their costs, including HIT, changing its incidence, lower costs for LMWH, changing fatality rate after PE and MB and change the cost effectiveness threshold. A two-way threshold analysis exploring the impact of baseline risk for both major

				bleeding and PE was also undertaken. There was only one situation in the deterministic sensitivity analysis in which the most cost effective strategy changed: high dose aspirin alone was the most cost effective strategy when the population specific pulmonary embolism relative risks were used. The results were highly sensitive to baseline risk of major bleeding and baseline risk of pulmonary embolism. For patients at lowest risk of major bleeding, combination prophylaxis is cost-effective, rather than mechanical prophylaxis alone.
Data sources				
Health outcomes: baseline events were obtained from the no prophylaxis arm of the RCTs included in the systematic review and NMA that informed the model. Relative treatment effects for DVT (symptomatic and asymptomatic), PE (symptomatic) and major bleeding. **Quality-of-life weights:** utilities based on the EQ-5D UK tariff were sourced from the published literature and previous guidelines. **Cost sources:** standard sources on unit costs in the UK were used including the drug tariff, the NHS reference costs and the BNF.				
Comments				
Source of funding: National Institute for Health and Care Excellence (NICE). **Limitations:** Some uncertainty regarding the applicability of unit costs from 2009 to current NHS context. The relative treatment effect applied to all VTE events in the model is the relative treatment effect obtained from the DVT NMA.				
Overall applicability:(b) Partially applicable **Overall quality**(c) Potentially serious limitations				

Abbreviations: AES: Anti-embolism stockings; BNF: British National Formulary; 95% CI: 95% confidence interval; CTEPH: chronic thromboembolic pulmonary hypertension; CUA: cost-utility analysis; da: deterministic analysis; da: deterministic analysis; EQ-5D: Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); FID: foot impulse devices; HD: high dose; HIT: Heparin induced thromboembolism; ICER: incremental cost-effectiveness ratio; IPCD: intermittent pneumatic compression device; LMWH: low molecular weight heparin; NR: not reported; NMA: network meta-analysis; pa: probabilistic analysis; PE: pulmonary embolism; QALYs: quality-adjusted life years; SA: sensitivity analysis; UFH: unfractionated heparin; VKA: Vitamin K antagonists.

(d) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(e) Directly applicable / Partially applicable / Not applicable

(f) Minor limitations / Potentially serious limitations / Very serious limitations

Study	[National Clinical Guideline Centre 2010[666]]			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost-effectiveness**
Economic analysis: CUA (health outcome: QALYs) **Study design**: Decision analytic model **Approach to analysis:** A decision tree model was developed based on the results of a systematic literature review and a network meta-analysis. **Perspective:** UK NHS and PSS **Time horizon:** VTEs and major bleeding events modelled for the acute and post discharge period. QALYs and health service costs arising from these events are modelled over the patient's lifetime **Treatment effect duration:**[(a)] 21 days **Discounting:** Costs: 3.5% ; Outcomes: 3.5%	**Population:** Adult (18 years or older) admitted for elective abdominal surgery to hospitals in England ; randomised 10 to 12 days after surgery (mainly cancer surgery patients) **Cohort settings:** Start age: 60 years Male: 50% **Intervention 1:** No post discharge prophylaxis **Intervention 2:** LMWH initiated post discharge and continued for 21 days.	**Total costs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): NR (95% CI: NR; p=NR) **Currency & cost year:** 2009 UK pounds **Cost components incorporated:** Pharmacological prophylaxis costs, prophylaxis testing, nurse time, VTE diagnosis and treatment costs, other events treatment costs (i.e. stroke, PTS, CTEPH, major bleeding, reoperation)	**QALYs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): NR (95% CI: NR; p=NR)	**Incremental net benefit (INB)** (pa) **Intervention 1:** £0 (comparator) **Intervention 2:** £49 Probability cost-effective (£20K threshold): **Intervention 1:** 22.5% **Intervention 2:** 77.5% **Analysis of uncertainty:** Deterministic and probabilistic sensitivity analyses were performed. The deterministic SAs explored the impact of changing the incidence of CTEPH and PTS and their costs, including HIT, changing its incidence, lower costs for LMWH, changing fatality rate after PE and MB and change the cost effectiveness threshold. A two-way threshold analysis exploring the impact of baseline risk for both major bleeding and PE was also undertaken. The result was consistent for all deterministic sensitivity analyses. In the probabilistic sensitivity analysis, LMWH was more cost-effective in 77% of the 5000 simulations of the probabilistic sensitivity analysis. It was also found that life expectancy would have to be halved for it to no longer be cost-effective for these patients.
Data sources				
Health outcomes: baseline events were obtained from the no prophylaxis arm of the RCTs included in the systematic review and MA that informed the model. Relative treatment effects for DVT (symptomatic and asymptomatic), PE (symptomatic) and major bleeding. **Quality-of-life weights:** utilities based on the EQ-5D UK tariff were				

