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Potential economic impact of expansion of same-day surgery in Australia

P F Gross

Institute of Health Economics and Technology Assessment, Sydney, Australia

Same-day surgery (SDS) is not new. In 1909 Nicoll and Glasq published their results on over 9000 surgical procedures in the *British Medical Journal*[1]. What is new in the international hospital literature is the rate of growth of SDS in different sites, the effects of this growth on future planning for traditional inpatient beds and operating theatres, and the renewed interest of health economists in the safety, efficacy and cost-effectiveness of specific surgical procedures performed as SDS and/or associated with lasers and using endoscopy[2–11]. This paper reviews (1) the current use rates of SDS services in Australia, (2) trends in SDS in the USA that have some relevance for Australia, (3) some potential economic benefits of expansion of SDS, and (4) the reforms in supply-side and demand-side mechanisms that are required in Australia if the share of SDS in all surgery is to increase to proportions now observed in US surgical services.

Key words: Same-day surgery, health economics, reimbursement methods, technology assessment, cost-effectiveness

Table 1. Growth of same-day procedures by hospital type, Australia, June 1989 to June 1993

	Day procedure units	*Public hospitals*	*Private hospitals*	*Total*
Quarter ending June				
1989	8115	31 578	43 787	83 480
1990	12 252	37 894	60 347	110 493
1991	17 340	40 233	70 999	128 572
1992	19 072	40 134	75 226	134 432
1993	21 312	39 554	81 044	141 910
Growth rate p.a. (%)	27.3	5.8	16.6	14.2
Market share				
1989	9.7	37.8	52.6	100.0
1993	15.0	27.9	57.1	100.0

Same-day surgery in Australia

Australia is a nation of nearly 18 million people, and 8.6% of its gross national product is spent on healthcare. Roughly 46% of that expenditure occurs in acute general hospitals endowed with 4.4 acute beds per 1000 population, with about 80% of the beds and bed-days being in public hospitals. Those beds are used at a rate of just under 1200 bed-days per 1000 population, due mainly to an admission rate of around 22%, one of the highest in the OECD nations.

Table 1 indicates the growth of SDS procedures in Australia from June 1989 to June 1993. Over that period, the annual growth rate of SDS was 14.2% in all acute hospitals and significantly higher in private hospitals. In the three major sites of SDS, the market shares changed significantly in that period, with under-capitalized public

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Correspondence and reprint requests to: Paul F. Gross, Health Group Strategies Pty Ltd, PO Box 1095, Dee Why, NSW 2099, Australia

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Table 2. Projection of supply of 'core' beds and day-only beds, NSW, 1990–2001 (source: NSW HSRG, March 1993)

Type of service	*Beds*			*Bed-days*		
	1990	2001	% change	1990	2001	% change
Core service	23 338	22 239	−4.7	6 198 000	5 522 000	−10.9
Day-only services	138 454	249 442	86.2	70 740	127 765	80.1
Total	NA	NA	NA	6.270	5.650	−9.9

Table 3. Variations in length of stay, day stay and preadmission days, HCF, 1993 (source: HCF Annual Report 1993)

Procedure	*Length of stay (days)*		*Percent day stay*		*Percent presurgical days*	
	Average	*Range*	*Average*	*Range**	*Average*	*Range**
Knee arthroscopy	0.9	0.5–1.8	51%	5–100%	NA	NA
Cataract removal	1.5	0.5–2.6	22%	0–100%	52%	0–85%
Herniorrhaphy	3.7	2–5	1.2%	0–12%	54%	31–85%
Prostatectomy	4.9	3–8	NA	NA	72%	50–96%
Hysterectomy	7.7	6–13	NA	NA	72%	43–100%
Tonsillectomy	1.4	1–3	1.5%	NA	26%	0–60%
Varicose veins	3.2	1–6	3%	0–17%	61%	40–94%

*Ranges for per cent day stay and per cent presurgical days are for major hospitals representing 50% of fund's payout.

hospitals either lacking the necessary resources or the surgical leadership to match the growth spurt of SDS in the other two sites.

