Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The health technology under investigation was routine cystoscopy at the time of abdominal, vaginal and laparoscopically-assisted vaginal hysterectomy. The comparator was no cystoscopy.

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised women undergoing hysterectomy.

Setting
The setting was not defined. The study related to a procedure conducted in secondary or tertiary care. The study was conducted in Durham (NC), USA, but synthesised data from a number of sources.

Dates to which data relate
The effectiveness evidence was collected from studies published between 1939 and 1999. The date to which the resource use related was not reported. The analysis used 1998 prices.

Source of effectiveness data
The effectiveness data were derived from a review of published studies.

Modelling
A decision-analytic model was used to estimate the benefits and costs. The model defined the probability, choices and potential outcomes associated with the use of routine cystoscopy at the time of total abdominal hysterectomy. A modified version of the model addressed the cost-effectiveness of universal cystoscopy in cases of vaginal hysterectomy and laparoscopically-assisted vaginal hysterectomy.

Outcomes assessed in the review
The outcomes assessed in the review were:

- the frequency of ureteral injuries with total abdominal hysterectomy;
- the frequency of ureteral injuries with total vaginal hysterectomy;
the frequency of ureteral injuries with laparoscopically-assisted hysterectomy;

the frequency of asymptomatic ureteral injuries;

the probability of needing percutaneous nephrostomy; and

the probability of a kinking ureteral injury.

Study designs and other criteria for inclusion in the review
The literature review was mainly limited to papers reporting human studies with more than 200 patients, because ureteral injury is a relatively rare condition. The exception was surveillance studies to identify ureteral injury. The study designs included in the review were not reported, although the reference list indicates that the review included non-experimental study designs.

Sources searched to identify primary studies
MEDLINE was searched from 1966 to January 2000. Additional references were obtained from reference lists and review articles. Expert opinion was used when data were not available in the literature.

Criteria used to ensure the validity of primary studies
Only studies of gynaecologic operations for benign conditions were included in the review. In addition, only studies with more than 200 patients were included in the review, unless the study was designed to provide routine surveillance of ureteral injury in the form of intraoperative cystoscopy or postoperative intravenous pyelography.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
Seventeen primary studies were included in the review.

Methods of combining primary studies
Not specified.

Investigation of differences between primary studies
Not reported.

Results of the review
The frequency of ureteral injuries with total abdominal hysterectomy was 0.5%.

The frequency of ureteral injuries with total vaginal hysterectomy was 0.2%.

The frequency of ureteral injuries with laparoscopically-assisted hysterectomy was 2%.

The frequency of asymptomatic ureteral injuries was 0.

Methods used to derive estimates of effectiveness
The probability of needing percutaneous nephrostomy and the probability of a kinking ureteral injury were estimated using expert opinion and consensus between authors. The authors also made some assumptions.
Estimates of effectiveness and key assumptions
The probability of needing percutaneous nephrostomy was 50% and the probability of a kinking ureteral injury was 10%. The authors also assumed that the surgeon performing the hysterectomy could perform cystoscopy and interpret the results, that cystoscopy is 100% sensitive and specific, and that the procedure is not associated with additional morbidity.

Measure of benefits used in the economic analysis
The measure of benefits used in the economic analysis was the rate of ureteral injury.

Direct costs
The direct costs to the hospital were included in the analysis. These were for cystoscopy, suture release, reimplantation at original surgery, percutaneous nephrostomy, reimplantation at separate admission, and reimplantation and fistula repair. The direct cost data were obtained from the Duke University Medical Center and Medicare reimbursement for diagnostic-related groups. The prices were estimated from actual data. Discounting was not relevant because the time frame of the study was less than one year. The study reported the average costs and marginal costs. The price data referred to 1998.

Statistical analysis of costs
Not reported.

Indirect Costs
The indirect costs were not included in the analysis since they were not relevant to the perspective of the study.

Currency
US dollars (US$).

Sensitivity analysis
A sensitivity analysis of the benefits and cost of cystoscopy was performed in which all outcome variables were varied. Variability in the data was investigated. The ranges for the benefits were taken from the literature, while those for the costs were taken from the Duke University Medical Center. A one-way sensitivity analysis was used.

Estimated benefits used in the economic analysis
For total abdominal hysterectomy, the low ureteral injury rate was 0.2% and the high injury rate was 2.0%. For total vaginal hysterectomy and laparoscopically-assisted hysterectomy, the low ureteral injury rate was 0.2% and the high injury rate was 5.0%.

Cost results
The costs were US$125 for cystoscopy, US$150 for suture release, US$3,000 for reimplantation at original surgery, US$2,000 for percutaneous nephrostomy, US$10,000 for reimplantation at separate admission, and US$11,000 for reimplantation and fistula repair.

