



UNIVERSITY OF
TECHNOLOGY SYDNEY

UTS:CHERE

**ECONOMIC EVALUATION OF THE
PROPOSED SURGICAL SCHEME AT
AUBURN HOSPITAL**

Final report

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The Centre for Health Economics Research and Evaluation (CHERE) was established in 1991. CHERE is a centre of excellence in health economics and health services research. It is a joint Centre of the Faculties of Business and Nursing, Midwifery and Health at the University of Technology, Sydney, in collaboration with Central Sydney Area Health Service. It was established as a UTS Centre in February, 2002. The Centre aims to contribute to the development and application of health economics and health services research through research, teaching and policy support.

CHERE's research program encompasses both the theory and application of health economics. The main theoretical research theme pursues valuing benefits, including understanding what individuals value from health and health care, how such values should be measured, and exploring the social values attached to these benefits. The applied research focuses on economic and the appraisal of new programs or new ways of delivering and/or funding services.

CHERE's teaching includes introducing clinicians, health services managers, public health professionals and others to health economic principles. Training programs aim to develop practical skills in health economics and health services research.

Policy support is provided at all levels of the health care system by undertaking commissioned projects, through the provision of formal and informal advice as well as participation in working parties and committees.

EXECUTIVE SUMMARY

Background

Public hospitals have experienced budget constraints but as demand for admissions has been growing at the same time, occupancy levels have been increasing. As emergency and urgent admissions are given priority, the effect has been not just longer waiting times and larger waiting lists for non-urgent admissions, but also frequent cancellations of elective surgery, thus adding to patients' waiting time. Consequently, there have been a number of attempts to reduce elective surgical waiting lists.

The Auburn Elective Surgical Program (AESP) was a pilot program funded by the NSW Health Department, to improve elective surgery for patients in Western Sydney Area Health Service (WSAHS). The program commenced 19th July 2001 and ended 15th November 2001. Initially, the program targeted three specific surgical procedures, laparoscopic cholecystectomy, hernia repair, and haemorrhoidectomy, and was expanded to include thyroidectomy, ligation and stripping of varicose veins and endoscopy. The program sought to improve the effectiveness and efficiency of administrative and clinical aspects of elective surgery by:

- Using spare operating theatre capacity at Auburn Hospital;
- the use of a new booking and waiting list system, managed by a nurse co-ordinator, which offered suitable patients a definite date for surgery;
- increasing surgical sessions by paying participating surgeons on a fee for service basis;
- however, surgery could be performed by a surgeon other than their treating surgeon;
- re-structuring elective surgical sessions to eliminate meal breaks;
- planning post discharge care so that surgery could be performed on a day only basis.

The Centre for Health Economics Research and Evaluation (CHERE) was commissioned to undertake an independent evaluation of the AESP. This study has examined the throughput, health outcomes, costs and patient satisfaction. Throughput data on the program were defined as time spent on the waiting list, number of failures to attend planned surgery, average length of stay, and number of surgical interventions. Health consequences were defined as complications, unplanned readmissions to hospital, wound infection after surgery, mortality, percentage of same day admissions and conversion rate to open cholecystectomy. Costs were estimated from a health service perspective. Patient acceptability was assessed by the proportion of eligible patients having their surgery under the AESP, and patient satisfaction by questionnaire.

Methods

Service use data were collected prospectively on patients treated by the AESP, recorded on the AESP data base, and provided to the evaluators by the program staff. Similarly, data on health outcomes were recorded on the AESP data base and provided to CHERE. Patient satisfaction was assessed by self completed questionnaire, mailed to patients approximately one month after surgery, and returned to CHERE.

Evaluation requires a comparison of what happened with an intervention in place, with what would have happened otherwise, and thus the identification of an appropriate comparison group is crucial. As neither an appropriate concurrent comparison group (a case control approach) or an appropriate historical comparison group (before/after design) could be identified for this study, a combination of approaches was used to construct a comparison group, and then modelling was used to estimate the costs and consequences that would have accrued to a similar group of patients under the current system without the intervention. This affected the data collection. Data for the intervention group were collected prospectively as part of the study process. However, for the comparison group data had to be drawn from several sources because no one source provided all the necessary data. Data were collected or extracted from existing data bases by the Nurse Coordinator and clinical support staff for the project; they were analysed, but not independently verified, by the evaluation team.



Results

Throughput: One hundred and forty three patients had surgery under the AESP, in a total of 37 additional surgical sessions. About half (57%) of these patients were admitted and discharged on the day of surgery. The majority of procedures performed under the program were laparoscopic cholecystectomies (36%) and hernia repairs (34%). Surgeons took less time to perform procedures under the AESP. The AESP has been a successful strategy for reducing elective surgical lists, as at the end of the trial period the waiting lists for the selected procedures had been eliminated. In particular, those patients who had had their surgery under the program had had longer waiting times than other patients waiting for similar surgery within WSAHS. The AESP appeared to ensure surgery for those pushed to the bottom of the waiting list. This report has estimated that the number of surgical procedures doubled under the program compared to normal practice. This is to be expected as additional resources were provided for surgical sessions and nursing care.

Acceptability: The AESP was accepted by most surgeons. Twelve of the thirteen surgeons approached to pool their public waiting lists agreed to do so. Eight of these undertook additional surgical sessions at Auburn Hospital. Fifty per cent of patients identified as eligible for the AESP from the waiting lists underwent surgery at Auburn Hospital, and half of these had originally been booked for surgery at Auburn. Eighty two (33%) declined the AESP, with the most frequent reason being that they preferred to have their choice of surgeon. Seventeen were determined to be unsuitable for day only surgery, on closer clinical review, or were sick on the day of surgery. Twenty seven (10%) could not be contacted or failed to attend.

Health consequences: No patient developed post-operative complications which were coded as such in their medical records, although three were transferred to the Intensive Care Unit, and one presented at the Emergency Department. There were no wound infections at 28 days post surgery. This suggests that quality of care is not adversely affected by the operation of the AESP.

Costs and cost savings: The current operation of the AESP relied on the spare operating capacity at Auburn Hospital and the ability of the operating theatres and support staff to absorb the additional workload. The additional costs of the AESP were the coordination and management of the program, the surgeon, and the nursing staff required for post-operative care. The AESP operating sessions were scheduled to eliminate the 'down time' of a meal break, thus increasing the productivity of the surgical team, and reducing costs. Day only admission. The best estimate is that the AESP generated savings of around \$60,000 in four months, although this may be over-estimated as the AESP patients may have been less severe cases than the comparison group. Unfortunately, there was no way to investigate this further within the available data.

Most of the cost savings are attributable to the reduction in length of stay. This is due to the apparently low use of day only admissions for laparoscopic cholecystectomies and hernia repairs, and higher average lengths of stay in WSAHS

Overall, then, the AESP achieved what it set to do, that is to provide an alternative means of managing elective surgical waiting lists to increase surgical throughput in WSAHS and to reduce waiting lists. The program was acceptable to surgeons and to most patients, and the results were achieved without an increase in adverse consequences or poorer health outcomes. Whether the AESP resulted in net cost savings is equivocal, as there were difficulties in identifying the appropriate comparison group and estimating the costs. Any significant cost savings were due to increasing day only admissions, and reducing total lengths of stay. This raises the question as to whether improved bed management could achieve similar savings, without the additional cost of additional surgical sessions, and without the pooling of waiting lists. The program also required an intensive input from the Project Manager and Nurse Coordinator. The persons employed in these positions demonstrated particular management skills and enthusiasm for ensuring the success of a novel program. It is not clear that these characteristics could be readily duplicated.

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INTRODUCTION

Auburn Elective Surgical Program

The Auburn Elective Surgical Program (AESP) was a pilot program funded by the NSW Health Department.

The primary aim of the program was to increase the effectiveness and efficiency of elective surgery for patients in Western Sydney Area Health Service (WSAHS). Initially, the program targeted patients on the waiting list for the following elective procedures: laparoscopic cholecystectomy; hernia repair; or haemorrhoidectomy. However during the study, this was expanded to include thyroidectomy, ligation and stripping of varicose veins and endoscopy.

The program sought to improve the effectiveness and efficiency of administrative and clinical aspects of elective surgery by:

- the use of a new booking and waiting list system;
- re-structuring elective surgical sessions; and
- planning post discharge care so that surgery could be performed on a day only basis.

The AESP introduced a new booking system for elective surgery. This system involved a more centralised approach being undertaken by the Nurse Coordinator. Other changes in responsibility also occurred. Table 1 summarises the changes in responsibility and personnel under the AESP. In this table, current practice refers to personnel who currently undertake these activities at Auburn Hospital.

Table 1: Changes in responsibility and personnel under the new booking system

ACTIVITIES	AESP	CURRENT PRACTICE
Review of Recommendations for Admission (RFA)	Nurse Coordinator	Bookings staff
Theatre scheduling	Nurse Coordinator	Bookings staff
Patient admissions	Peri-operative staff	Bookings staff

There were changes in the organisation and delivery of surgery. A summary of these changes appears in Table 2. Under AESP, operating lists were scheduled as 6.5 hour sessions with no interruptions with surgeons' being paid fee-for-service. This differed to current practice where operating lists are scheduled as 4 hour sessions with 15 minute meal breaks. Payment is sessional for public patients.

Table 2: Key changes to the organisation and delivery of elective surgery

SURGERY	AESP	CURRENT PRACTICE
Structure of surgical sessions:	6.5 hour sessions with no interruptions	4 hour sessions with a 15 minute meal break
Surgeon performing procedure:	VMO	Registrar/VMO
Surgeon remuneration:	Fee for service	Sessional
Referrals to post acute community care	100% referral	Select patient referrals

The research study

The program commenced 19th July 2001 and ended 15th November 2001. The program was implemented at Auburn Hospital, a district hospital within WSAHS. Auburn Hospital was chosen because of its spare surgical capacity at the time. Coordination and administration of the program was undertaken by WSAHS. A listing of the project team appears in Appendix A.

Surgeons with a significant elective surgical case load from within the WSAHS were invited to take part in the program. Invitation was made by the Project Manager of the study. The surgeons approached had to agree to either: reallocate their public hospital waiting list to a common list or reallocate their public hospital waiting list and undertake additional surgical sessions at Auburn Hospital for fee-for-service remuneration.

The waiting list for each participating surgeon was pooled into a common list. This common list served as the list of potential study candidates. All patients on this list had their Recommendations For Admission (RFA) reviewed by the Nurse Coordinator to determine their suitability. If the RFA documented major co-morbidities, for example myocardial infarction in the previous six months or an epileptic seizure in the last month, they were returned to the original hospital and the patient resumed their current position on the waiting list. The Nurse Coordinator then contacted the remaining patients and asked them to take part in the program.

Patient participation in the program involved the patient:

- Attending the out-patient Pre admission Clinic at Auburn Hospital and a clinical review prior to surgery to assess suitability;
- Having surgery at Auburn Hospital on a definite date which would not be cancelled;
- Having surgery performed by a different surgeon;
- Receiving Post Acute Continuing Care in their home once released from hospital; and
- Returning to the Pre-admission Clinic 28 days after surgery.

If the patient did not agree to take part in the program they resumed their current position on the waiting list.

Patients who underwent surgery were also invited to complete a patient satisfaction questionnaire. This questionnaire was mailed to patients approximately one month after surgery. Patients were contacted by telephone when no questionnaire was returned within a reasonable time.

The Centre for Health Economics Research and Evaluation (CHERE) was commissioned to undertake an independent economic evaluation of the program.

Evaluation

Economic evaluation involves the systematic comparison of alternative interventions in terms of consequences and costs (service use). There are a number of different types of economic evaluation, each type differs according to the measurement of the consequence(s) being examined.