In 1990/91 in the public hospitals of the largest state, New South Wales (NSW), 25% of all separations were from SDS services. The highest shares of SDS in the state's surgical services were for male sterilization (85%), other red cell disorders (78%), myringotomy with tube insertion (77%), and vaginal, cervical and vulvar procedures (75%). In the period 1988/89 – 1991/92 in NSW public hospitals, the largest growth rates in separations occurred in general surgery (22% per year), medical oncology (12%), dialysis and respiratory medicine (each about 8.5%), cardiology (7.5%), infectious diseases (7%), and neurology and orthopaedics (each 6%), the overall annual growth rate being 12.9% in that period. 66% of all additional separations in public hospitals in the period were due to the growth of day-only surgical and medical services.

In NSW private hospitals in the same period, the overall annual growth rate of separations was 39.7%, with the largest annual growth rates occurring in general surgery (31%), obstetrics (8%), and orthopaedics, psychiatry and gastroenterology (each about 6%). 77% of all additional private hospital separations in the period were due to the growth of day-only services.

In NSW, these changes in market share and volume growth have led the state's health planners to conclude that between 1990 and 2001, the supply of beds and bed-days in 'core' hospital services and in SDS services will decline as shown in Table 2, with significant declines in both beds and bed-days in the core hospital services, 80% growth rates in day-only services, and a 10% decline in all bed-days in the forecast period.

For at least two reasons, these estimates understate the likely decline in acute beds and bed-days that are likely to occur by 2001. First, health insurance funds have commenced the long overdue task of utilization review of hospital services, creating in the process new databases that reveal some disturbing variations in hospital stay. For Australia's fourth largest health fund, Table 3 illustrates some inexplicable differences in three key variables affecting the costs of seven common surgical procedures, i.e. the average length of stay (ALOS), the share of SDS in all surgical services, and the proportion of all surgical days that involved a presurgical stay in hospital. There may be valid reasons for these variations – but at the very least they require some careful scrutiny by the Royal College, teaching hospitals and individual surgeons.

Second, SDS services will be influenced by the expansion of high-tech home healthcare, early discharge programs and case management, all of which are causing significant reductions in the total number of acute bed-days worldwide[12].

Trends in SDS in other nations: the USA as bell-wether

For historical, technological and reimbursement reasons, the US health system is a bell-wether of technological change in surgical services. There are three major sites of SDS in US healthcare: (1) hospital outpatient departments, (2) freestanding ambulatory care facilities (e.g. ambulatory surgical centres (ASC), comprehensive outpatient rehabilitation facilities, diagnostic imaging facilities, lithotripsy and dialysis centres), and (3) private doctors' offices. Table 4 shows the growth rates of ambulatory surgery from 1984 to 1992.

Table 4. Percentage growth of market shares in ambulatory surgery USA, 1984–1992

Site of services	*1984*	*1988*	*1992*
Hospital outpatient department	84.7	79.3	72.9
Ambulatory surgical centre	7.9	13.8	17.2
Doctor's office	7.4	6.9	9.9
Total	100	100	100

Outpatient departments

The significant decline in the rate of growth of procedures in hospital outpatient departments has been offset by growth rates in procedures in the ASCs' and doctors' office. Some major causes of the absolute growth in US outpatient surgical procedures in the period 1983–1992 include development of shorter-acting anaesthetics (such as propofol), the rapid diffusion of less invasive surgical procedures that have reduced the need for inpatient care (due mainly to the introduction of arthroscopes and laparoscopes), and the evolution of new cataract surgery procedures causing less trauma and patient risk. Cataract removal is the most frequently performed outpatient surgical procedure funded by Medicare in the USA (roughly 750,000 procedures in 1990, and a growth rate of 52% in the period 1988–1990). In 1990, the scope of SDS procedures performed in US outpatient surgical units was wider than in most other nations and the rate of growth of some outpatient surgical procedures in the period 1988–1990 was unmatched elsewhere (Table 5).

One economic outcome of a growth in outpatient surgical services has been the increased share of total hospital revenue generated from outpatient services. In the period 1980–1991 as the number of outpatient surgical procedures grew from 3 million to 12 million, total revenue growth in US outpatient services came 20% from higher utilization and 35% from greater intensity and complexity of outpatient services.

