The financial impact of an endoluminal stenting procedure

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A glossary of terms is included at Appendix 1.

Abstract

This paper reports on a study that examined the financial impact of an endoluminal grafting procedure for an abdominal aortic aneurysm using the Mialhe Endoluminal Aortic Stentor. Clinical outcomes were not a focus of this study. The results of the study suggest that financial impacts of new clinical procedures can be understood and addressed through planning and greater liaison between clinicians, coding professionals and clinical costing staff.

Introduction

The present casemix funding system presents public hospitals with a significant financial exposure when undertaking research and development into minimally invasive therapies. The study reported in this paper examines the financial impact of an endoluminal stenting procedure for repair of aortic aneurysms conducted at Monash Medical Centre (MMC) in Victoria.

The use of minimally invasive therapy has increased markedly in recent years. The endovascular technique to repair aortic aneurysms is gaining widespread support. MMC performed an endoluminal aortic stent procedure for abdominal aortic aneurysms on 10 patients between December 1994 and June 1995. This was a significant undertaking and has major clinical and financial implications for MMC and the community.

In December 1994 members of the Department of Vascular Surgery at MMC, working in association with Dr Claude Mialhe, embarked on the implementation

of this minimally invasive therapy. Hospital management considered that this procedure has significant financial implications and requested that costs and revenues for the procedure be studied by the Hospital's Clinical Support Team. The intent of this study was not to suppress the new technology, but to find ways to better understand the financial impact of introducing new technology through the research and development stage.

Literature review

Repair of abdominal aortic aneurysms using the open repair method has been widely practised since the 1950s. During the 1960s vascular surgeons introduced the endo-aneurysmal surgical graft, where the aneurysm is opened but not excised and a graft is then placed into the lumen (Banta 1993). The percutaneous method of repair is estimated to negate many of the risks associated with the open repair method and to result in a reduced length of stay. The closed trans-femoral technique was introduced into clinical practice by Parodi and colleagues. Lazarus (1992) suggested that the endovascular technique would halve direct costs, but no study to support this statement was cited. At the time of the study less than 300 patients worldwide had undergone this procedure. Therefore clinical outcomes will need to be examined over time.

Purpose of study

The purpose of this study was to describe the financial impact of an endoluminal grafting procedure for an abdominal aortic aneurysm using the Mialhe Endoluminal Aortic Stentor. Clinical outcomes were not a focus of this study.

Procedure description and overview

Operative techniques

The Miahle Endoluminal Aortic Stentor consists of a nitinol stent, which has a high radial strength and low thrombogenicity, covered by a strong, thin woven polyester fabric. Its structure is essentially the same as the Cragg Endopro, which can be used to extend the stentor if necessary. The stentor is constructed in a straight, bifurcated or tapered configuration. The bifurcated stentor extends down into the common iliac arteries above the internal iliac arteries. The tapered stentor excludes both iliac systems so as to require a femoro-iliac crossover bypass to preserve the contralateral internal iliac artery.

The first patient was treated under epidural anaesthesia and the remainder under light general anaesthesia. For all procedures, there were two surgeons, an anaesthetist, radiologist, radiographer, and a surgical and radiology nursing team, either scrubbed or in attendance.

The sample group

The sample group included nine males and one female, with an average age of 74 years, who were admitted to MMC with the principal diagnosis of abdominal aortic aneurysm. Patients were selected by the surgeons on the dual criteria of having aneurysms suitable for endovascular repair and having other medical conditions which were likely to increase the risk of open repair. All patients signed a consent which clearly explained the procedure. The trial of endoluminal grafting was approved by the MMC Human Ethics Committee.

Costing methodology

Costs were examined using the Transition Clinical Costing System, utilising full absorption costing methodology for all activities associated with endoluminal aortic grafting. The costing system was augmented by considerable additional detailed analysis of the relevant procedural hospital resources used for these patients, particularly labour, prostheses and other high-cost items. Data were collected using a combination of real-time and retrospective recording methods.

Detailed analysis of expenses benefited from a division of costs into two categories: procedural and non-procedural costs.

Procedural costs included salaries for vascular surgeons, radiologists, operating room and imaging nursing staff, prostheses, diagnostic catheters and other theatre consumables. All human resource utilisation costings included penalties and allowances.

The Transition Clinical Costing System and manual data collection provided the determination of all major costs. A real-time sample of all low-cost consumables used during the procedure was analysed for two of the first five patients and this became the standard for all patients.