The AESP sought to increase the effectiveness and efficiency of elective surgery for patients in WSAHS. It was thought that the program would have a wide impact on a number of outcomes. For this reason, a cost consequence analysis was chosen because this type of evaluation allows a range of different outcome measures to be explored.

Every economic evaluation involves a comparison between alternative interventions. The comparator may be another program or current practice. In this study, the AESP has been compared to current practice. Defining current practice in order to measure costs and consequences proved challenging in selecting a valid comparator group and in obtaining the appropriate data. Therefore, the appropriate comparison, the same patients who were not treated under the AESP, had to be constructed from a variety of sources.

An economic evaluation applies an incremental approach to the analysis of an intervention. This means that the differences between the AESP and current practice are of interest. It was anticipated that the differences between the two alternatives would be in terms of throughput, health consequences and costs. Table 3 summarises the anticipated impact of the AESP.

**Table 3:** Anticipated impact of the AESP

Throughput	Reduce the time patients spent waiting for elective surgery Reduce the number of no-shows to surgery Shorten patients' length of stay Increase the number of surgical intervention for the time period
Health Consequences	Reduce the number of post operative complications Reduce the number of unplanned readmissions Reduce peri-operative deaths Reduce the wound infection rate measured at 28 days after surgery
Other	Improve patient satisfaction with waiting times

In this study, the acceptability of the AESP has been assessed by the proportion of patient refusals to participate in the program, and by evaluating patient satisfaction for those patients who had their surgery performed under the program.

Every economic evaluation undertaken contains some degree of uncertainty over the results. One method to address uncertainty is sensitivity analysis. This involves changing the assumptions that have been made and determining how this affects the results. There are a number of forms of sensitivity analysis. In this study, simple one way sensitivity analysis has been undertaken in which the assumed values of each variable in the analysis are varied across a plausible range while the values of the other variables in the analysis remain fixed.

Methods: Throughput

Throughput data on the program were defined as time spent on the waiting list, number of failures to attend planned surgery, average length of stay, and number of surgical interventions. Throughput data for current practice came from a number of sources (Table 4).

Table 4: Data sources used for current practice for throughput measures

THROUGHPUT MEASURE	DATA SOURCE FOR CURRENT PRACTICE
Length of stay	WSAHS Health Information Exchange (HIE) data for the financial year 2000-01.
Waiting time	Elective operations over an 18 month period for patients treated and discharged according to waiting list records for WSAHS.
Number of surgical interventions	Elective operations over an 18 month period for patients treated and discharged according to waiting list records for WSAHS.

Methods: Consequences

Health consequences were defined as complications, unplanned readmissions to hospital, wound infection after surgery, mortality, percentage of same day admissions and conversion rate to open cholecystectomy. These data were collected by the Nurse Coordinator throughout the study on patients who had surgery under the AESP.

Consequence data, similar to the data described above, for current practice came from a number of sources (Table 5).

Patients who had their surgery performed under the program were asked to complete a patient satisfaction questionnaire (Appendix B). These questionnaires were posted to patients at least one month after having the operation.

Table 5: Data sources used for current practice for consequences

CONSEQUENCES	DATA SOURCE FOR CURRENT PRACTICE
Post operative complication rate	Administrative data for Westmead Hospital for a 3 month period provided by Clinical Management Support Unit of WSAHS.
Unplanned readmission rate	Administrative data for Westmead Hospital for a 3 month period within 28 days provided by Clinical Management Support Unit of WSAHS.
Wound infection rate	Auburn Hospital Survey of Surgical Wound Infection 7/12/1999 (Appendix C).
Mortality rate	Administrative data for Westmead Hospital for a 3 month period provided by Clinical Management Support Unit of WSAHS.
Percentage of same day admissions	WSAHS HIE data for the financial year 2000-01.
Conversion rate to open cholecystectomy	The Health Roundtable [2001].

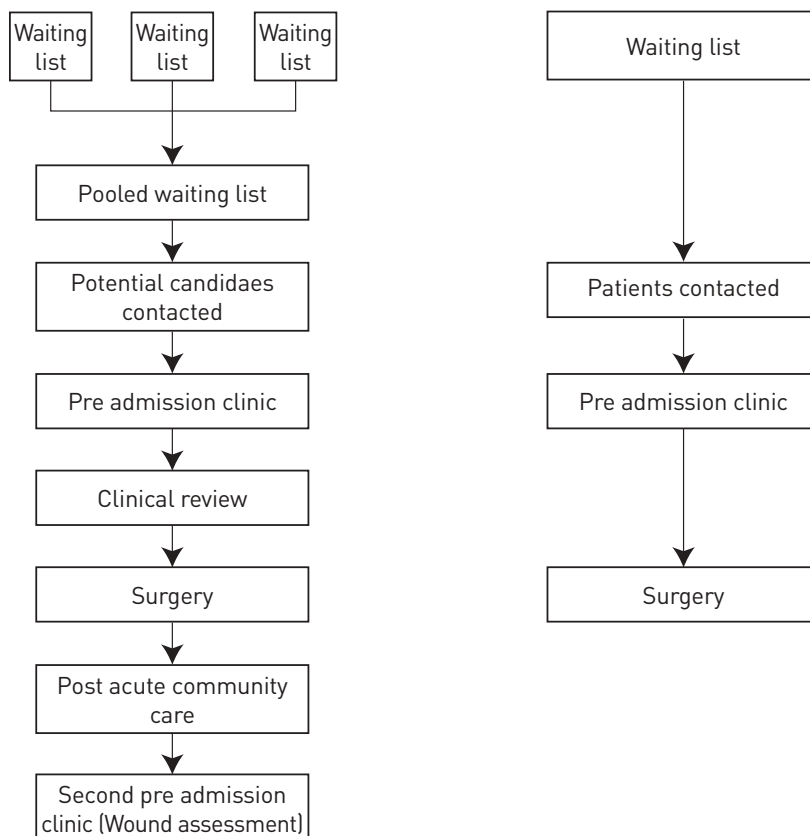
Methods: Costs

1. Identify the components of care

A number of perspectives can be applied when conducting an economic evaluation. In this study, a health services perspective has been adopted because the study aimed to examine the impact of the AESP on the health system, in particular the delivery of elective surgery.

Figure 1 identifies the components of care under the AESP and current practice. Five of these components, the pre admission clinic, clinical review, surgery, post operative care for in-patients and post acute community care, were identified as major and potentially different costs between the AESP and current practice. There were also components of the program which were required to establish the program and research activities required for its evaluation (Appendix D). These components were not included in the estimation of program operating costs.

Figure 1: Components of care identified





2. Data collection

Service use data, collected prospectively on patients who agreed to take part in the AESP program, were the number of visits to the pre admission clinic, clinical review, and time spent in the operating theatre, and hospital length of stay. These data were recorded on the AESP patient database.

Service use data for current practice was either extrapolated from the service use data collected on patients who agreed to take part in the AESP program (where the activity was unchanged by the AESP) or obtained from other data sources as described in Table 6.

Table 6: Assumption or data sources used for estimating the cost of current practice

COST	ASSUMPTION/DATA SOURCE
Pre admission clinic	Assumed to be the same as AESP patients
Clinical review	Assumed not to be undertaken under current practice
Surgery	
→ Operating equipment	Assumed to be the same as AESP patients
→ Operating theatre consumables	Assumed to be the same as AESP patients
→ Operating theatre staff	
— Surgeons	Mean surgical time for non study surgeons operating at Auburn Hospital for the same procedures
— Surgical assistant	Mean surgical time for non study surgeons operating at Auburn Hospital for the same procedures
— Anaesthetist	Mean surgical time for non study surgeons operating at Auburn Hospital for the same procedures
— Nursing	Mean surgical time for non study surgeons operating at Auburn Hospital for the same procedures
Post operative (in-patients)	WSAHS HIE data for the financial year 2000-01.
Post acute community care	Assumed not to be undertaken under current practice
Other equipment	Assumed not to be undertaken under current practice

3. Derive total cost

The total cost of the AESP and current practice were derived by multiplying service use by price (unit costs). Unit costs were either the actual cost reported under the program or standard fees as detailed below in Table 7. Average cost was calculated by dividing total cost by the number of procedures performed.

Table 7: Unit costs used

COST COMPONENT	UNIT COST
Pre admission clinic	Medicare Benefits Schedule (MBS) Reported staff costs
Clinical review	MBS
Surgery	
→ Operating equipment	Reported by the Auburn Operating Suite and Day Surgery Unit
→ Operating theatre consumables	Reported by the Auburn Operating Suite and Day Surgery Unit
→ Operating theatre staff	
— Surgeons	Fee-for-service cost and MBS where fee-for-service cost was missing
— Surgical assistant	Reported staff time and NSW award rates
— Anaesthetist	Reported staff time and NSW award rates
— Nursing	Reported staff cost
Post operative (in-patient)	Australian Refined Diagnostic Related Groups
Post acute community care	Reported time and cost by Nurse Coordinator

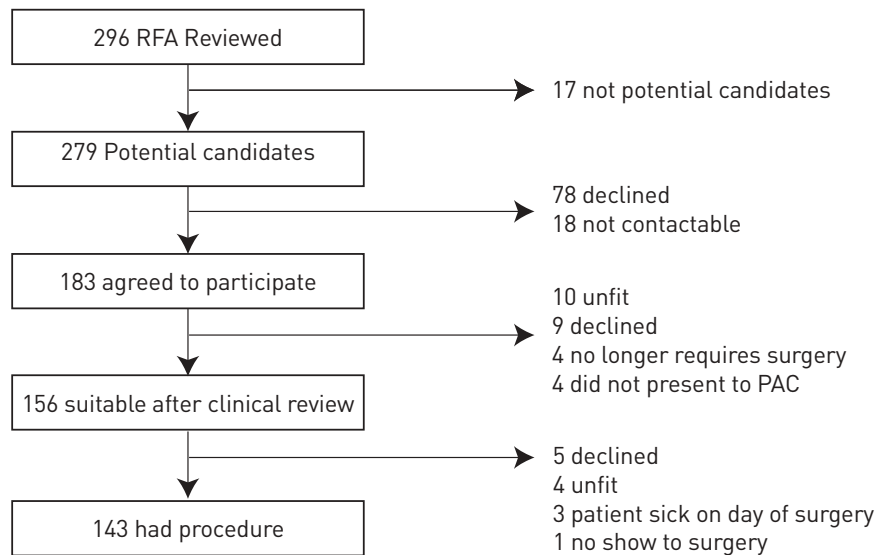
THROUGHPUT MEASURES OF THE AUBURN ELECTIVE SURGICAL PROGRAM

Participation

The AESP operated from 19th July 2001 to 15th November 2001. In that time, there were 296 RFA reviewed by the Nurse Coordinator, of which 279 people were deemed to be potential candidates for the program. Of these, 183 people agreed to take part in the program, 78 declined and 18 were not able to be contacted after several attempts were made. A further nine people declined to take part in the study after they initially agreed to participate. Four people did not present to the pre-admission clinic. Of the people who did present for the pre admission clinic, ten people were found to be not fit for surgery and four people were found to no longer require surgery. After the clinical review, a further five people declined to participate, four people were found to be unfit and three people were sick on the day of surgery. One person did not show for surgery. 143 procedures were performed under the program.

The AESP process is outlined schematically in Figure 2.

Figure 2: Study profile





The characteristics of the patients who underwent surgery under the program are summarised in Table 8.