sourced from the published literature and previous guidelines. **Cost sources:** standard sources on unit costs in the UK were used including the drug tariff, the NHS reference costs and the BNF.	
Comments	
Source of funding: National Institute for Health and Care Excellence (NICE). **Limitations:** Some uncertainty regarding the applicability of unit costs from 2009 to current NHS context. The relative treatment effect applied to all VTE events in the model is the relative treatment effect obtained from the DVT MA.	
Overall applicability:[(b)] Directly applicable	**Overall quality**[(c)] Potentially serious limitations

Abbreviations: AES: Anti-embolism stockings ;BNF: British National Formulary; 95% CI: 95% confidence interval; CTEPH: chronic thromboembolic pulmonary hypertension; CUA: cost-utility analysis; da: deterministic analysis; da: deterministic analysis; EQ-5D: Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); FID: foot impulse devices; HIT: Heparin induced thromboembolism; ICER: incremental cost-effectiveness ratio; LMWH: low molecular weight heparin; NR: not reported; NMA: network meta-analysis; pa: probabilistic analysis; PE: pulmonary embolism; QALYs: quality-adjusted life years; SA: sensitivity analysis;

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(b) Directly applicable / Partially applicable / Not applicable

(c) Minor limitations / Potentially serious limitations / Very serious limitations

Study	**[Wade 2015[985]]**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost-effectiveness**
Economic analysis: CUA (health outcome: QALYs) **Study design:** Systematic review and economic model, including value of information analysis. **Approach to analysis:** a two stage modelling approach, a decision tree for the acute phase (up to 14 days post-surgery) followed by Markov models for the long term phase with annual cycles.	**Population:** Patients undergoing any general surgery (subgroups considered were THR, TKR, general surgery for high risk patients, general surgery for medium risk patients and general surgery for low risk patients. The results presented here are for the general surgery subgroups [high, medium and low risk patients]) **Cohort settings:** Start age: 60 years	**Total costs (mean per patient):** **High risk patients:** Intervention 1: £521 Intervention 2: £522 Intervention 3 : £345 **Intermediate risk patients:** Intervention 1: £276 Intervention 2: £306 Intervention 3 : £230 **Low risk patients:** Intervention 1: £177 Intervention 2: £217	**QALYs (mean per patient):** **High risk patients:** Intervention 1: 12.755 Intervention 2: 12.758 Intervention 3 : 12.764 **Intermediate risk patients:** Intervention 1: 12.765 Intervention 2: 12.767 Intervention 3 : 12.769 **Low risk patients:** Intervention 1: 12.769 Intervention 2: 12.769	**ICER:** **High risk patients:** Intervention 1: Dominated Intervention 2: Dominated Intervention 3: Dominant 95% CI: NR Probability Intervention 1 cost-effective (£20K/30K threshold): 4%/4% Probability Intervention 2 cost-effective (£20K/30K threshold): 18%/18% Probability Intervention 3 cost-effective (£20K/30K threshold): 78%/79% **Intermediate risk patients:** Intervention 1: Dominated

