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Financial Impact of PEVAR Compared with Standard Endovascular Repair in Canadian Hospitals

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Abstract

Objectives: The percutaneous endovascular abdominal aortic repair (PEVAR) approach is a minimally invasive technique that has demonstrated clinical benefit over traditional surgical cut down associated with standard endovascular abdominal aortic aneurysm (AAA) repair (EVAR). The objective of our study was to evaluate the budget impact to a Canadian hospital of changing the technique for AAA repair from the EVAR approach to the PEVAR approach.
Methods: We examined the budget impact of replacing the EVAR approach with the PEVAR approach in a Canadian hospital that performs 100 endovascular AAA repairs annually. The model incorporates the costs associated with surgery, length of stay, and postoperative complications occurring within 30 days.
Results: The use of PEVAR in AAA repair is associated with increased access device costs when compared with the EVAR approach (CAD$1000 vs CAD$400). However, AAA repair completed with the PEVAR approach demonstrates reduced operating time (101 minutes vs 133 minutes), length of stay (2.2 days vs 3.5 days), time in the recovery room (174 minutes vs 193 minutes), and postoperative complications (6% vs 30%), which offset the increased device costs. The model establishes that switching to the PEVAR approach in a Canadian hospital performing 100 AAA repairs annually would result in a potential cost avoidance of CAD$245,120.
Conclusions: A change in AAA repair technique from EVAR to PEVAR can be a cost-effective solution for Canadian hospitals.

Résumé

Objectifs : La réparation endovasculaire percutanée (REVAP) de l'aorte abdominale est une technique à effraction minimale qui présente des avantages cliniques par rapport à l'incision pratiquée dans le cadre d'une réparation endovasculaire (REVA) standard d'un anévrisme de l'aorte abdominale (AAA). L'étude avait pour objectif d'évaluer l'incidence sur le budget d'un hôpital canadien du remplacement de la technique REVA par la technique REVAP pour la réparation des AAA.
Méthodes : L'incidence budgétaire du remplacement de la REVA par la REVAP dans un hôpital canadien qui effectue 100 réparations de l'AAA chaque année a été examinée. Le modèle tient compte des coûts associés à l'intervention chirurgicale, de la durée du séjour et des complications postopératoires dans les 30 jours suivant l'intervention.
Résultats : Le recours à la technique REVAP pour la réparation de l'AAA est associé à des coûts de dispositifs d'accès plus élevés que le recours à la technique REVA (1 000 $ CA contre 400 $ CA). Cependant, les réparations de l'AAA au moyen de la technique REVAP sont liées à une diminution de la durée des interventions (101 contre 133 minutes), de la durée du séjour (2,2 contre 3,5 jours), du temps passé en salle de réveil (174 contre 193 minutes) et des complications postopératoires (6 % contre 30 %), ce qui a pour effet d'annuler la hausse des coûts de dispositifs. Le modèle a permis d'établir que l'adoption de la technique REVAP par un hôpital canadien qui effectue 100 réparations de l'AAA par an permettrait une économie potentielle de 245 120 $ CA.
Conclusions : Le remplacement de la technique REVA par la technique REVAP pour la réparation de l'AAA peut représenter une solution économique pour les hôpitaux canadiens.

Key Words: Aneurysm; Percutaneous; Endovascular repair

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The promise of percutaneous endovascular abdominal aortic repair (PEVAR) and the progressively smaller profiles of devices have served as the basis for an even less invasive, modern-day endovascular abdominal aortic aneurysm (AAA) repair (EVAR) procedure. Evaluated against femoral exposure, a percutaneous approach allows for more frequent use of local anesthesia, a shorter operation, and an earlier ambulation time [1]. Furthermore, by avoiding a groin skin incision, PEVAR supports reduced patient pain, wound complications, and length of stay [1]. The objective of our study was to evaluate the budget impact to a hospital of changing the technique for AAA repair from the EVAR approach to the PEVAR approach.

Methods

We examined the budget impact of replacing the EVAR approach with the PEVAR approach in a Canadian hospital that performs 100 EVARs annually. The model incorporates the costs associated with surgery, length of stay, and postoperative complications occurring within 30 days (Figure 1).