Table 8: Characteristics of patients who underwent surgery (n=143)

	MEAN/FREQUENCY	STANDARD DEVIATION/PERCENTAGE
Female	79	55%
Age (years)	48.50	17.99
Non English speaking background	62	43%
Procedure		
→ Laparoscopic cholecystectomy → (including conversion)	52	36%
→ Hernia repair, open or laparoscopic	49	34%
→ Endoscopy	19	13%
→ Other	23	16%
Time spent on waiting list prior to being contacted (days)	109	101.93
Urgency code		
→ 8	99	69%
→ 7	36	25%
→ 2	7	5%
→ 1	1	1%
Hospital patient was waiting to have surgery		
→ Auburn	77	54%
→ Westmead	34	24%
→ Blacktown	27	18%
→ Mt Druitt	5	4%

Surgery

The description and numbers of the 14 different procedures performed under the program are presented in Table 9. The two patients (4%) who had open cholecystectomy had this following a laparoscopic procedure.

To simplify subsequent analysis, patients who underwent an open cholecystectomy have been grouped under the heading 'Laparoscopic cholecystectomy'. The heading 'endoscopy' includes endoscopy, colonoscopy and gastroscopy procedures. Patients who underwent either haemorrhoidectomy, varicose veins stripping, thyroid procedure and any other procedure have been grouped under the heading 'Other procedures'.

Table 9: Type and number of procedures performed

PROCEDURE	NO. PERFORMED
Laparoscopic cholecystectomy	50
Open cholecystectomy	2
Endoscopy	1
Endoscopy and therapeutic procedure	3
Colonoscopy	7
Colonoscopy and therapeutic procedure	2
Gastroscopy	6
Hernia repair	47
Other hernia	1
Hernia repair and minor procedure	1
Haemorrhoidectomy	2
Thyroid procedure	5
Varicose vein stripping	5
Other	11
TOTAL	143

54% of patients had their surgery performed at the same hospital for which they were originally waiting to have their surgery. 46% of patients had their surgery at a different hospital. 36% of patients had their original surgeon perform the surgery.

One patient did not present on the planned day of surgery. The very small number of no-shows could be explained by the Nurse Coordinator contacting each patient the day prior to surgery to confirm details. Therefore it is necessary to explore the reasons for a change in surgery date.

Eleven patients had their scheduled day of surgery changed, four of these were patient factors rather than hospital initiated, as shown in Table 10.

Table 10: Reason for a date change to planned surgery

REASON	NO. OF PATIENTS
Surgeon ill	4
Sick on day of surgery	2
Patient decided not to have surgery on designated date	2
Nurses strike	1
Missing data	2
TOTAL	11



Length of stay

57% of patients were admitted and discharged on the same day. The average length of stay for this population was 9.21 hours (Standard deviation:3.03, Minimum: 3 hours, Maximum: 15 hours).

43% of patients stayed overnight after their surgery. The average length of stay for this population was 1.33 days (Standard deviation:0.93, Minimum: 1 day, Maximum: 5 days). A more detailed breakdown of the average length of stay by procedure appears in Table 11.

Table 11: Detailed breakdown of the average length of stay by procedure

PROCEDURE	N	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
Laparoscopic cholecystectomy					
→ Same day patient	17	11.24 hrs	1.82 hrs	7 hrs	14 hrs
→ Overnight patient	29	1.34 days	0.90 days	1 day	4 days
Hernia repair					
→ Same day patient	30	10.43 hrs	2.30 hrs	6 hrs	15 hrs
→ Overnight patient	19	1.32 days	1.00 days	1 day	5 days
Endoscopy					
→ Same day patient	18	6.00 hrs	2.00 hrs	3 hrs	10 hrs
→ Overnight patient	0	0	0	0	0
Other procedure					
→ Same day patient	11	8.00 hrs	3.12 hrs	4 hrs	14 hrs
→ Overnight patient	9	1.33 days	1.00 days	1 day	4 days

NB. there were missing observations.

Surgeons

Thirteen surgeons were approached to take part in the study, twelve surgeons agreed to contribute their waiting list to a common pool. Eight of the twelve surgeons also elected to undertake additional surgical sessions. The number of procedures performed and surgical sessions undertaken by surgeon appears in Table 12. One surgeon preferred to wait for the results of this study before agreeing to participate.

Table 12: Number of procedures performed and surgical sessions undertaken by surgeon

STUDY SURGEON	NUMBER OF PROCEDURES PERFORMED	NUMBER OF SURGICAL SESSIONS
Surgeon 1	38	9
Surgeon 2	30	8
Surgeon 3	22	5
Surgeon 4	16	5
Surgeon 5	14	4
Surgeon 6	11	3
Surgeon 7	8	2
Surgeon 8	4	1
TOTAL	143	37*

NB. Four surgeons agreed to take part in the study but did not undertake any additional surgical sessions.

*One additional surgical session was not undertaken due to the surgeon being ill.

A more detailed breakdown of the type of procedures performed by surgeon is contained in Table 13.

Table 13: Detailed breakdown of the type of procedures performed by surgeon

STUDY SURGEON	LAPAROSCOPIC CHOLECYSTECTOMY	HERNIA REPAIR	ENDOSCOPY	OTHER	TOTAL
Surgeon 1	11	9	8	10	38
Surgeon 2	9	15	3	3	30
Surgeon 3	14	6	0	2	22
Surgeon 4	7	1	3	5	16
Surgeon 5	3	11	0	0	14
Surgeon 6	3	4	4	0	11
Surgeon 7	3	1	1	3	8
Surgeon 8	2	2	0	0	4
TOTAL	52	49	19	23	143

The average length of a surgical session was 4.9 hours (Minimum: 2.36 hours; Maximum: 7.22 hours). Four sessions went over the 6.5 hours scheduled.

The mean time each surgeon took to perform a laparoscopic cholecystectomy (Table 14), hernia repair (Table 15), endoscopy (Table 16) and other procedures (Table 17) appears in the next four tables. The mean time was calculated using the start and out of theatre times contained in the project database.

Table 14: Mean time taken to perform a laparoscopic cholecystectomy by surgeon

STUDY SURGEON	MEAN TIME (ROUNDED TO THE NEAREST MINUTE)	STANDARD DEVIATION	MINIMUM	MAXIMUM
Surgeon 1	73	20.72	39	115
Surgeon 2	60	11.57	40	76
Surgeon 3	63	12.94	50	92
Surgeon 4	81	19.91	63	122
Surgeon 5	54	7.55	46	61
Surgeon 6	96	16.52	80	113
Surgeon 7	88	7.37	82	96
Surgeon 8	57	12.02	48	65
TOTAL	70	18.44	39	122

**Table 15:** Mean time taken to perform a hernia repair by surgeon

STUDY SURGEON	MEAN TIME (ROUNDED TO THE NEAREST MINUTE)	STANDARD DEVIATION	MINIMUM	MAXIMUM
Surgeon 1	63	15.59	33	90
Surgeon 2	53	19.97	25	110
Surgeon 3	57	41.57	23	139
Surgeon 4	70	—	—	—
Surgeon 5	51	9.78	36	65
Surgeon 6	55	17.67	33	76
Surgeon 7	28	—	—	—
Surgeon 8	37	4.95	33	40
TOTAL	54	20.69	23	139

NB: Surgeon 7 and Surgeon 4 performed only one procedure.

Table 16: Mean time taken to perform an endoscopy by surgeon

STUDY SURGEON	MEAN TIME (ROUNDED TO THE NEAREST MINUTE)	STANDARD DEVIATION	MINIMUM	MAXIMUM
Surgeon 1	14	8.08	6	25
Surgeon 2	16	8.14	7	22
Surgeon 3	57	41.57	23	139
Surgeon 4	35	2.89	33	38
Surgeon 5	0	0	0	0
Surgeon 6	21	18.46	6	47
Surgeon 7	24	—	—	—
Surgeon 8	0	0	0	0
TOTAL	20	12.03	6	47

Table 17: Mean time taken to perform other procedures by surgeon

STUDY SURGEON	MEAN TIME (ROUNDED TO THE NEAREST MINUTE)	STANDARD DEVIATION	MINIMUM	MAXIMUM
Surgeon 1	87	51.97	21	155
Surgeon 2	47	17.09	29	63
Surgeon 3	13	3.54	10	15
Surgeon 4	83	81.92	9	215
Surgeon 5	0	0	0	0
Surgeon 6	0	0	0	0
Surgeon 7	25	8.50	19	35
Surgeon 8	0	0	0	0
TOTAL	66	56.25	9	215

Table 18 presents the total surgical time taken by each surgeon to perform a procedure. Total surgical time was the sum of the time taken to perform the specific procedure. It does not include any delays between patients.

Table 18: Total surgical time by surgeon in minutes

STUDY SURGEON	LAPAROSCOPIC CHOLECYSTECTOMY	HERNIA REPAIR	ENDOSCOPY PROCEDURE	OTHER	TOTAL SURGICAL TIME
Surgeon 1	802	570	113	873	2,358
Surgeon 2	544	801	49	141	1,535
Surgeon 3	886	342	0	25	1,253
Surgeon 4	568	70	104	414	1,156
Surgeon 5	162	565	0	0	727
Surgeon 6	288	218	83	0	589
Surgeon 7	263	28	24	76	391
Surgeon 8	113	73	0	0	186
TOTAL	3,626	2,667	373	1,529	8,195



CONSEQUENCES OF THE AUBURN ELECTIVE SURGICAL PROGRAM

Not suitable study candidates

17 patients were deemed not suitable candidates for the program after a review of their RFA. Two patients had been treated elsewhere and two patients were removed from the waiting list following review. For six of these patients, the review of their RFA prompted reconsideration of their urgency status and they were operated on during the study period. Four patients had surgery after the AESP had ended, three patients were still waiting for surgery as at 1 June 2002.

Post operative complications, unplanned readmissions, and deaths

According to Auburn Hospital medical record codes, no patient developed post operative complications after surgery, had a readmission within 28 days of surgery or died under the program.

However, data on departures from agreed clinical pathways (variance data) identified three patients transferred to the Intensive Care Unit after surgery. Further, there was one presentation to the Auburn Hospital Emergency Department.

Wound assessment at 28 days

37 wound assessments were performed 28 days after elective surgery. The majority of patients did not wish to return to Auburn Hospital for the wound assessment. These assessments were conducted in the pre admission clinic by the Nurse Coordinator. Figures have been reported for 30 patients because 7 patients did not consent to the release of information. Table 19 presents a breakdown of patients who had a wound assessment by surgical procedure.

Table 19: Patients who had a wound assessment by procedure

	NO. OF PATIENTS
Laparoscopic cholecystectomy	19
Hernia repair	10
Endoscopy	0
Other	1
TOTAL	30

No patient was found to have had an infected wound from the time of surgery to the time of assessment (Table 20 and Table 21).

Table 20: Whether the patient currently had an infected wound at 28 days

	NO. OF PATIENTS
Yes	0
No	25
Missing data	5
TOTAL	30

Table 21: Whether the patient had had an infected wound from time of surgery to review

	NO. OF PATIENTS
Yes	0
No	24
Missing data	6
TOTAL	30

Time away from work

Information about time taken away from work was obtained by asking patients to complete a patient satisfaction questionnaire (Appendix B). These questionnaires were posted to patients at least one month after having surgery. 78 questionnaires were returned (response rate: 55%).

Only 15% of the questionnaires returned mentioned taking time away from work to have their surgery. The average amount of time taken, for those who took time, was 13 days (Minimum: 3.5 hours, Maximum: 30 days). 9% of patients who returned a questionnaire also responded that they had family and friends take time off work to help them after the surgery. The amount of time taken by family and friends varied between 2 hours to 3 weeks.



COST OF AUBURN ELECTIVE SURGICAL PROGRAM

Estimation of the total cost of AESP

The total cost of AESP consisted of the five components of care identified (pre admission clinic, clinical review, surgery, post operative and post acute community care) and the cost of other equipment. Costs are presented in 2001 Australian dollars. The methods used to estimate the different components of total cost are outlined below.