The relative effectiveness of the interventions was based on a systematic review and network meta-analysis (NMA) of published RCTs. **Perspective:** UK NHS and PSS **Time horizon:** lifetime **Treatment effect duration:**[(a)] 14 days **Discounting:** Costs: 3.5% ; Outcomes: 3.5%	Male: 50% **Intervention 1:** LMWH (which is assumed to be the background pharmacological prophylaxis therapy administered to all patients) for a duration of 7 days (standard duration). **Intervention 2:** Knee-length AES in addition to pharmacological prophylaxis (LMWH) for a duration of 7 days (standard duration). **Intervention 3:** Thigh-length AES in addition to pharmacological prophylaxis (LMWH) for a duration of 7 days (standard duration).	Intervention 3 : £182 **Currency & cost year:** 2014 UK pounds **Cost components incorporated:** Prophylaxis costs. Monitoring tests. Nurse time. VTE treatment costs. Costs of treating adverse events , long term consequences and complications (CTEPH, PTS, bleeding, stroke, re-operation)	Intervention 3 : 12.771	Intervention 2: Dominated Intervention 3: Dominant 95% CI: NR Probability Intervention 1 cost-effective (£20K/30K threshold): 5%/4% Probability Intervention 2 cost-effective (£20K/30K threshold): 18%/18% Probability Intervention 3 cost-effective (£20K/30K threshold): 78%/78% **Low risk patients:** Intervention 1: comparator Intervention 2: Dominated Intervention 3: £2,632 95% CI: NR Probability Intervention 1 cost-effective (£20K/30K threshold): 9%/7% Probability Intervention 2 cost-effective (£20K/30K threshold): 18%/18% Probability Intervention 3 cost-effective (£20K/30K threshold): 74%/75% **Analysis of uncertainty:** Probabilistic sensitivity analysis was conducted. Analyses were reported for two main scenarios : i- the base-case NMA based on the no interaction, random-effects analysis, using the predictive distribution output ii- the direct meta-analysis comparing thigh-length AES (plus pharmacological prophylaxis) with

				knee-length AES (plus pharmacological prophylaxis). Additionally, sensitivity analysis changing the price used for AES (based on published prices and clinical experts estimate) and the level of patient adherence to thigh-length stockings (90% and 75%). The results of all scenario and sensitivity analyses were largely consistent with the base case results.

Data sources

Health outcomes: baseline event rates were based on the ACCP 2012 guideline, which used systematic review of RCTs published between 2003 and 2010 and meta-analysis. LMWH was considered the baseline treatment. The relative treatment effect was based on a systematic review and NMA of RCT data. long-term events included are PTS, CTEPH, stroke, VTE recurrence, The main health outcomes included were DVT (symptomatic), DVT (asymptomatic), PE (symptomatic) and major bleeding. **Quality-of-life weights:** from published sources largely using the EQ-5D UK tariff. **Cost sources:** standard UK unit cost sources including NHS reference costs and the drug tariff in addition to data from published sources and clinical expert opinions.

Comments

Source of funding: NIHR HTA. **Limitations:** Mixed population of all surgery types, however subgroup analysis is also presented. The model did not include some relevant health outcomes; e.g. clinically-relevant non-major bleeding, minor bleeding and surgical site infection.

Overall applicability:[(b)]Directly applicable **Overall quality**[(c)] Potentially serious limitations

Abbreviations: AES: anti-embolism stockings; 95% CI: 95% confidence interval; CTEPH: chronic thromboembolic pulmonary hypertension; CUA: cost-utility analysis; da: deterministic analysis; EQ-5D: Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER: incremental cost-effectiveness ratio; NMA: network-meta-analysis; NR: not reported; pa: probabilistic analysis; PTS: post-thrombotic syndrome; QALYs: quality-adjusted life years; RCT: randomised controlled trial; TKR: total knee replacement; THR: total hip replacement.

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b) Directly applicable / Partially applicable / Not applicable

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