Impact of a quality improvement programme based on vascular access flow monitoring on costs, access occlusion and access failure


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 study compared a quality improvement programme (QIP) based on periodic access flow measurements versus no measurements of access flow (i.e. reference period, RP). During the RP, vascular access surveillance consisted of non-standardised tools, frequent palpation before access cannulation, incidental auscultation before haemodialysis treatment, and registering of arterial and venous pressure during haemodialysis treatment. In the QIP, vascular access surveillance comprised monthly arteriovenous graft (AVG) and 3-monthly autogenous arteriovenous fistula (AVF) vascular access flow measurements using the Transonic HD01 access flow monitor (Transonic Systems Inc., Ithaca, NY). Based on the findings, patients were referred for angiography combined with percutaneous transluminal angioplasty (PTA) or PTA.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis

Study population
The study population comprised local incident haemodialysis patients with a vascular access (AVF or AVG). No further inclusion criteria were applied.

Setting
The setting was secondary care. The economic study was carried out in the Netherlands.

Dates to which data relate
Effectiveness data for the RP cohort referred to the period from 1996 to 1998, while data for the QIP cohort referred to the period from 2001 to 2003. Cost data were reported for the price year 2002.

Link between effectiveness and cost data
The costing was performed retrospectively, using resource use data from the sample of patients used in the effectiveness study.

Study sample
The size of the study sample was not determined in the planning phase to assure a certain power. All local incident haemodialysis patients with a vascular access (AVF or AVG) were eligible for the study. No patients were reported to have refused access to their data. Overall, 119 patients were included in the RP group and 117 in the QIP group.

Study design
The analysis was based on a retrospective comparative study with historical control. The data were not analysed blinded to the groups. Data for the RP group referred to the period 1996 to 1998, while data for the QIP referred to the period 2001 to 2003.

Analysis of effectiveness
The primary outcomes used in the analysis were the number of angiographic procedures with and without additional PTA performed, number of vascular access thrombectomies (both AVF and AVG), number of AVF thrombotic
occlusive events, number of access losses, and average access survival time until access loss. The patient groups were found to be comparable in terms of their baseline characteristics. Differences between the groups were compared using Poisson or chi-squared tests and Mann-Whitney U-tests, where suitable.

**Effectiveness results**

The following results are expressed as the mean +/- the standard deviation (SD).

A total of 77 (0.53 +/- 1.25/patient-year) angiographies without PTA were performed in the RP group and 57 (0.28 +/- 0.55/patient-year) in the QIP group, (p=0.047).

The number of angiographies with PTA performed were 48 (0.33 +/- 0.65/patient-year) in the RP group and 205 (0.88 +/- 1.16/patient-year) in the QIP group, (p=0.000).

The number of vascular access thrombectomies was 108 (0.63 +/- 1.06/patient-year) in the RP group and 60 (0.25 +/- 0.57/patient-year) in the QIP group, (p=0.000).

The number of AVF thrombotic occlusive events/patient-year were 0.21 (+/- 0.40) in the RP group versus 0.09 (+/- 0.29) in the QIP group, (p=0.022).

The AVG thrombotic occlusive events/patient-year were 1.14 (+/- 1.36) in the RP group and 0.45 (+/- 0.74) in the QIP group.

The number of access losses did not differ significantly between the two groups, and neither did the number of patients with access loss who received a central catheter until the creation of a new vascular site.

**Clinical conclusions**

The authors concluded that the QIP resulted in a decrease in thrombotic occlusive events and in the number of surgical interventions performed.

**Measure of benefits used in the economic analysis**

The authors did not derive a summary measure of benefit in the economic analysis. In effect, a cost-consequences analysis was performed.

**Direct costs**

The direct health care costs were included in the analysis. These related to angiography alone and combined with PTA, central vein catheter placement, surgical thrombectomy, new vascular access site creation, access flow measurement-related labour costs and cost of the Transonic HD01. Although summary aggregated costs were reported for each procedure, the costs accounted for personnel, equipment, material and overheads. Hospitalisation costs were also included in the analysis. All cost estimates were based on actual data derived from the hospitals' financial administration and were reported for the price year 2002. The cost of the Transonic HD01 was appropriately devaluated. The costs and the quantities of resources used were reported separately.

**Statistical analysis of costs**

Descriptive statistics were provided for all cost estimates (i.e. mean values, SDs and ranges).

**Indirect Costs**

Productivity costs were not included in the analysis.

**Currency**

Euros (EUR).

**Sensitivity analysis**

No sensitivity analysis was conducted.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**

The total costs were reported per patient-year. These were EUR 2,289.16 (+/− 3,153.68) in the RP group and EUR 1,538.40 (+/− 2,279.90) in the QIP group. Cost-differences between the two groups were not found to be statistically significant.

A sub-group analysis restricted to AVG patients demonstrated that QIP resulted in a cost reduction that was statistically significant, (p=0.01). The RP for AVG incurred a total cost of EUR 4,003.96 (+/− 3,810.92), while the QIP incurred a total cost of EUR 2,360.95 (+/− 2,838.17).

When the analysis accounted for AVF patients only, cost-differences between the two groups were not statistically significant.

**Synthesis of costs and benefits**

The costs and benefits were not combined.

**Authors’ conclusions**

The authors concluded that a quality improvement programme (QIP) based on periodical access flow measurement, with additional angiography and intervention, was effective in reducing the number of acute vascular access failures due to thrombotic events. However, the programme resulted in cost-savings only for arteriovenous graft (AVG) patients and not for arteriovenous fistula (AVF) patients.

**CRD COMMENTARY - Selection of comparators**

The QIP was chosen with reference to published clinical practice guidelines (Kidney Outcome Quality Initiative). The interventions provided during the RP would appear to represent a commonly used approach in the authors' setting. You should decide if the comparators represent widely used technologies in your own setting.

**Validity of estimate of measure of effectiveness**

The analysis was based on a retrospective comparative study with a historical control. Such a study design is associated with some limitations, mainly data handling bias, reporting biases and confounding. The study sample was representative of the study population and the patient groups were shown to be comparable at analysis. Statistical analysis was performed to detect significant differences between the two groups. However, there were no power calculations to assess whether the study was adequately powered to detect clinically significant results.

**Validity of estimate of measure of benefit**

The authors did not derive a summary measure of benefit. In effect, a cost-consequences analysis was performed.

**Validity of estimate of costs**

Although the perspective adopted was not explicitly reported, the cost analysis suggests that it was that of a hospital. An aggregated cost for each procedure was reported, although it appears that all the relevant aspects of costs (i.e. overheads, labour costs etc.) have been included within each category. The cost estimates were appropriate for the authors' setting and resource use relating to the various procedures was also based on actual patient data. The costs and the quantities were reported separately. No sensitivity analysis was conducted to assess the robustness of the estimates used.

**Other issues**

The authors compared their findings with those from other studies. The clinical results appeared, in general, to be in agreement and a balanced discussion of the differences was provided. The authors did not address the issue of the generalisability of the results to other settings. The study involved local incident haemodialysis patients with AVF or AVG vascular access, and this was reflected in the authors' conclusions. As a limitation of their study, the authors acknowledged that the retrospective study design could have introduced some biases into the analysis.

**Implications of the study**
The authors did not make any explicit recommendations for changes in policy or practice, nor did they make any recommendations for further research.

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