*Pre admission clinic

The cost of the pre admission clinic was based on the procedural clinical pathways (laparoscopic cholecystectomy, hernia repair and endoscopy) developed by the Clinical Pathways Working Party for the program. The costs were identified on an individual patient basis and included the time of the nurse, interpreter (where the patient required an interpreter) and anesthetist, and the cost of diagnostic tests. Time estimates were based on expert opinion.

Table 22 summaries the staff classification and time estimates used to cost the pre admission clinic. Hourly rates of pay for nurses were sourced from the Public Hospitals Nurses' (State) Award (NSW Health Department Circular 2000/30). Pay rates for anaesthetic registrars and interpreters were extracted from the Staff in Public Hospitals, Health Services and the NSW Ambulance Service covered by the Health and Research Employees Association (NSW Health Department Circular 2000/31). On-costs have been included. These costs have been calculated at 25% to cover annual leave, superannuation and sick pay.

Table 22: Staff classification and time estimates for the pre admission clinic

STAFF	CLASSIFICATION	TIME ESTIMATES (MINS)	HOURLY RATE (INCL. ON-COSTS)
Nurse	Registered nurse Level 8	20	\$27.20
Anesthetist	3rd year registrar	12	\$39.02
Interpreter*	Grade 2, 3rd year	30	\$19.70

Diagnostic tests have been costed at 75% schedule fee from MBS which is the schedule fee for performing these tests in hospital as actual cost data for Auburn Hospital were not available. Different diagnostic tests were costed for the different surgical procedures (Table 23). Table 23 also contains the particular item numbers and schedule fee used. Bowel preparation has been costed using the cost for Glycoprep listed in the MIMS (MIMS, 2002). For the costing component of this study, it has been assumed that no additional nurse time was needed to perform the bowel preparation.

Table 23: Tests performed in the pre admission clinic

TEST	MBS ITEM CODE	75% SCHEDULE FEE	LAPAROSCOPIC CHOLECYSTECTOMY	HERNIA REPAIR	ENDOSCOPY	OTHER PROCEDURE
FBC	65070	\$16.70	Yes	Yes	No	Yes
Biochemistry	66509	\$15.30	Yes	Yes	No	Yes
ECG	11702	\$12.15	Conditional*	Conditional*	Conditional*	Conditional*
Bowel preparation	NA	\$10.66	No	No	Yes	No

*ECG were costed for those patients who either had a cardiac history and/or were greater than 60 years of age.

The total cost of the pre admission clinic, including patients who attended more than once, was \$9,376.

***Clinical review**

The cost of the clinical review involved the cost of the surgeon's time for the consultation. Surgeon's time has been costed at 75% schedule fee using the MBS item code 104. This cost was \$49.95 per consultation. 172 patients had a clinical review either in the surgeon's private rooms or at Auburn hospital. One cost was used irrespective of where the review took place. The total cost of clinical review was \$8,591.

***Surgery**

The cost of surgery included the cost of purchasing operating equipment, operating theatre consumables, and staff and ward costs. The AESP was designed to utilise spare capacity existing at Auburn Hospital. For this reason, building and overhead costs have not been included.

Operating equipment cost

Information on operating equipment purchased for the study was provided by the Operating Suite and Day Surgery Unit of Auburn Health Services (Table 24). Two complete general sets of instruments were purchased, in addition to five complete re-usable laparoscopic instrument sets. It has been assumed that the operating equipment has a useful life of between one and three years. Using these estimates and assuming an interest rate of 5%, an equivalent annual cost was calculated. The equivalent annual cost has been apportioned over the life time of the program. The life time of the program was 101 days. The cost of operating equipment purchased and attributed to the program was \$17,535.

Table 24: Operating equipment cost

	TOTAL COST	USEFUL LIFE SPAN (YRS)	EQUIVALENT ANNUAL COST	ATTRIBUTED PROJECT COST
General instruments				
→ Braun general trays	\$1,680	3	\$588	\$163
→ Tekno general sets	\$3,949	3	\$1,381	\$382
Laparoscopic instruments				
→ Trocars/cannulae	\$14,315	1	\$14,315	\$3,961
→ Surgical access	\$23,711	1	\$23,711	\$6,561
→ J&J	\$8,650	1	\$8,650	\$2,394
→ Braun trays (lap)	\$7,581	3	\$2,651	\$734
→ Braun trays (lap)	\$3,500	3	\$1,224	\$339
→ Kaiser	\$726	1	\$726	\$201
→ Suction irrigator	\$2,420	1	\$2,420	\$670
→ Lap handles	\$7,703	1	\$7,703	\$2,132
TOTAL	\$74,235			\$17,535

Operating theatre consumables

Cost estimates of operating theatre consumables by procedure were provided by the Operating Suite and Day Surgery Unit of Auburn Health Services (Table 25). Operating theatre consumables included theatre goods (for example, all aspects of linen drapes / instrument sets and accessories needed from blades to gloves), anaesthetic components and recovery goods.

Costs were identified on an individual basis based on the procedure undertaken by the patient. The total cost of operating theatre consumables was \$50,730.

Table 25: Operating theatre consumables

PROCEDURE	TOTAL COST
Laparoscopic cholecystectomy	\$380
Laparoscopic hernia repair	\$380
Laparoscopic proceeding to open cases	\$760
Endoscopy	\$150
Other cases	\$380



Staff and ward costs

Only the cost of additional staff and staff members who were diverted from other activities, for example, surgical registrars, have been identified. Porters or secretarial staff within the theatre have not been included, based on the assumption that these staff were able to absorb the extra workload. The cost of surgery was identified on an individual basis and attributed according to the patient’s actual surgical time.

The cost of the participating surgeons was provided by WSAHS. This cost (Table 26) was the fee-for-service payment made to each surgeon.

Table 26: Fee-for-service payment made to each participating surgeon

SURGEON	TOTAL PAYMENT
Surgeon 1	\$17,152
Surgeon 2	\$12,469
Surgeon 3	\$13,466
Surgeon 4	\$9,393
Surgeon 5	\$7,186
Surgeon 6	\$2,836
Surgeon 7	\$2,169*
Surgeon 8	\$1,484*
TOTAL	\$66,156

*At the time of writing this report, these surgeons had not claimed. Therefore, the claim amount has been estimated using the MBS item numbers.

The surgical assistant has been costed as a Resident Medical Officer 4th year and the anaesthetist as a Staff Specialist Level 4. Hourly rates of pay for the surgical assistant and anaesthetist were sourced from Staff in Public Hospitals, Health Services and the NSW Ambulance Service covered by the Health and Research Employees Association (HREA) (NSW Health Department Circular 2000/31) and Salary Increase for Salaried Senior Medical Practitioners (NSW Health Department Circular 2000/37) respectively. Hourly rates were adjusted to include 25% on-costs. The hourly rate for the surgical assistant and anaesthetist were \$36.16 and \$59.91 respectively.

The total cost of nursing and ward staff was provided by the Operating Suite and Day Surgery Unit of Auburn Health Services (Table 27). Actual staff costs were adjusted to include 25% on-costs. This cost was then divided by the total surgical time to give the cost per minute for nursing and ward staff. Lunch break relief has been included in the cost.

Table 27: Nursing and ward staff cost

	NO. OF STAFF	STAFF CLASSIFICATION	TOTAL COST (NO ON-COSTS)	TOTAL COST (INCL. ON-COSTS)
Theatre	2	Registered nurse year 6	\$9,874.24	\$12,342.80
	1	Enrolled nurse special grade	\$3,693.40	\$4,616.75
Recovery	1	Registered nurse year 6	\$2,954.88	\$3,693.60
Day ward	1	Registered nurse year 6	\$2,954.88	\$3,693.60
Lunch relief			\$209.20	\$261.50
TOTAL			\$19,686.60	\$ 24,608.25

The total staff cost was \$103,885.

***Post operative cost for in-patients**

Post operative cost refers to the cost of care beyond day of surgery. Therefore, patients who stayed overnight incurred a post-operative cost. A cost per day was derived by the summation of a number of Australian Refined Diagnostic Related Groups (AR-DRG) cost components (Commonwealth Department of Health and Aged Care, 2001). Not all cost components were used as this would have lead to double counting. The cost components included were: ward medical, ward nursing, non clinical salaries, pathology, imaging, allied, pharmacy, supplies and hotel. The most notable exclusion was the surgical component.

Post operative cost was calculated on an individual basis by multiplying the cost per day for the patient's AR-DRG with their actual length of stay. Missing values were replaced with the average of the remaining patients.

AR-DRG codes were assigned by a medical practitioner independent of the program (Table 28). All laparoscopic cholecystectomies were assigned the code H04B (Laparoscopic cholecystectomy without complications) because the AESP was biased towards good risk candidates. Other AR-DRG codes were assigned according to the procedural description contained in the study database. The total post operative cost was \$47,151.

Day surgery costs for those who did not stay overnight were included in the surgical staff costs under the day surgery nurses.

Table 28: AR-DRG codes

AR-DRG	DESCRIPTION OF AR-DRG	TOTAL COST OF INCLUDED COMPONENTS	AVERAGE LENGTH OF STAY (DAYS)	COST PER DAY
H04B	Chol - Closed Cde-Csc	\$1,384	2.5	\$554
G08Z	Abdom, umb & Oth Hernia Pr A→0	\$1,384	2.84	\$487
G09Z	Inguinal & Femoral Hernia Pr A→0	\$922	1.77	\$521
K06Z	Thyroid procedures	\$1,423	2.74	\$519
F20Z	Vein ligation & stripping	\$901	1.59	\$567
J10Z	Skn, subc tis & brst plastic pr	\$745	1.54	\$484
G11B	Anal & Stomal procedures - Csc	\$674	1.63	\$413

Source: National Hospital Cost Data Collection, Final cost weights for AR-DRG v4.1, Round 4 (1999-00) NSW

***Post acute community care cost**

An estimate of the number of hours (174.5 hours) the post acute community care team spent visiting project patients and an average cost per hour (\$21.28 per hour) was supplied by Auburn Health Services. On-costs of 25% have been added to this hourly rate. The total cost of post acute community care was \$4,642.

***Other equipment costs**

A number of pieces of equipment were purchased for the study. Information on the cost of equipment was provided by the Operating Theatre and Day Surgery Unit of Auburn Health Services. The information provided was the purchase price (unit cost) and an estimate of the useful life of the equipment (Table 29). Using these estimates and assuming an interest rate of 5%, an equivalent annual cost was calculated. The cost of equipment was apportioned over the life time of the program (101 days) to estimate an equivalent daily cost. With the exception of the image intensifier, it was assumed that all the equipment purchased for the program was not shared between theatres and that all the equipment could be used elsewhere. It was assumed that the image intensifier was used in other situations over the life time of the project. The total cost of other equipment was \$7,863.



Table 29: Other equipment costs

ITEM	NO.	UNIT COST	TOTAL COST	USEFUL LIFE SPAN (YRS)	EQUIVALENT ANNUAL COST	% PROJECT USE	ATTRIBUTED PROJECT
Camera	1	\$7,000	\$7,000	2	\$3,585	100%	\$992
Camera head	2	\$4,700	\$9,400	2	\$4,815	100%	\$1,332
Video adaptor	1	\$1,000	\$1,000	2	\$512	100%	\$142
Light source	1	\$7,121	\$7,121	3	\$2,490	100%	\$689
Insufflator	1	\$8,036	\$8,036	3	\$2,810	100%	\$778
Recovery monitor	1	\$2,500	\$2,500	5	\$550	100%	\$152
Trolley	1	\$1,900	\$1,900	2	\$973	100%	\$269
Clip applicator	2	\$2,163	\$4,325	2	\$2,215	100%	\$613
VCR	1	\$280	\$280	5	\$62	100%	\$17
Image intensifier	1	\$158,000	\$158,000	7	\$26,005	40%	\$2,878
TOTAL			\$199,562				\$7,863

Total cost

Table 30 summarises the total cost of the AESP in 2001 Australian dollars. As can be seen the largest cost component are surgical staff and ward time, theatre consumables and the post-operative inpatient costs.