Non-procedural costs were calculated using the Transition system and separately identifying the resource utilisation for each patient. Ward costs were allocated on the basis of nursing dependency weighted bed-days. Pathology costs were calculated from the Medical Benefits Schedule (Commonwealth Department of Human Services and Health 1994). Pharmacy, catering and allied health costs were calculated from the Transition system.

Revenue was calculated using the Victorian Government's 1994–95 casemix funding formula. The hospital received revenue in five categories:

1. Fixed or Benchmark Overhead Grant
2. Training and Development Grant
3. Other Revenue
4. Diagnosis Related Group (DRG) or Variable Payment
5. Public Medical Payment.

Sources 4 and 5 have government set dollar values per Weighted Inlier Equivalent Separation (WIES). To calculate the revenue at the patient level, the total revenue for each of the first three sources of funding was taken and the gross amount was pro-rated by the actual number of WIES the hospital produced during the 1994–95 financial year. This calculation provides a dollar value per WIES for each revenue category so that there is a common denominator that can be used across any patient sample. Adding the dollar figures per WIES from the five sources results in a value that can be multiplied by the WIES for each patient to arrive at a revenue attributable to that patient.

The 10 patients were costed in two groups. The costing methodology remained constant for both groups, however, the revenue variable differed between the groups as a different DRG weight was applied. The first group's revenue utilised DRG 231 (2.281) and the second group was classified as DRG 228 (weight 5.9971). This will be discussed further.

Results

MMC incurred a total loss of $196 710 (Table 1). The main reasons for this loss were the high cost of the prostheses, a mean length of stay of 14 days, and high clinician and nursing costs incurred during this learning phase of the procedure. The DRG used for this procedure varied between the first group of patients and the second group.

The first group were coded using DRG 231 and the second group DRG 228. A comparison of the two groups resulted in an $11 338 favourable variance for procedural costs and a $4627 unfavourable variance for non-procedural costs. Overall, the second group's costs were 5 per cent lower than those of the first group.

Revenue differences between the two groups were significant (Table 2). The first group generated only A$25 536, compared to A$67 139 for the second group. This 163 per cent increase in revenue was the most significant factor contributing to the improvement in the financial impact of the two groups.

Table 1: Cost comparison of actual costs for the 10 patients compared to 10 patients classified as DRG 231 and 228

	Actual study patients	DRG 231	DRG 228
Procedural costs			
Imaging	$32 390	$12 762	$7 538
Theatre	$137 488	$10 322	$46 613
Subtotal	*$169 878*	*$23 084*	*$54 151*
Non-procedural costs			
Wards	$33 059	$29 678	$48 615
Medical	$12 356	$7 996	$19 136
Pathology	$5 149	$2 241	$4 011
Pharmacy	$6 325	$3 674	$9 439
Catering	$2 989	$2 707	$6 011
Allied health	$1 441	$698	$1 933
Indirect costs	$58 188	$18 640	$48 610
Subtotal	*$119 507*	*$65 634*	*$137 755*
Total costs	**$289 385**	**$88 718**	**$191 906**
Total revenue	**$92 675**	**$51 073**	**$134 277**
Results	**($196 710)**	**($37 645)**	**($57 629)**

Discussion

Limitations to the study include the small patient sample, which has a significant impact on the reported average length of stay. Also, costs associated with additional surgical procedures undertaken in theatre were not included.

The differences in revenue between the two groups is solely due to the application of a different DRG classification. A preliminary analysis of the first group indicated a significant disparity between actual costs and resource utilisation as prescribed in DRG 231. After significant consultation with the National Coding Centre, the second group was classified as DRG 228. A comparison of actual patient costs to 10 patients classified as DRG 231 and 228 is useful in understanding the impact of inappropriate classification. Table 1 demonstrates that had all 10 patients been classified as DRG 228. The primary determinant for classifying a patient to 231 and not 228 was the surgical approach.