Ambulatory surgical centres

Three major causes of the increase in ASCs have been US federal government legislation in 1982 allowing payments of medical facility fees to ASCs, expansion by the Health Care Financing Administration of the list of procedures for which ASCs could receive a facility fee, and liberalization or elimination of certificate of need requirements that had impeded ASC creation or expansion. As a result, between 1963 and 1991 the number of ASCs in the USA increased from 239 to 1556, and the number of ASC procedures from 377,000 to over 2.5 million, with ophthalmology, gynaecological and ENT procedures constituting 55% of all ASC procedures.

The overall effect of these changes in surgical care in the USA has been quite profound. In the period 1980 to 1992, while the number of inpatient admissions and bed-days fell 14.1% to 19.1%, respectively, and the number of emergency department visits and other outpatient visits rose 17.5% and 103.7%, respectively, the share of outpatient surgery in total surgery rose from 16.3% in 1980 to 53.8% in 1992.

Economic impact of the evolution in SDS

The measurement of the full economic effects of the transition to SDS is conceptually quite difficult, although many studies have compared different measures of cost of SDS against the costs of traditional surgical services.

The economic appraisal of new medical technologies such as SDS usually involves one of three methods: cost minimization analysis, cost-effectiveness analysis and cost-utility analysis. Having regard to the typical flow of patients in SDS (Figure 1), three sets of costs (direct, indirect, and 'psychic') are relevant to all three methods (Table 6).

If only direct costs are considered in the economic appraisal of two surgical interventions, one typical computation in cost-minimization analysis is:

$$C = C_T + C_C - C_{HC} \qquad \text{(Equation 1)}$$

where C = savings (or increase) in direct costs due to the new SDS intervention; C_T = difference in the direct costs of the two surgical treatments (e.g. SDS and traditional surgery), including bed stay, OR costs, lab costs and postoperative visits, as well as the additional costs of care provided in the home or community care settings by relatives, friends and volunteers; C_C = difference in the costs of treating any complications of the two treatments; and C_{HC} = difference in the costs of future health costs averted by the new intervention.

In cost effectiveness analysis (CEA), one typical computation used is:

$$C = \frac{C_T + C_C - S_{HC}}{LYS} \qquad \text{(Equation 2)}$$

where LYS = number of life-years saved by the new surgical treatment.

It should be noted that LYS is only one of many possible denominators for measuring the cost-effectiveness of a new surgical procedure against another intervention. The denominator measuring 'effectiveness' in a cost-effectiveness analysis (CEA) can vary with the surgical procedure and target site. Two equally tenable alternative denominators to LYS might be the percentage gain in weeks of pain-free living due to the new technique or the percentage increase in visual acuity associated with new types of cataract surgery. For some new surgical techniques, it is quite conceivable that while the procedure might cause savings in direct costs, in the early years of its diffusion along a learning curve it may increase morbidity or case mortality rates and thus reduce life-years. In the hands of an inexperienced surgeon, laparoscopic herniorrhaphy may be such an example in 1994[2].

Finally, if we adjust the LYS measure to incorporate measures of patient quality of life in the remaining years of life, the resulting cost-utility analysis (CUA) generates

Table 5. Hospital outpatient procedures responsible for largest proportion of charges, US Medicare beneficiaries, 1990 (source: ProPAC analysis of the 5% Hospital Outpatient Bill File from the Health Care Financing Administration. Includes ambulatory surgical centre-approved services only)

Procedure	*No. of procedures*	*Percent change 1988–90*
Cataract removed, insert lens	747 300	52
Diagnostic colonoscopy	289 120	121
Colonoscopy lesion removal	163 260	100
Upper gastrointestinal endoscopy, diagnostic	195 600	90
Secondary cataract laser surgery	170 760	103
Upper gastrointestinal, biopsy	164 900	111
Inguinal hernia repair	64 800	134
Cystoscopy	157 140	46
Colonoscopy and biopsy	112 280	113
Breast lesion removal	66 000	75
Wrist nerve tension	55 520	62
Kidney stone fragmentation	10 900	150
Breast biopsy	37 480	19
Dilation and curettage	37 760	50
Knee arthroscopy	18 320	63