We completed a comprehensive literature review to identify clinical trials comparing clinical outcomes or resource utilisation with PEVAR and EVAR. We performed the literature search in PubMed and Google Scholar in June 2016 and utilised the following search terms: *Percutaneous* or *PEVAR* or *Endovascular suture* or *Cutdown* or *PEVAR vs EVAR* AND *Abdominal Aortic Repair*. A total of 10 retrospective studies and 10 noncomparative prospective studies were identified and excluded due to heterogeneity in methodology. A total of 3 comparative prospective studies were selected for the analysis and their outcomes were pooled [1–3]. The studies included 2 prospective randomized trials [1,2] and a single nonrandomized prospective trial [3], representing a total of 239 patients.

The outcomes extracted and included in the budget impact were those that were shown to be statistically significantly different between PEVAR and EVAR in the 3 studies. Significant resource utilisation outcomes included operative time, recovery time, and length of stay. Significant clinical outcomes included groin complications occurring at 30 days, notably bleeding, thrombosis, and lymphocele. In the Nelson et al [1] study, clinical outcomes differed considerably according to the closure device used and therefore only results for patients in the 8F Perclose ProGlide (Abbott Vascular, Markham, ON, Canada) group were included. Other potential clinical benefits from PEVAR, such as reduced complications from local anesthesia, may exist, although they were not captured or significant in these studies and therefore were not incorporated.

The costs were estimated for each procedure (PEVAR and EVAR) and included preoperative care, access and closure devices, the cost of operating room time and other procedure costs, the cost of groin complications, and the cost of recovery and length of stay (Tables 1 and 2). The Ontario Case Costing Initiative is a publically available case-costing database for Ontario hospitals and was used to obtain case cost data for preoperative care, thrombosis requiring endarterectomy, and pharmaceuticals (code 1KA80GQNRN) [4]. A large Canadian Hospital calculated the hourly cost of the operating room (CAD$2300/hour) and the daily cost of an inpatient stay (CAD$1145/day), while the cost of recovery room time was drawn from a pilot study in a Canadian community hospital [8,9]. The cost of nursing time was based on the average salary of a Canadian nurse [5]. Market research was used to determine the cost of the endovascular aortic stent grafts and medical devices. The costs of local and general anesthesia were sourced from the literature [6,7]. The costs of bleeding complications were based on the cost of red blood cell transfusion [10]. For the treatment of lymphocele it was assumed that CAD$50 in dressings were applied and 1 hour of nursing time in hospital was required. A multivariate sensitivity analysis was completed using confidence intervals from the literature for clinical outcomes. Cost estimates were varied by ±10%.

There are a number of assumptions in the model. First, the model incorporates postoperative outcomes occurring within 30 days of surgery and may exclude differences between PEVAR and EVAR after that time period. It is also assumed that benefits of PEVAR are identical regardless of the stent graft being used. It is assumed that 3 nurses are needed to assist during surgery and that they receive benefits equal to

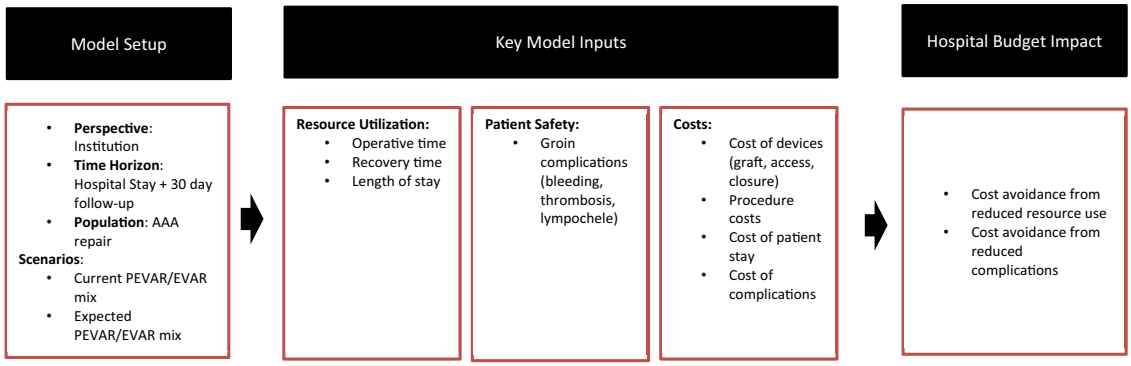

Figure 1. Model construction. AAA = abdominal aortic aneurysm; EVAR = endovascular abdominal aortic aneurysm repair; PEVAR = percutaneous endovascular abdominal aortic repair.