Table 30: Total cost of the AESP

COMPONENT	COST
Pre admission clinic	\$9,376
Clinical review	\$8,591
Surgery	
→ Operating equipment	\$17,535
→ Operating theatre consumables	\$50,730
→ Staff and ward	\$103,885
Post operative (in-patients)	\$47,151
Post acute community care	\$4,642
Other equipment	\$7,863
TOTAL	\$249,772

Estimation of average cost

Table 31 contains the total average cost of the AESP. The total average cost has been presented a number of ways to take into account differences in resource use between difference groups.

Table 31: Total average cost of the AESP

COMPONENT	AC PER PATIENT WHO AGREED TO TAKE PART IN THE STUDY (N=183)	AC PER PATIENT SEEN IN PRE ADMISSION (N=179)	AC PER PATIENT WHO UNDERWENT SURGERY (N=143)
Pre admission clinic	\$51.23	\$52.38	\$65.56
Clinical review	\$46.95	\$48.00	\$60.08
Surgery			
→ Operating equipment	\$95.82	\$97.96	\$122.62
→ Operating theatre consumables	\$277.21	\$283.41	\$354.76
→ Staff and ward	\$567.68	\$580.36	\$726.47
Post operative (in-patients)	\$257.65	\$263.41	\$329.73
Post acute community care	\$25.36	\$25.93	\$32.46
Other equipment	\$42.97	\$43.93	\$54.98
TOTAL	\$1,364.88	\$1,395.38	\$1,746.66

Table 32 presents the total average cost per patient broken down by procedure.

Table 32: Total average cost of the AESP per patient per procedure

COMPONENT	LAPAROSCOPIC CHOLECYSTECTOMY (N=52)	HERNIA REPAIR (N=49)	ENDOSCOPY (N=19)	OTHER (N=23)
Pre admission clinic	\$73.71	\$66.26	\$33.40	\$72.24
Clinical review	\$62.29	\$57.48	\$54.36	\$65.32
Surgery				
→ Operating equipment	\$122.62	\$122.62	\$122.62	\$122.62
→ Operating theatre consumables	\$394.62	\$380.00	\$150.00	\$380.00
→ Staff and ward	\$892.94	\$705.06	\$227.11	\$808.23
Post operative (in-patients)	\$540.94	\$258.91	\$-	\$275.45
Post acute community care	\$32.46	\$32.46	\$32.46	\$32.46
Other equipment	\$54.98	\$54.98	\$54.98	\$54.98
TOTAL AVERAGE COST	\$2,174.56	\$1,677.78	\$674.94	\$1,811.31



COMPARISON OF THE COSTS AND CONSEQUENCES OF THE AUBURN ELECTIVE SURGICAL PROGRAM TO CURRENT PRACTICE

Cost comparison for laparoscopic cholecystectomy and hernia repair

To estimate the total cost of performing the same number of operations in current practice, the following assumptions were made:

- All patients attended a pre admission clinic irrespective of whether their surgery was performed under AESP or not.
- The cost of the clinical review, post acute community care, other equipment and set-up were considered additional costs of undertaking the AESP. These costs would not have been incurred if the patients had had their surgery performed in accordance with current practice.
- The cost of surgery (staff component) and the post operative care cost would differ by which setting surgery was performed. Differences could be in terms of differences in surgical time, length of stay or surgeon remuneration.

Costs and consequences have been modelled for the elective surgical procedures: laparoscopic cholecystectomy and hernia repair.

The following tables present the average surgical time taken to perform a laparoscopic cholecystectomy (Table 33) and hernia repair (Table 34) for AESP and non AESP patients by surgeon. Surgery start and theatre end times for non AESP patients (defined as patients who had their surgery performed at Auburn Hospital during the same period) were supplied by WSAHS. The mean surgical time taken for non AESP patients has been presented for both study and non study surgeons.

In our analysis, the average surgical time, weighted by the number of procedures performed, for non study surgeons has been used. This comparator has been chosen because mean surgical times are expected to be higher for study surgeons (non AESP patients) given these are patients who were not candidates for the program and therefore unlikely to be day surgical cases. Hence they are likely to represent more complicated cases.

Table 33: Mean surgical time taken (minutes) to perform a laparoscopic cholecystectomy

SURGEON	AESP PATIENTS	NON AESP PATIENTS
Surgeon 1	73	—
Surgeon 2	60	—
Surgeon 3 (adjusted)	69	79
Surgeon 4	81	98
Surgeon 5	54	127
Surgeon 6	96	142
Surgeon 7	88	67
Surgeon 8	57	114
TOTAL AVERAGE FOR STUDY SURGEONS (ADJUSTED)	71	106
TOTAL WEIGHTED AVERAGE FOR NON STUDY SURGEONS		109

Table 34: Mean surgical time taken (minutes) to perform a hernia repair

SURGEON	AESP PATIENTS	NON AESP PATIENTS
Surgeon 1	63	78
Surgeon 2	53	
Surgeon 3	57	77
Surgeon 4	70	51
Surgeon 5	51	69
Surgeon 6	55	
Surgeon 7	28	53
Surgeon 8	37	99
TOTAL AVERAGE FOR STUDY SURGEONS	54	71
TOTAL WEIGHTED AVERAGE FOR NON STUDY SURGEONS		60

Differences in mean surgical time between AESP and non AESP patients (non study surgeons) were apparent. On average, under current practice, laparoscopic cholecystectomies took an additional 40 minutes to perform and hernia repairs 6 minutes.

Assuming that all laparoscopic cholecystectomies and hernia repairs performed under current practice had the total weighted average surgical time for non study surgeons (that is, 109 minutes for laparoscopic cholecystectomies and 60 minutes for a hernia repair), the additional cost of surgery for the staff and ward component was \$10,658.17 (\$39,630.88-\$28,972.71) as shown in Table 35.

Table 35: Difference in the cost of surgery (staff and ward component) between AESP and current practice (using total weighted average surgical time for non study surgeons)

	AESP	CURRENT PRACTICE LAPAROSCOPIC	HERNIA	TOTAL
Surgeon assistant	\$3,792.63	\$3,415.96	\$1,771.86	\$5,187.82
Anaesthetist	\$6,283.23	\$5,659.20	\$2,935.44	\$8,594.64
Theatre	\$9,478.12	\$8,536.78	\$4,428.04	\$12,964.83
Theatre	\$3,545.24	\$3,193.13	\$1,656.28	\$4,849.42
Recovery	\$2,836.34	\$2,554.65	\$1,325.10	\$3,879.74
Day ward	\$2,836.34	\$2,554.65	\$1,325.10	\$3,879.74
Lunch relief	\$200.81	\$180.86	\$93.81	\$274.68
TOTAL	\$28,972.71	\$26,095.24	\$13,535.64	\$39,630.88

Under current practice, remuneration for surgeons on public patients is sessional payment. In this analysis, sessional payment has been calculated as the length of the specialised surgical session (6.5 hours) multiplied by the total number of surgical sessions undertaken (37 sessions) multiplied by an hourly rate of pay plus 25% on-costs and apportioned on the basis of surgical time. Each surgeon has been costed as a Senior Specialist Visiting Medical Officers with an hourly rate of pay of \$136.25 per hour (NSW Health Department Circular 2001/79).

Table 36 compares the total cost of surgeons under the two alternatives. This comparison compares the difference in the cost of surgeons under the different remuneration arrangement. The total cost of surgeons under the AESP (in which surgeons were paid fee-for-service) was \$52,008. Assuming that in current practice the same number of procedures were performed by surgeons but for sessional payment, the total cost would be \$31,454. The difference between the two alternatives was \$20,554.



Table 36: Total cost of surgeons under the AESP and current practice

	AESP (FEE-FOR-SERVICE PAYMENT)	CURRENT PRACTICE (SESSIONAL PAYMENT)
Laparoscopic cholecystectomy	\$29,738.72	\$18,123.43
Hernia repair	\$22,269.20	\$13,330.17
TOTAL	\$52,007.92	\$31,453.60

However, under current practice, surgeons take a longer time to perform a procedure. Therefore we need to cost the additional time spent. For a laparoscopic cholecystectomy, the additional time has been calculated at 40 minutes and for a hernia repair 6 minutes.

Table 37: Cost of extra surgical time under current practice

PROCEDURE	NO. PERFORMED	ADDITIONAL TIME SPENT	TOTAL COST
Laparoscopic cholecystectomy	52	40 minutes	\$5,904.17
Hernia repair	49	6 minutes	\$834.53
TOTAL			\$6,738.70

The total cost for surgeons under current practice was \$38,192.30 (\$31,453.60+\$6,738.70). The difference in the cost for surgeons between AESP and current practice is \$13,815.62 (\$52,007.92-(\$31,453.60+ \$6,738.70)).

The AESP was intended to be a day only program: less patients would stay overnight after surgery and post operative costs would be reduced. Table 38 compares the percentage of same day admissions and length of stay for in-patients between AESP and current practice. Data on current practice came from WSAHS HIE data for the financial year 2000-01.

Table 38: Comparison of the percentage of same day admissions and length of stay for AESP and current practice patients

	AESP PATIENTS	CURRENT PRACTICE PATIENTS
Percentage of same day admissions		
Laparoscopic cholecystectomy	37%	1%
Hernia repair	61%	21%
Length of stay (in patients)		
Laparoscopic cholecystectomy	1.34 days	2.35 days
Hernia repair	1.32 days	2.66 days

Under current practice, 1% of patients for laparoscopic cholecystectomy and 21% for hernia repair were estimated to be day only admissions while under the AESP, 37% and 61% respectively were day only.

Table 39 converts the difference in total length of stay between AESP and current practice into the total additional post operative cost under current practice. This additional post operative cost is based on treating the same number of patients (n=52 laparoscopic cholecystectomies; n=49 hernia repairs) as done so under the AESP. This analysis assumes that the AESP patients who stayed overnight are identical to the current practice patients who stayed overnight.

If the same number of laparoscopic cholecystectomies had been performed under current practice as in the AESP, patients would have stayed in hospital a further 77.08 days $[(0.99*52*2.35) - (0.63*52*1.34)]$. For hernia repairs, patients would have spent an additional 77.74 days $[(0.79*49*2.66) - (0.39*49*1.32)]$ days in hospital in total.

Table 39: Total additional post operative cost of performing surgery under current practice

PROCEDURE	DIFFERENCE IN TOTAL LENGTH OF STAY (IN PATIENTS)	POST OPERATIVE COST PER DAY	TOTAL ADDITIONAL POST OPERATIVE COST
Laparoscopic cholecystectomy	76.28 days	\$554	\$ 42,702
Hernia repair	77.74 days	\$504*	\$39,183
TOTAL			\$81,885

*There are two AR-DRG codes (two per diem costs) for hernia repairs. For this analysis the average of the two costs $((\$487 + \$521)/2)$.

Table 40 compares total cost for laparoscopic cholecystectomies and hernia repairs for the AESP and current practice combining all the above differences identified between AESP and current practice.

From the table, it is evident that the difference in cost between AESP and current practice is being driven by the cost attributed to post operative (in-patient) care.