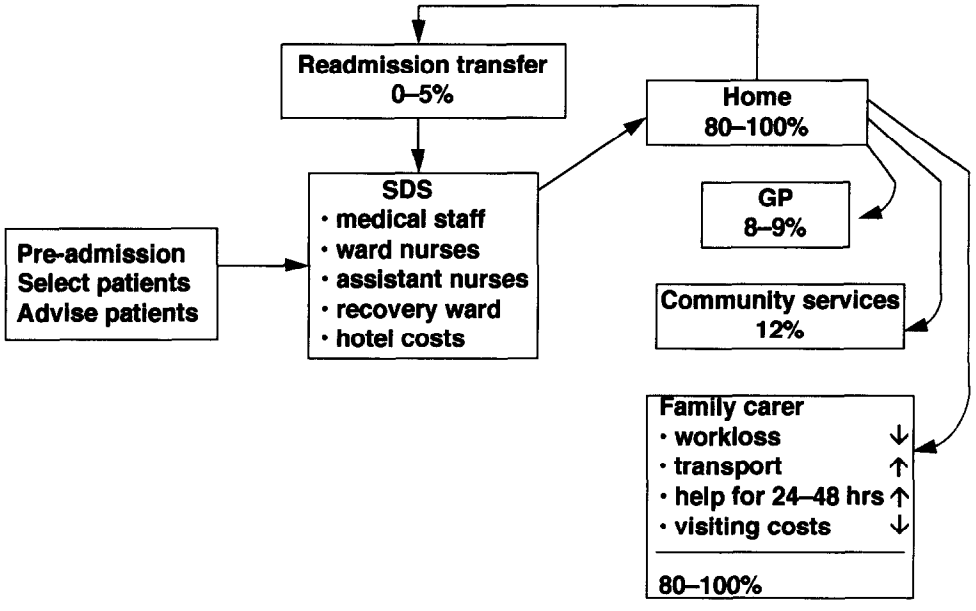

Figure 1. Typical flow of patients, same-day surgery

a cost per quality-adjusted life year (QALY) gained by the new intervention. The methodological problems of measuring quality of life (QOL) before and after surgical procedures are formidable and often not recognized by health economists unfamiliar with the desirable psychometric properties of QOL scales or the methods of validation of such scales. These limited insights are most evident when researchers attempt to rank different therapies by their cost per QALY[3–25]. Comparisons of the benefits and costs of day surgery against traditional surgery abound[26–34]. A smaller number of studies have compared the costs of freestanding surgical units against ambulatory surgery within a hospital[35–37]. A well designed CEA comparing ambulatory surgery in an 'intermediate health unit' (or outpatient surgery hospital) against a traditional secondary hospital in Colombia, South America, included a large range of measures of direct and indirect costs and some crude measures of health outcome[37]. The average direct cost per non-recurrent elective inguinal herniorrhaphy was four times higher in the traditional hospital, and the patient and family gained at least six days from an ambulatory surgery procedure that took 26 minutes (compared with 37 minutes in the traditional hospital). This study comes closest to a model study of the economic impact of new surgical interventions.

Creating incentives for faster adoption of SDS in Australia

Policies to encourage faster adoption of new interventions including SDS usually focus on the supply-side of

Table 6. Relevant economic costs in different types of surgery

Direct costs
Diagnosis
Preadmission investigation
Operating room staffing
Surgical times
Recovery time
Preoperative and postoperative patient education
Supplies, particularly disposables
Treatment of side-effects
Care by informal carers of patient in the home
Indirect costs
Lost productivity
Lost days of work
Lost time of family and patient in travel to/from hospital
'Psychic costs'
Pain, stress, embarrassment
Quality of life measures

healthcare rather than on the demand side. A preoccupation with either supply-side regulation or incentives is evident worldwide.

Supply-side reforms

Until recently Australia had a negative list, i.e. a list of procedures designated by the Commonwealth government as not appropriate for SDS. At one stage in the mid-1980s, this negative list was almost as long as the positive list being used to encourage SDS in other nations. As indicated above, the US government encouraged the adoption of SDS by (1) deregulation of the sites of care in which SDS can be performed and (2) economic incentives in Medicare and Medicaid which encouraged patients and doctors to use less costly sites of care.