Table 2: Cost comparison of actual costs and revenues of the two groups

	First group	Second group	Variance
Procedural costs			
Imaging	$18 696	$13 694	$5 002
Theatre	$71 912	$65 567	$6 345
Subtotal	*$90 608*	*$79 261*	*$11 347*
Non-procedural costs			
Wards	$14 420	$18 639	($4 219)
Medical	$6 178	$6 178	$0
Pathology	$1 736	$3 413	($1 677)
Pharmacy	$2 704	$3 621	($917)
Catering	$1, 74	$1 315	$359
Allied health	$807	$634	$173
Indirect costs	$29 921	$28 267	$1 654
Subtotal	*$57 440*	*$62 067*	*($4 627)*
Total costs	**$148 048**	**$141 328**	**$6 720**
Total revenue	**$25 536**	**$67 139**	**($41 603)**
Results	**($122 512)**	**($74 189)**	**($48 323)**

There are considerable financial implications for endovascular stenting procedures for inpatients in Victorian tertiary teaching hospitals. The results of the study reported here indicate that clinical trials and developmental work progressing towards less invasive procedures will create a dilemma in public systems funded partially or wholly on the casemix formula. Less invasive treatment generally equates to DRGs that have less DRG weight and a lower price generated for each patient. The time lag between the introduction of new procedures and the true reflection of their costs in DRG weights is currently two years or more. In the meantime, alternative funding sources will need to be found if the hospitals are not able to absorb these costs within their normal operating budgets.

The lack of sophisticated information systems in Australian public hospitals has been noted in several recent government reviews. Our experience from this study highlighted areas within the information systems and data capture processes at MMC that needed upgrading or reviewing.

Complete, comprehensive operation profile sheets should be required for all patients regardless of private or public status. If the documentation is incomplete, then the hospital will not maximise revenue due nor will the information systems reveal complete patient resource utilisation.

Recommendations

Hospital networks need to develop close formal relationships with State and national coding bodies to facilitate transfer of clinical costing data in a timely manner. This will reduce the current time lag between the advent of new technology and the allocation of an appropriately weighted DRG.

There is a need to develop a prospective care path which maps the proposed clinical and financial outcomes for each stage of care, prior to the implementation of any new or high-cost clinical procedure. It is paramount that this tool is utilised by and in close collaboration with all health service providers, and should be submitted as part of the ethics committee approval process.

Conclusion

The DRG initially allocated to the procedure described in this paper did not accurately reflect the cost of the procedure and consequently resulted in a major financial loss. Although it is estimated that non-procedural costs will fall over time with improved efficiencies, it does not negate the financial burden resulting from the prosthetic costs. Clinicians are in a prime position to be active in the financial and practical evaluation of new clinical procedures. In the future, the ability to undertake development work may well depend on the business planning ability of the astute clinician. As demonstrated, the financial impacts can be understood and addressed through planning and greater liaison between clinicians, coding professionals and clinical costing staff.

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Appendix 1

Glossary

Diagnosis related group (DRG) Is a means of classifying a variety of diagnoses into a group. These groups aim to represent patients with a similar resource utilisation pattern, level of complexity and length of stay.

AN-DRG In Australia, 526 DRGs have been developed with advice from the Australian Clinical Casemix Committee and through statistical analysis. This study used version 1 of the classification system.

Inlier Equivalent Separations (IES) This is part of the Victorian Government casemix funding formula. IES is a measure of activity which adjusts separations within a DRG for a length of stay. Patients who have a statistically long length of stay above a DRG's upper trim point are counted as more than one separation, and the hospital receives additional funding in compensation. IES are reduced to a fraction of one for patients who stay less than a statistical low boundary point, or below the DRG's lower trim point, therefore reducing funding.

High/low trim point The high trim point for a DRG is calculated by multiplying the State average inlier length of stay for that DRG by 3. The low trim point is obtained by dividing the State average inlier length of stay for the DRG by 3.

DRG weight Is a calculated index that is directly related to the estimated cost of treatment for an average inpatient in a particular DRG. Thus if one DRG is three times the DRG weight of another, one would anticipate the average treatment cost for patients in the first group to be three times that for the second group.

Weighted Inlier Equivalent Separation (WIES) Is calculated by multiplying the DRG weight by the total IES for the patient. It is a measure similar to units of care.

Transition Clinical Costing System (Transition) Is a fully integrated software package used in the study for hospital patient costing, casemix analysis and resource utilisation management. The technique utilises full absorption costing methodology.

DRG 231 Vascular procedure, except major reconstruction, without pump, with complications (DRG weight 2.281).

DRG 228 Major reconstruction vascular procedure, with complications (DRG weight 5.9971).

References

Banta H 1993, 'Implications of minimally invasive therapy', *Australian Clinical Review*, vol 13, pp 83–8.

Commonwealth Department of Human Services and Health 1994, Medical Benefits Schedule, November.

Lazarus H 1992, 'Endovascular grafting for the treatment of abdominal aortic aneurysms', *Surgical Clinics of North America*, vol 72, no 4, pp 959–67.