Table 40: Total cost comparison between AESP and current practice for laparoscopic cholecystectomy and hernia repair

	AESP	CURRENT PRACTICE	DIFFERENCE
Pre admission clinic	\$7,079.47	\$7,079.47	\$0.00
Clinical review	\$6,055.95	NA	\$6,055.95
Surgery			
→ Operating equipment	\$12,384.83	\$12,384.83	\$0.00
→ Operating theatre consumables	\$39,140.00	\$39,140.00	\$0.00
→ Staff and ward	\$80,980.63	\$77,823.18	\$3,157.45
Post operative (in-patients)	\$40,815.61	\$122,700.38	-\$81,884.77
Post acute community care	\$3,278.62	NA	\$3,278.62
Other equipment	\$5,553.41	NA	\$5,553.41
TOTAL	\$195,288.52	\$259,127.86	-\$63,839.34

Sensitivity analysis

The analysis undertaken so far has been based on a number of assumptions. Sensitivity analysis involves changing the assumptions that have been made and determining how this affects the results. The assumptions made in the analysis will be varied one at a time (Table 41). For all of the assumptions made, the AESP continues to be less expensive. However, if the post-operative length of stay is considered to be the same for all patients who are admitted over night then the AESP becomes only marginally less expensive compared to current practice. This demonstrates the reliance of the program on achieving reduced post operative stay in order to generate savings.



Table 41: One way sensitivity analysis

ORIGINAL ASSUMPTION FOR CURRENT PRACTICE	MODIFIED ASSUMPTION FOR CURRENT PRACTICE	TOTAL COST OF AESP	TOTAL COST OF CURRENT PRACTICE	TOTAL COST DIFFERENCE LAPAROSCOPIC CHOLECYSTECTOMY AND HERNIA REPAIR
Length of stay	A. % same day admissions for current practice; Laparoscopic cholecystectomy; 1%, Hernia repair; 21%	A. \$195,288.52	A. \$280,895 Total post operative cost (in patients) is \$144,467.	A. \$85,606 AESP is less expensive
	Using NSW benchmarks for ALOS for current practice: Laparoscopic cholecystectomy; 3.38 days Hernia repair; 2.27 days			
	B. % same day admissions for current practice; Laparoscopic cholecystectomy; 1% Hernia repair; 21%	B. \$195,288.52	B. \$204,180 Total post operative cost (in patients) is \$67,752.	B. \$8,891 AESP is marginally less expensive
	Using AESP LOS for current practice: Laparoscopic cholecystectomy; 1.34 days Hernia repair; 1.32 days			
% of same day admissions	Using the AESP % same day admissions for current practice; Laparoscopic cholecystectomy; 37% Hernia repair; 61%	\$195,288.52	\$208,479.75 Total post operative cost (in patients) is \$72,052.27.	\$13,191 AESP is marginally less expensive
	LOS: Laparoscopic cholecystectomy; 2.35 days, Hernia repair; 2.66 days			
Mean surgical time difference	Use the total average time for study surgeons: Laparoscopic cholecystectomy; 35 mins, Hernia repair; 17 mins	\$195,288.52	\$260,891 Total staff and ward component is \$79,586.	\$65,603 AESP is less expensive
Surgeons receive sessional payment	Surgeons receive fee-for-service under current practice	\$195,288.52	\$272,943 Total staff and ward component is \$91,639.	\$77,655 AESP is less expensive

Consequence comparison for laparoscopic cholecystectomy and hernia repair

Table 42 compares the consequences of the AESP to current practice. Data on current practice came from a number of sources which have been documented in the fourth column of the table.

Two points should be noted in regard to the data for current practice. First, data on the conversion rate to open laparoscopic cholecystectomy includes both emergencies and elective procedures. This rate may not be directly comparable to the very low rate of conversion achieved in the AESP. Emergency patients may have the features that result in higher conversion rates (Halachmi et al. 2000) and therefore the natural rate of elective surgery conversion may be lower than the 7% reported.

Second, typically wound infection data is not collected at 28 days after surgery. This posed problems for the comparison. Data on wound infection has been extracted from the Auburn Hospital Survey of Surgical Wound Infection 7/12/1999 (Appendix C). This survey involved a postal questionnaire being distributed to patients, who underwent day only surgical procedures at Auburn Hospital, approximately one month after surgery. 144 questionnaires were returned (response rate=64%); 10 patients had undertaken a laparoscopic cholecystectomy and 9 a hernia repair.

Table 42: Comparison of consequences

	AESP	NON AESP PATIENTS	DATA SOURCE FOR CURRENT PRACTICE PATIENTS
Waiting time			
Laparoscopic cholecystectomy	117days	71 days	Elective operations over an 18 month period for patients treated and discharged according to waiting list records for WSAHS
Hernia repair	135 days	65 days	
Conversion rate to open cholecystectomy	3.9%	National: 7% Westmead: 6%	The Health Roundtable (2001)
Unplanned readmission rate within 28 days			Administrative data for Westmead Hospital for a 3 month period provided by Clinical management Support Unit of WSAHS
Laparoscopic cholecystectomy	0%	0%	
Hernia repair	0%	9.7%	
Post operative complications rate			Administrative data for Westmead Hospital for a 3 month period provided by Clinical management Support Unit of WSAHS
Laparoscopic cholecystectomy	0%	2.5%	
Hernia repair	0%	4.8%	
Mortality rate			Administrative data for Westmead Hospital for a 3 month period provided by Clinical management Support Unit of WSAHS
Laparoscopic cholecystectomy	0%	0%	
Hernia repair	0%	1.6%	
Wound infection rate			Auburn Hospital Survey of Surgical Wound Infection 7/12/1999 (Appendix C)
Laparoscopic cholecystectomy	0	0 patients out of 11	
Hernia repair	0	1 patient out of 9	

Patients under the AESP had had a longer waiting time than patients under current practice; this reflects the time these patients had been on waiting lists and is not due to the AESP. This may indicate that these were less severe cases. Patients who had surgery under the AESP had an overall lower conversion rate to open cholecystectomy than current practice. For laparoscopic cholecystectomies, patients under the program had a lower rate of complication. The rate of unplanned readmissions and mortality for laparoscopic cholecystectomy were equivalent to current practice. For hernia repairs, the AESP patients had a lower unplanned readmission, post operative complications and mortality rate. The small number of observations and lack of a suitable comparator makes a comparison of wound infection rate not appropriate or robust.

**Waiting list**

To estimate the number of laparoscopic cholecystectomies and hernia repairs which would have been performed under current practice, we have used data on elective operations performed over an 18 month period for patients treated and discharged according to waiting list records for WSAHS. These data were not completely accurate but were the best available.

To derive an estimate of the number of procedures which would have been performed under current practice, the total number of patients treated and discharged was divided by the number of months and the number of surgeons operating. This gave a rate per month per surgeon of operations undertaken. For laparoscopic cholecystectomies this was 0.8 operations per month per surgeon and for hernias this was 0.75 per month per surgeon (Table 43 and Table 44).

The AESP ran for 3.65 months and involved eight surgeons. Therefore the expected number of laparoscopic cholecystectomies under current practice is 24 ($0.82 \times 8 \times 3.65$) and the expected number of hernias is 22 ($0.75 \times 8 \times 3.65$).

Table 43: The number of laparoscopic cholecystectomies performed under current practice

Number of surgeons operating	12
Total number of patients treated and discharged in 18 months from waiting list	177
Number of patients treated and discharged per month per surgeon (177/18/12)	0.82
Life time of the AESP in months	3.65
Applying the above rate, the number treated and discharged per surgeon for the study period	2.99
Number treated and discharged under current practice by 8 surgeons	24
Number treated and discharged under AESP by 8 surgeons	52

Table 44: The number of hernia repairs performed under current practice

Number of surgeons operating	11
Total number of patients treated and discharged in 18 months from waiting list	150
Number of patients treated and discharged per month per surgeon (150/18/11)	0.75
Life time of the AESP in months	3.65
Applying the above rate, the number treated and discharged per surgeon for the study period	2.76
Number treated and discharged under current practice by 8 surgeons	22
Number treated and discharged under AESP by 8 surgeons	49

Under the AESP, the number of laparoscopic cholecystectomies performed doubled. For hernia repairs, the number more than doubled.

ACCEPTABILITY OF AUBURN ELECTIVE SURGICAL PROGRAM TO PATIENTS

The acceptability of the program to patients was assessed two ways:

1. Investigating patient refusals to participate in the program; and
2. Evaluating patient satisfaction for those patients who had their surgery performed under the program.

Patient Refusals

Of the 279 potential candidates for the project, 78 (30%) people declined to take part. The characteristics of these people appears in Table 45. These people were approximately 52 years of age, from an English speaking background, waiting to have their surgery at Westmead hospital, had experienced a wait of approximately 203 days prior to being contacted and had an urgency code of eight.

Table 45: Characteristics of people who declined to take part in the project (n=78)

	MEAN/FREQUENCY	STANDARD DEVIATION/ PERCENTAGE
Female	36	46%
Age (years)	52.51	15.11
Non English speaking background	4	5%
Procedure		
→ Laparoscopic cholecystectomy	25	32%
→ Hernia repairs, open or laparoscopic		
→ Haemorrhoidectomy	39	50%
→ Other	2	3%
	12	15%
Time spent on waiting list prior to being contacted (days)	202.80	188.39
Urgency code		
→ 2	4	5%
→ 7	19	24%
→ 8	55	71%
Hospital patient was waiting to have surgery		
→ Westmead	35	45%
→ Auburn	20	26%
→ Blacktown	21	27%
→ Mt Druitt	2	3%

The main reason for refusal (Table 46) was that patients preferred to have their own doctor. 16 (67%) of the 24 people who preferred to have their own doctor were waiting to have surgery at Blacktown hospital under Dr Szabo. All the people who responded that they preferred their own hospital were waiting to have their surgery at Westmead Hospital.

**Table 46:** Reasons for refusal (n=78)

	FREQUENCY	PERCENTAGE
Prefer to have own doctor	24	31%
Prefer to have operation at own hospital	21	27%
Commitments (eg planned holidays)	11	14%
Already had surgery	10	13%
No longer wish to have surgery performed	5	6%
Illness	2	3%
Personal reasons (eg emotionally unprepared)	2	3%
Auburn Hospital is too far to travel	2	3%
Other reasons	1	1%

Patient satisfaction

Patients who had their surgery performed under the program were asked to complete a satisfaction questionnaire (Appendix B). These questionnaires were posted to patients at least one month after having their operation. 78 questionnaires were returned (response rate: 55%).

Close to half the patients who returned questionnaires were happy with the length of time they had to wait to have their operation (Table 47). 25% of patients who responded thought the wait was too long.

Table 47: How patients felt about the length of time they had to wait to have their operation

RESPONSE	FREQUENCY	PERCENTAGE
Happy with length of time	38	49%
A bit too long	18	23%
Far too long	17	22%
Missing data	5	6%
TOTAL	78	

Prior to having their operation, 35% of patients described their health as being fair (Table 48).

Table 48: How patients described their health 3-4 weeks before the operation

RESPONSE	FREQUENCY	PERCENTAGE
Excellent	5	6%
Very good	11	14%
Good	18	23%
Fair	27	35%
Poor	11	14%
Missing data	6	8%
TOTAL	78	

91% of patients felt that the details of the program had been clearly explained to them. 6% of patients did not agree that the details of the program had been clearly explained.

The main feature which patients liked about the program was knowing that their surgery would not be cancelled (Table 49).

Table 49: Features that the patient liked about the program

RESPONSE	FREQUENCY
Knowing surgery would not be cancelled	60
Being discharged from hospital within 24 hours	46
Having surgery at Auburn Hospital	38
Having a different surgeon	17
TOTAL	161

Figure 3 presents some of the qualitative responses given by patients about what they liked best about the program.