In Canada, the approach seems to be somewhere between the Australian negative list policy and the US positive list/incentives policies. In 1991, long after UK guidelines on day surgery were first published, a subcommittee on health program guidelines in Canada issued a set of guidelines on day surgery which identified a list of procedures that were known to have been performed as SDS[38]. In 1993, the province of Saskatchewan released its discussion paper on minimally invasive therapy (MIT)[39]. It provided some examples of MIT, focusing mainly on laparoscopic cholecystectomy, endometrial ablation, treatment of benign prostatic hyperplasia, and discectomy for herniated discs. It estimated that as much as C$5.5 million could be saved each year in hospital operating costs in the province if a number of assumptions applied, including (1) a reduction of 50% of hospital days by substitution of laparoscopic procedures for open procedures; (2) replacement of 50–75% of hysterectomies by endometrial ablation; (3) reduction of 50% of hospital days by substitution of SDS for transurethral resection of the prostate (with no open prostatectomies replaced by SDS); and (4) reduction of hospital days for laminectomy if percutaneous discectomy was shown to be effective. This paper also raised the thorny but critical issues of how to encourage the diffusion of SDS, the need to credential surgeons to carry out new procedures, and the need for careful patient selection if the SDS procedures were to be cost-saving.

The use of economic incentives on the supply side to encourage the diffusion of effective SDS is more evident in US health-financing strategies than in most other nations. Cataract surgery is one area where SDS rates vary widely from 20–25% in Quebec, to 80% in the UK to 95–100% in the USA[40]. There are significant levels of agreement on criteria for measuring the appropriateness of cataract surgery[41]. Economic incentives are being applied in an HCFA-financed contract study of cataract surgery in five US sites starting in 1993. The particular economic incentive being evaluated is a single global fee for surgery, anaesthesia and hospital care, with the patient billed once for the global fee which covers preoperative care, preoperative measurements, surgeons' fees and postoperative care for 120 days. This payment method is, in effect, a fee for case management designed to encourage high quality SDS for cataracts.

Demand-side reforms

The role of patients in the choice of surgical site has been investigated from at least two perspectives that are relevant if it is deemed socially desirable to increase the proportion of surgery undertaken as SDS. One study[40] found that even after controlling for patient and hospital characteristics, there was still a relationship between the likelihood of SDS for cataracts and the propensity of a surgeon to operate on an outpatient basis, challenging the basic belief that the choice of surgical site is based strictly on patient condition and the availability of hospital facilities. Focusing on the local situation in Quebec, the researchers indicated that 'since patient characteristics are not the sole factors in the choice of cataract management strategy, there is real potential, and this is confirmed by the practice in other countries, for expanding day surgery in Quebec'.

Another view, that informed consumers can determine both the rate and site of surgery, is supported by two recent initiatives in patient education for surgery. Kaiser Permanente (Denver) tested in a GP's office a video on benign prostatic hyperplasia (BPH) produced by the Foundation for Informed Medical Decision Making in New Hampshire. The showing of the video, which provides unbiased information on the risks, benefits and costs of nearly a dozen treatment strategies for BPH (based on data from an NIH Consensus Development Conference in the early 1990s), was associated with a 44% decline in the 'demand' for open surgery by Kaiser enrollees in a 12-month period. Unpublished studies by European researchers presented at the Health Economics Conference in Paris in December 1992 suggested that if patients are informed about the availability of less invasive procedures, they are more likely to demand them.

Conclusion

As in most other developed nations, Australia has not invested heavily in new types of information required to educate consumers about the benefits, costs and risks of different types of surgery, including innovations in SDS. Beyond incentives on the supply and demand sides to increase the share of SDS in all surgery, Australian health policy reforms in the mid 1990s will need to reduce a number of other barriers to diffusion of SDS, including:

- the lack of medical practice guidelines that could reduce complications and improve health outcomes
- perverse economic incentives in the financing of SDS which do not encourage alternative site therapy because health insurance funds pay higher benefits for more costly hospital care
- government policies which regulate the site and types of surgery and which do not fund home healthcare at adequate levels
- databases on use rates and costs of existing surgical practices which are often two years out of date when published, if published at all.

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