Synthesis of costs and benefits
The marginal costs to prevent one unrecognised ureteral injury were calculated. For total abdominal hysterectomy, the marginal cost to prevent one unrecognised ureteral injury was US$54,000 at the low injury rate and was "cost-saving" at the high injury rate. For total vaginal hysterectomy and laparoscopically-assisted vaginal hysterectomy, the marginal
cost was US$56,500 at the low injury rate and was "cost-saving" at the high injury rate. The threshold rate, defined as the rate at which the marginal cost was US$0, was 1.5%.

The sensitivity analysis of injury rates for total abdominal hysterectomy showed that, at low rates of injury, performing cystoscopy was more expensive than not performing cystoscopy. This was because the high postoperative repair costs in a very few cases were averaged over many hysterectomies. At high rates of injury, the high postoperative repair costs associated with not performing routine cystoscopy occurred in more cases, so the cost per hysterectomy was higher. The threshold rate was 2%.

The sensitivity analysis of injury rates for total vaginal hysterectomy and laparoscopically-assisted vaginal hysterectomy gave similar results to those for total abdominal hysterectomy.

A sensitivity analysis of the cost of cystoscopy was also conducted. For total abdominal hysterectomy, at a cost of US$300 per cystoscopy, the cost per injury prevented at an injury rate of 0.5% was US$51,565. At US$500 per cystoscopy, the cost was US$91,565 per injury prevented. If the injury rate was assumed to be 1.5%, then the estimated cost per injury prevented for a cystoscopy costing US$300 was US$11,565. For a cystoscopy costing US$500, the estimated cost per injury prevented was US$25,898.

Authors' conclusions
The cost-effectiveness of routine intraoperative cystoscopy depends on the rate of ureteral injury, independent of the route of hysterectomy. If the rate exceeds 1.5% for abdominal hysterectomy and 2% for vaginal or laparoscopically-assisted vaginal hysterectomy, then routine cystoscopy is cost-effective.

CRD COMMENTARY - Selection of comparators
The choice of the comparator was justified on the grounds that cystoscopy is not routinely performed during hysterectomy. You, should decide if no cystoscopy or other methods of detection are widely used in your setting.

Validity of estimate of measure of effectiveness
The effectiveness data were derived from a review of published studies. The authors stated that a systematic review of the literature had been undertaken and reported criteria to identify studies for the review. They did not, however, report detailed inclusion or exclusion criteria, the types of studies included, or the methods used to screen and review papers and extract the data. MEDLINE was searched for studies and further studies were identified from reference lists and review papers. The estimates of effectiveness from the primary studies were combined, although the authors did not report how this was conducted. The impact of differences between the primary studies was not considered when estimating the effectiveness.

Validity of estimate of measure of benefit
One measure of benefit was used in the economic analysis. The estimation of benefits was obtained directly from the effectiveness analysis. The authors reported that the effects of undiagnosed ureteral injury were excluded due to the lack of data. They noted that this might underestimate the consequences of no cystoscopy to identify injuries.

Validity of estimate of costs
All the categories of cost relevant to the perspective adopted were included in the analysis, although some relevant costs were omitted. The authors reported that they excluded the costs of outpatient treatment for ureteral injury, non-medical costs and the potential costs of malpractice litigation, and justified these exclusions. The authors noted that excluding these costs biases the model against the intervention, routine cystoscopy. The costs and the quantities were not reported separately. The resource costs and charges were estimated from published sources and the Duke University Medical Center. A sensitivity analysis of the quantities was not conducted, and neither was a statistical analysis of the prices. Discounting was not necessary since all the costs were incurred in less than one year. Charges were used to proxy some costs. The authors reported the dates to which the prices related.
Other issues
The authors did not compare their findings with those from other studies. The issue of generalisability to other settings was addressed. The authors did not present their results selectively. The study evaluated patients undergoing abdominal hysterectomy, vaginal hysterectomy and laparoscopically-assisted hysterectomy, and this was reflected in the authors’ conclusions. The authors reported a number of limitations of their study. The study did not incorporate variables such as patient pain and suffering, time lost from work, physician malpractice, and physician anguish associated with litigation. An estimate of the cost of litigation and negligence settlements resulting from intraoperative ureteral injury was not included. The effectiveness and costs of cystoscopy are dependent on the competence of pelvic surgeons with the technique (cystoscopy) and the availability of cystoscopy equipment. The model assumed no morbidity from cystoscopy.

Implications of the study
This model could be used as a tool for hospitals to examine their policies relating to cystoscopy. Routine cystoscopy at the time of hysterectomy may be cost-saving when the rate of ureteral injury is above 1.5% for abdominal hysterectomy and above 2% for vaginal or laparoscopically-assisted vaginal hysterectomy. At lower rates, cystoscopy has a net positive cost. The authors recommend that further research should address whether this cost is worthwhile.

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