Figure 3: Qualitative patient responses about what they liked best about the program

Having the operation performed <i>'It was good just to get it over and done with', 'That the operation was done', 'Discharged by 24 hours', 'Getting the job done', 'Getting the surgery over and done with', 'Relieved to have definite date so problem dealt with'</i>
Quick service <i>'It was quick', 'It was in and out'</i>
Good service/staff <i>'Staff pleasant, courteous and efficient', 'Totally relaxed staff', 'Helpful services', 'Good treatment all round', 'Good service', 'Home visits after leaving hospital'</i>
Reduced waiting time <i>'I did not have to wait too long', 'Reduced waiting time', 'Able to receive treatment earlier than expected'</i>
Certainty it was going to get done <i>'Knowing it was finally going to happen', 'Having surgery performed sooner'</i>
Other responses <i>'Surgery performed by a qualified surgeon, not registrar', 'Having my doctor also supervising the operation'</i>

The main feature patients did not like about the program was having to travel to Auburn Hospital (Table 50).

Table 50: Features that the patient did not like about the program

RESPONSE	FREQUENCY
Having to travel to Auburn Hospital	14
Not staying in hospital overnight	11
Having surgery at Auburn Hospital	8
Not having own surgeon	7
TOTAL	40



Figure 4 presents some of the qualitative responses given by patients about what they liked least about the program.

Figure 4: Qualitative patient responses about what they liked least about the program

Discharged too early
'Being pressured to go home despite vomiting', 'Discharged too early', 'Being discharged from hospital within 24 hours'

Waiting
'Long wait for discharge in the am after surgery', 'Waiting seven hours before operation', 'Waiting', 'Time waiting at the hospital', 'Just waiting before surgery'

Other responses
'Not staying in hospital overnight', 'Complications with operation', 'Pain - a bit', 'Unorganised discharge waiting 5.5 hours for script', 'Hospital meals on the day'

58% of patients who answered the questionnaire had a different surgeon to the surgeon they first saw, perform their operation. 28% did not have a different surgeon and 14% did not know. Approximately 40% of patients did not mind having a different surgeon (Table 51).

Table 51: Patient feelings about having a different surgeon

RESPONSE	FREQUENCY
Happy	10
Relaxed	6
Did not mind	18
A bit concerned	2
Anxious	1
Missing data	8
TOTAL	45

32% of patients were very happy to have their operation at Auburn Hospital (Table 52). It should be noted that the majority of patients were scheduled to have their operation at Auburn originally.

Table 52: How patients felt about having their operation at Auburn Hospital

RESPONSE	FREQUENCY	PERCENTAGE
Very happy	25	32%
Happy	19	24%
Did not mind	23	29%
Unhappy	4	5%
Missing data	7	9%
TOTAL	78	

65 patients said that they would recommend Auburn hospital to their friends, followed by Westmead Hospital (Table 53).

Table 53: Hospitals patients would recommend

RESPONSE	FREQUENCY
Auburn	65
Westmead	27
Blacktown	8
None of the above	4
TOTAL	104

14% of patients had had their operation postponed previously. The average number of times surgery was postponed was once. 65% of patients answered that a definite date of surgery was important (Table 54).

Table 54: How important a definite date of surgery was to the patient

RESPONSE	FREQUENCY	PERCENTAGE
Very important	51	65%
Important	11	14%
Not important	8	10%
Missing data	8	10%
TOTAL	78	

51 patients responded that their stay in hospital was about the length they had been told. 11 patients felt that their stay was longer and 10 shorter than what they had been told (Table 55).

Table 55: Patient's perception as to length of stay in hospital

RESPONSE	FREQUENCY	PERCENTAGE
About what had been told	51	65%
Longer than had been told	11	14%
Shorter than what been told	10	13%
Missing data	6	8%
TOTAL	78	

The majority of respondents were very satisfied with the care they received in their home after the operation (Table 56).

Table 56: How satisfied patients were with the care they received in their home

RESPONSE	FREQUENCY	PERCENTAGE
Very satisfied	47	60%
Satisfied	17	22%
Undecided	2	3%
Missing data	12	15%
TOTAL	78	



DISCUSSION

The key features of the AESP were the pooling of waiting lists for selected elective surgical procedures, the use of spare operating theatre capacity at Auburn Hospital, the payment of surgeons by fee-for-service to public patients, a review of the Recommendation for Admission by a Nurse Coordinator, and the planning of post operative care on the basis of a day only admission. Between July and November 2001, 143 patients received their planned surgery by eight surgeons under this program.

The intended effect of the AESP was to reduce the waiting lists and the waiting times for elective surgery, and to provide patients with a firm scheduled date for their surgery and hence improve patient satisfaction. It was planned to do this at lower cost by using spare capacity and day only hospital stays, while not compromising the quality of care.

The underlying concept of the AESP has been shown to be feasible, as twelve out of thirteen eligible surgeons agreed to participate; and 183 contacted and eligible patients agreed to participate. Eighty two patients, or over half, were discharged on the day of surgery.

The evaluation of the AESP was required to consider four major aspects: the extent to which elective surgical throughput was increased and waiting lists were reduced; the impact of increasing surgical throughput on costs; the effect on health outcomes, particularly whether changing the consulting surgeon and reducing length of stay would increase complications; and whether patient satisfaction could be improved. There are two essential features to any evaluation, the design and the data collection.

Evaluation involves a comparison of what happened with an intervention in place, with what would happen if the circumstances were the same but the intervention did not exist. The design, therefore, has to address what and how to identify the appropriate comparison. The strength of a randomised controlled trial lies in the extent to which the evaluator can control the circumstances: all relevant aspects of treatment are controlled and planned while subjects are randomised to intervention or control group so that any individual characteristics which might influence the outcomes are distributed across both groups. Thus the only difference should be the exposure to the intervention. This is why randomised controlled trials are considered the strongest form of clinical evidence. Other forms of developing comparators are less strong and are considered to be potentially exposed to more bias (NHMRC, 2000).

The usual approaches, when a randomised controlled trial is infeasible, are to identify an appropriate concurrent comparison group (a case control approach) or to use a before and after approach which involves comparing the intervention group with a group who were treated before the new intervention was introduced. Neither of these were appropriate in this study. Comparing the AESP patients with concurrent patients who received surgery at Westmead or other WSAHS hospitals would introduce a bias in favour of the AESP. As low risk patients were selected for the AESP, the non-AESP group is likely to be sicker; both in co-morbidities and disease status and that this will increase their length of stay relative to the intervention group irrespective of any effect of the intervention. The before\after approach also presented difficulties. As surgery waiting times vary by time of the year, it is important to use a similar period yet in the same period for the previous year the Sydney Olympic Games were held and this had a major effect on the scheduling of elective surgery.

Hence, a combination of approaches were used to construct a comparison group, and then modelling was used to estimate the costs and consequences that would have accrued to a similar group of patients under the current system without the intervention. Although restricting the comparison group with patients of similar severity was attempted, this depended on the data available by which to assess severity. Clearly, there were more clinical data available to the Nurse Coordinator in reviewing each patient for eligibility for the AESP, than there were from historical data. Therefore it is likely that the AESP group was still a lower risk group than the comparison.

The second major issue for any evaluation is the quality and comparability of data. This is addressed by ensuring validity, reliability of the data items, and collecting data for both intervention and control groups from the same sources in the same way. Data for the intervention group were collected prospectively as part of the study process. However, for the comparison group data had to be drawn from several sources because no one source provided all the necessary data. Thus, theatre information, waiting list information and inpatient stay were collected from different databases. In addition, where there were alternative sources of the same information, for example the waiting list records and the hospital information exchange, these were often not consistent. Data were collected or extracted from existing data bases by the Nurse Coordinator and clinical support staff for the project. They were analysed, but not independently verified, by the evaluation team.

Therefore, the estimate of the throughput, costs and consequences of the AESP is likely to be an accurate description of what happened. More caution must be exercised in considering the comparison with current practice due to the shortcomings of the study design and the data collection.

Effect on throughput and waiting times

The AESP has been shown to be a successful strategy for reducing elective surgical lists, as at the end of the trial period the waiting lists for the selected procedures had been eliminated. In particular, those patients who had had their surgery under the program had had longer waiting times than other patients waiting for similar surgery within WSAHS. The AESP appeared to ensure surgery for those pushed to the bottom of the waiting list. This report has estimated that the number of surgical procedures doubled under the program compared to normal practice. This is to be expected as additional resources were provided for surgical sessions and nursing care.

Costs and savings of the AESP

Cost estimates were developed using unit cost data for the components of care, and health consequence data from various sources. There may have been some selection bias, in that those patients with long waiting times (left on the waiting lists) were the less severe cases and these less severe cases were selected for the program. This would lead to an over-estimation of the savings of the AESP. Unfortunately, there was no way to investigate this within the available data. The best estimate is that the AESP generated savings of around \$60,000 in four months.

The current operation of the AESP relied on the spare operating capacity at Auburn Hospital and the ability of the operating theatres and support staff to absorb the additional workload. The additional costs of the AESP were the coordination and management of the program, the surgeon, and the nursing staff required for post-operative care. Were these factors to change, then the cost estimates would also change. The project has not investigated the opportunity cost of the surgeons' additional operating time, whether it was reduced leisure time or a reallocation of working time and if the latter, what other activities were curtailed. This would be important in assessing the long term viability of the program.

Additionally the opportunity cost of the surgery being moved from tertiary institutions such as Westmead hospital was not explicitly considered. The use of the theatre time freed up by moving patients into the AESP might allow more difficult operations to take place at Westmead hospital. The value of this has not been addressed.

Finally, the AESP comprised not just the pooled waiting lists and the additional operating theatre time. The operating sessions were scheduled to eliminate the 'down time' of a meal break, thus increasing the productivity of the surgical team, and contributing to the savings in cost. Further, same day discharge was planned. Most of the cost savings are attributable to the reduction in length of stay. This is due to the apparently low use of day only admissions for laparoscopic cholecystectomies and hernia repairs, and higher average lengths of stay in WSAHS. It may be that all or some of these management strategies could be used to reduce the current waiting lists without increasing operating time, or to reduce elective surgery costs.



The methods of investigating the difference in the cost of post operative stay may have been subject to bias as discussed above. Additionally the use of per diem costs may have exaggerated the difference in costs as the costs are concentrated in the first day. The cost of the extra days that were modelled for current practice, the marginal cost, may have been less than the average cost calculated. Without the difference in post operative costs the two alternatives are approximately equal in expenditure.

Patient acceptability

Most patients accepted the transfer of their surgery to Auburn Hospital although less than half actually had been booked at a hospital other than Auburn. Further, although all patients were asked to accept the possibility that another surgeon would perform their operation, in around one third of the cases, the original surgeon operated. Patients reported relief that they had had their surgery performed, and this was a major factor in the patients' satisfaction with the AESP.

Around one third of eligible patients refused to participate in the AESP, primarily as they did not want to change surgeons.

The complication rate attributable to the program was minimal, this gives reassurance that the quality of care is not adversely impacted on for this group of patients in being in a pooled waiting list or having a different surgeon.

Generalisability

This refers to the extent to which the experience of Auburn would be repeated if transferred to another setting. There were a number of features that made the AESP more likely to be a success at Auburn Hospital that may not be replicated at other facilities. Surgical time and surgical beds were quarantined at Auburn Hospital specifically for the study. This may not be achieved in other hospitals, especially those with a larger emergency department which requires additional capacity for unplanned admissions. The program also required an intensive input from the Project Manager and Nurse Coordinator. The persons employed in these positions demonstrated particular management skills and enthusiasm for ensuring the success of a novel program. It is not clear that these characteristics could be readily duplicated.

