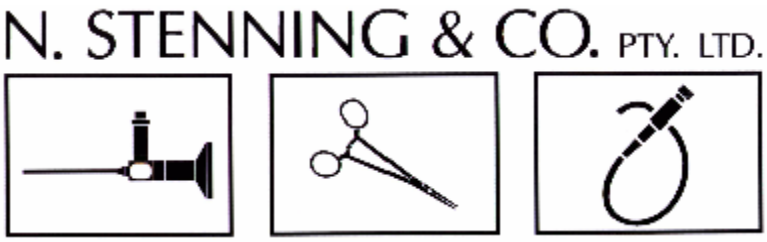
PRODUCTIVITY COMMISSION STUDY INTO THE IMPACT OF ADVANCES IN MEDICAL TECHNOLOGY ON HEALTHCARE EXPENDITURE IN AUSTRLIA



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IMPACT OF ADVANCES IN MEDICAL TECHNOLOGY ON HEALTHCARE EXPENDITURE IN AUSTRALIA

SUMMARY

This paper is to highlight the importance of medical technology in the area of Cardiovascular with the focus on the use of the Abiomed BVS support system for use in the cardiac failure population.

CARDIOVASCULAR CATEGORY

The Abiomed BVS 5000 is a temporary artificial heart used for patients with failing hearts. It can completely take over the pumping action for either the left or right or both sides of the heart, allowing it to rest and recover, whilst still maintaining the normal circulation throughout the rest of the body.

The BVS5000 temporary artificial heart system consists of three basic components:

1. an automatic drive console
2. a unique dual chamber blood pump
3. a transthoracic cannula or specially designed tubes that connect the blood pump to the patient's heart.

DISEASE BURDEN

"Despite substantial improvements in myocardial protection and other technical advances, postoperative ventricular dysfunction persists as a complication in 2% - 6% of all patients undergoing cardiac or thoracic aorta surgery." (Couper, Dekkers & Adams 1999)

Even despite the expense of maximal inotropic support and the insertion of an intraaortic balloon pump (IABP) many of these patients are unable to be weaned from cardiopulmonary bypass and will go on to require more support through the use of a ventricular assist device in order to achieve adequate systemic perfusion.

Over the last several years mechanical cardiac assistance has become a more successful and acceptable approach for this difficult problem. The Abiomed BVS 5000 is a circulatory support system that is being successfully used in Australia and in many other countries.

The Abiomed BVS 5000 is an external, pulsatile, mechanical circulatory support system. In the USA it is approved for patients who suffer from any cardiac disorder, where native heart recovery is likely. This includes, but is not limited to: Postcardiotomy ventricular dysfunction; Myocardial failure due to a failed heart transplant; Right heart failure following insertion of an implantable LVAD; Viral myocarditis.

The BVS 5000 is an asynchronous, pulsatile ventricular assist device. It is capable of providing mechanical circulatory support in right, left, or bi-ventricular dysfunction, the system is intended for temporary support.

ESTABLISHED TREATMENTS

Cardiac failure is defined as an alteration in the ability of the heart to pump, which results in inadequate delivery of oxygen and nutrients to the cells. This leads to cellular dysfunction, decreased systemic blood flow, decreased cardiac output and ultimately further deterioration in cardiac failure.

Treatment of cardiac failure is dependent upon etiology but is typically managed through the use of pharmacological support or an Intra-Aortic Balloon Pump (IABP), there are however limitations to these conventional therapies as follows:

Pharmacological Support

Inotropic therapy is directed at increasing myocardial contractility. If, however, myocardial oxygen balance is not maintained, the inotropic effect will result in increased myocardial oxygen consumption causing aggravation of ischemia.

Intra-aortic balloon pump

Intra-aortic counterpulsation is indicated when a modest increase in cardiac output is required. The IABP assists the heart by reducing afterload and increasing coronary perfusion. There must be adequate output from the ventricle in order for the IABP to work. Rarely are inotropes able to be withdrawn with IABP support. Support with the IABP can increase cardiac output by 15-20%. This is not adequate for treatment of severe ventricular dysfunction.

CLINICAL BENEFITS OF NEW TECHNOLOGY

As stated by Guyton[1] et al. 1993, "the BVS was shown to be safe and effective when used for temporary mechanical circulatory support in patients suffering from severe refractory postcardiotomy ventricular dysfunction. With the use of the BVS 5000 lives will be saved that otherwise would not survive with the use of conventional therapies".

Patients suffering from ventricular dysfunction, when treated with the conventional therapies (IABP and / or inotropes) often develop multi-organ failure, as these therapies are not able to provide complete circulatory support. This results in poor perfusion to the vital organs, leading to multi organ failure. Once in multi organ failure their length of stay (LOS) in hospital increases greatly, in some cases patients may require transplantation of affected organs and may face the possibility of death. When the BVS 5000 is used in these cases it **provides full circulatory support** and allows the patients' heart to **rest and recover**. This prevents the onset of multi organ failure and LOS is greatly reduced.

The BVS adequately restored haemodynamics and allowed for myocardial recovery.

A substantial number of patients, who would otherwise have died, survived to lead normal lives.

Although complications characteristic of postcardiotomy patients were present, BVS 5000 support was not associated with an unacceptable level of adverse reactions. Survivors are free from complications.

REGULATORY & FUNDING ISSUES

We currently are in an era that is seeing a decrease in hospital operating revenue which is driven by managed healthcare and the ongoing pressure to control spending. Hospitals manage this by reducing capital budgets. Heart failure within the healthcare system is a growing area and it is one where through advances in technology we are seeing patient's lives being saved that previously would have been lost.

LITERATURE REVIEW

A report that was published in 1997 by Oz, Grewal and Gelijn[2.] looked at the cost considerations for long term mechanical circulatory support. The major implication from the study is that the most significant cost reductions can be

achieved by shortening intensive care unit days and length of stay. This can be achieved if the LVAD devices are used earlier than in the current practice in a bridge to transport scenario. This would also significantly reduce the number of diagnostic studies required.

A report published in 1996 by Mark W. Rieger[3] stated that 'the addition of the ventricular assist device to compliment interventions within a high-quality cardiovascular program can be justified based on the potential reduction in ICU days for patients with right ventricular failure and/or left ventricular failure following open heart surgery. The improved outcomes associated with appropriate patient selection further serves to strengthen the justification.'

REFERENCES

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