Overall, then, the AESP achieved what it set to do, that is to provide an alternative means of managing elective surgical waiting lists to increase surgical throughput in WSAHS and to reduce waiting lists. The program was acceptable to surgeons and to most patients, and the results were achieved without an increase in adverse consequences or poorer health outcomes. Whether the AESP resulted in net cost savings is equivocal, as there were difficulties in identifying the appropriate comparison group and estimating the costs. Any significant cost savings were due to increasing day only admissions, and reducing total lengths of stay. This raises the question as to whether improved bed management could achieve similar savings, without the additional cost of additional surgical sessions, and without the pooling of waiting lists. The most frequent reason patients gave for refusing surgery on the AESP was wanting to retain their own doctor. Further, the results of the AESP would not be replicated in other settings unless the same conditions were found as pertained at Auburn at the time of this study.

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**Appendix A:** Listing of the project team

		CONTRIBUTION TO THE AESP
Chief Investigator	Geoff Surgeon 3	Medical advisor.
Project Manager	Cathie Whitehurst	Project management and coordination of the project team.
Nurse Coordinator	Debra Smith	Clinical coordinator and patient's point of contact.
Other members	Lyn Dahms	Data collection and extraction. Facilitator for the mapping of the bookings process.
	Bronwyn Merritt	Data collection and extraction. Minute taker.
	Helen Joyce	Manager of operating and pre admission clinic
	Andrew Baker	Direction of medical services. Database developer.
	Susan Dunn	Data collection and extraction.
	John Senior	Facilitator for the development of the clinical pathways.
	Janice Labett	Stream director for surgical support services.

Appendix B: Patient satisfaction questionnaire

**AUBURN HOSPITAL ELECTIVE SURGICAL PROGRAM
FOLLOW-UP QUESTIONNAIRE**

1. How long had you been waiting to have your operation? MONTHS: _____ or YEARS _____

2. How do you feel about the length of time you had to wait to have the operation?

- Far too long
- A bit too long
- Happy with the length of time

3. How would you say your health was 3-4 weeks before the operation?

- Excellent
- Very good
- Good
- Fair
- Poor

You had your surgery under the Auburn Hospital Elective Surgical Program. This meant that:

- you had your surgery at Auburn Hospital,
- you were given a definite date of surgery that would not be cancelled, and
- your surgery could have been performed by a different surgeon to the one you previously saw.

4. When you agreed to have your operation under the program, were the details of the program clearly explained to you?

- Yes
- No

5. Was there anything that you wish you had known?

- Yes
- No

If Yes, what did you want to know? _____

6. What **did you like** about the program? (You can tick more than one response)

- Knowing your surgery would not be cancelled
- Having a different surgeon
- Having surgery at Auburn Hospital
- Being discharged from hospital within 24 hours
- All of the above
- Anything else (please state) _____

7. What did you like best about the program? _____



8. What **didn't** you like about the program? (You can tick more than one response)
- Not having my own surgeon
 - Having surgery at Auburn Hospital
 - Having to travel to Auburn Hospital
 - Not staying in hospital overnight
 - All of the above
 - Anything else (please state) _____
9. What did you like **least** about the program? _____
10. Was your operation performed by a different surgeon to the surgeon you first saw about the operation?
- Yes
 - No → Go to Question 12
 - Don't know
11. How did you feel about having a different surgeon to the one you previously saw? (You can tick more than one response)
- Happy
 - Relaxed
 - Didn't mind
 - A bit concerned
 - Anxious
- Other comments _____
12. How did you feel about having your operation at Auburn Hospital?
- Very happy
 - Happy
 - Didn't mind
 - Unhappy
 - Very unhappy
- Other comments _____
13. If your friend needed to have the same operation as the one you just had which hospital would you recommend? (Your can tick more than one response)
- Westmead Hospital
 - Blacktown Hospital
 - Auburn Hospital
 - None of the above
- Other comments _____
14. Before you had the operation, had the operation been postponed?
- Yes
 - No
- If Yes, How many times had your operation been postponed? _____

15. How important was a definite date of surgery to you?
 Very important
 Important
 Not important
16. How long were you in Auburn hospital? MONTHS: _____ or YEARS _____
17. Was your stay in hospital
 Longer than you had been told
 About what you had been told
 Shorter than you had been told
18. How would you describe your current employment status?
 Employed full-time
 Employed part-time
 Unemployed → Go to Question 22
 Home duties → Go to Question 22
 Student not working → Go to Question 22
 Student working
 Retired → Go to Question 22
 Other (please state) _____
19. Did you have to take time off paid work to have the surgery?
 Yes
 No

 If Yes, What is your occupation? _____
 How much time did you take off paid work to have and recover from the surgery? _____ days.
20. Did your family or friends have to take time off paid work to help you after the surgery?
 Yes
 No
 If Yes, How much time did each person take off paid work?
 Person 1 Occupation _____ hours _____
 Person 2 Occupation _____ hours _____
21. After you were discharged from hospital you had a nurse come to your home. How many times did the nurse come to your home?
 _____ visits
22. Overall, how satisfied were you with the care you received in your home?
 Very satisfied
 Satisfied
 Undecided
 Dissatisfied
 Very dissatisfied

Thank you once again for helping with our research!



Appendix C: Auburn Hospital Survey of Surgical Wound Infection 7/12/1999

AUBURN HOSPITAL SURVEY OF SURGICAL WOUND INFECTION

7/12/99

Introduction

Patients who had surgery at Auburn Hospital in July 1999 were surveyed to determine surgical wound infections experienced after discharge.

Method

Questionnaires were distributed by post to patients one month after surgery. Patients who had undergone simple diagnostic endoscopies were not surveyed. The questionnaire elicited information regarding wound healing, signs of infection and other problems.

Results

- a) Response rate 164 questionnaires were distributed, 91 (55.4%) were returned.
- b) Surgical procedures undergone by respondents. (See table 1).
- c) Problems associated with surgery. Table 2 shows 19 (21%) respondents experienced problems. In 4 (4.3%) cases responses indicated presence of infection in surgical wounds. In 15 (16.6%) cases responses indicated presence of other problems such as persistent redness around the surgical wound (4 cases or 4.3%). One respondent indicated she believed she had suffered a miscarriage as a result of the surgery.

Discussion

The post discharge surgical wound survey conducted in 1998 showed an infection rate of 7.9%. This prompted the policy that all patients who were to undergo surgery at Auburn Hospital were to have a preoperative antiseptic body wash (Triclosan 1%). The surgical wound survey conducted in 1999 indicates a surgical wound infection rate post discharge from hospital of 4.9%. Thus the preoperative antiseptic body wash may have contributed to a 3% reduction in surgical wound infection rate post discharge from hospital. There are number of limitations associated with the methodology of the survey and therefore the results are not necessarily reliable or generalisable to a high degree of confidence. A more structured and comprehensive methodology with a standardised instrument is recommended although this would be expensive and time consuming.

Table 1: Surgery Undergone by Respondants

TYPE OF PROCEDURE	N=	%
Excision Lesion	17	18.7
Laparoscopic Cholecystectomy	10	11.0
Excision Lesion & Skin Graft	9	9.9
Hernia Repair	9	9.9
Lower Segment Cesarean Section	7	7.7
Open Cholecystectomy	4	4.4
Appendicectomy	3	3.3
Skin Graft	3	3.3
Ligation & Stripping Of VV	4	4.4
Removal Of Plate, Screws, Wires	3	3.3
Right Carpal Tunnel Release	2	2.2
Laparotomy Ovariectomy	2	2.2
Release Right Ulna Nerve, Trigger Fingers	2	2.2
Thyroidectomy	2	2.2
Total Hip Replacement	1	1.1
bilateral Breast Reduction	1	1.1
Biopsy	1	1.1
Excision Olecranon Bursa	1	1.1
Exploration Of Sinus	1	1.1
Insertion Of Chest Drain	1	1.1
Laparoscopic Adhesions Division	1	1.1
Open Cysto-Gastrotomy	1	1.1
Radical Orchidectomy.	1	1.1
Removal Of Glass	1	1.1
Breast Microdochotomy.	1	1.1
Total Knee Replacement	1	1.1
Abdominal Hysterectomy	1	1.1
Wedge Resection Great Toe.	1	1.1



Table 2: Problems Associated with Surgery Undergone by Respondents

OPERATION PERFORMED	CONDITION OF WOUND				COMMENT	INFECTED
	RED	PUS	BLOOD	OTHER		
Excision breast lump	y			y	Numbness returned.	
Excision lesion left ear			y			
Excision lesion side nose, flap repair	y					
Repair inguinal hernia	y		y	y	Wound edges came apart	Y
Inguinal hernia repair	y					
Repair of peristomal hernia	y			y	Problem with the stoma.	
Appendicectomy				y	Miscarriage after the surgery.	
Appendicectomy				y?		
Breast microdochotomy	y			y	Still bleeding.	
Radical orchidectomy	y	y	y	y?		Y
Ligation veins	y			y?		
Abdominal hysterectomy	y					
Biopsy lesion lower lid	y	y				
Caesarian section	y	y		y	On antibiotics	Y
Release trigger fingers	y			y	Pain spread to other fingers and arms.	
Laparoscopic cholecystectomy				y	Pain	
Bilateral breast reduction	y					
Debridement & skin graft finger				y	Pain and limited movement	
Exploration abdominal wall sinus				y	Allergic to tape	

Appendix D: Set-up and research activities

Set-up costs

→ Advertising

A number of staff members were recruited as part of the program. This included registered nurses for the operating suite and day surgery unit, anaesthetists, and surgeons.

The cost of advertising for additional nursing staff was provided by the Western Sydney Area Health Service Advertising Department. Initial recruitment in June 2001 was unsuccessful so a second recruitment drive was undertaken in August 2001. Additional staff was employed by the end of August. Agency nurses were used in support of the routine operation sessions whilst new staff could not be recruited. Both recruitment drives involved advertisements in regional and national newspapers. Four advertisements were placed in June and six in August. The total cost of advertising was \$2,973.

Existing anaesthetists were used in the study, hence there was no advertising cost incurred. Participating surgeons were approached by the Project Manager to participate.

→ Clinical Pathways Working Group

Clinical pathways for a variety of procedures were developed for the project by the Clinical Pathways Working Group. This group involved a team of eight core members from a number of specialities. Nine pathways were developed from four meetings of approximately two hours duration.

→ Admission / Pre admission Working Group

This working group was established to investigate the current booking process for patients at Auburn Hospital. The group involved five members from a number of areas. Numerous flow charts for inpatient management were formulated.

→ Other set-up costs

COMPONENT	COST/WORK
Purchase of a photocopier	Leased over 18 months for \$4000
Purchase of binders for patient notes	Additional files had to be created for each patient part taking in the program

Research activities

Below is a listing of the activities, in addition to the cost for CHERE's time, associated with conducting the study. This list is not comprehensive.

Database development

An existing database was modified for the project to keep track of movements between waiting lists and record data relating to project patients. The database was designed in ACCESS by a clinician from Auburn Hospital. Subsequent modifications were made to this database over the life of the project. The main user of the database was the nurse coordinator. Staff training and education were provided.

Collection of wound assessment data

Wound assessment data were collected specifically for the program and thereby a research cost. Wound assessments were performed by the nurse coordinator in a second pre admission clinic 28 days after surgery. 30 of the 143 patients who underwent surgery returned for a wound assessment.

Table 31 lists the other costs incurred to conduct the study.

Table 31: Other costs incurred to conduct the study

COMPONENT	COST/WORK
Purchase of a new computer	\$5,800
Telephone calls	On average three telephone calls were made to patients. All of these calls were within the local Sydney area.
Data entry	Estimate 15 minutes per patient
Nurse coordinator time	An additional two minutes was taken by the nurse coordinator to explain the details of the study.

