The Green Lane Paediatric and Congenital Cardiac Service

Starship Children’s Hospital

Annual Report

July 2004 – June 2005

Collated by Dr Tom Gentles, Clinical Director
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1. Background

The Green Lane Paediatric and Congenital Cardiac Service is a national service based at the Starship Children’s Hospital.

It is the sole provider of cardiology and cardiac surgical services for infants and children with congenital and acquired heart disease in New Zealand and also provides a fetal cardiology service and investigation and treatment of those born with congenital heart disease who are now adults. The service provides an extensive network of outreach clinics and also provides consultation and support to clinicians caring for patients within the regional hospital setting.

In addition there is an active clinical research and audit programme that includes collaborative ventures with academic groups nationally and internationally.
2. Service Components

2.1 Summary

The service has a number of interrelated components including:
- Paediatric inpatient (medical and surgical)
- Paediatric and congenital cardiac treatment (surgical and catheter based)
- Paediatric Outpatient
- Peripheral Clinics
- Fetal Cardiology
- Adult Congenital Cardiology
- Cardiac Inherited Disease

Investigative Services include
- Echocardiography
- Cardiac Catheterisation
- Exercise testing
- Cardiac MRI

Ancillary services contracted from adult cardiology
- Electrophysiology laboratory
- Pacemaker diagnostics
- Electrophysiology and electrocardiography technical staff
- Cardiac catheterisation laboratory support staff

Ancillary services contracted from Adult Cardiothoracic Surgery and Operating Theatres.
- Perfusionists
- Theatre nurses
- Anaesthetists & anaesthetic technicians

2.2. Paediatric inpatients

There is a dedicated 22 bed ward including a 4 bed High Dependency Unit. The service shares a 16 bed paediatric intensive care unit, utilising on average 4 beds. The intensive care unit is staffed by paediatric intensivists.

All inpatients are tertiary referrals, with the majority originating outside the Northern Region

2.3 Paediatric and Congenital Cardiac Surgery

Paediatric cardiac surgery is undertaken in a dedicated cardiac theatre at Starship Children’s Hospital under the leadership of Mrs Kirsten Finucane. Adult congenital cardiac surgery is undertaken by the same surgical team in the adult cardiac operating theatre in the adjoining Auckland City Hospital. Postoperatively patients are transferred to the Paediatric Intensive Care Unit or to the Cardiac Intensive Care Unit in the case of adults.
2.3.1 Surgical volumes and outcomes
The following statistics are counts of admissions that result in cardiac surgery and exclude patients cannulated for ECMO for non cardiac reasons, and premature neonates who underwent ligation of a patent ductus arteriosus in the neonatal intensive care unit.

Surgical admissions and length of stay have remained stable over the past 5 years (Figure 1).

![Surgical admissions by year and type of procedure](image1.png)

Figure 1. Surgical admissions by year and type of procedure

Approximately one half of surgical admissions are for infants aged <1 year, and 10% are for adults with congenital heart disease (age ≥15 years) (Figure 2).

![Surgical admissions by age](image2.png)

Figure 2. Surgical admissions by age

Surgical mortality is low and has continued to fall despite increasing numbers of complex procedures including Norwood palliation for hypoplastic left heart syndrome. Early mortality rates quoted below relate to deaths within the surgical admission or within 30 days of operation. Patients are counted once per admission even if they had multiple procedures during an admission (Tables 1-3). A detailed data analysis of surgical results over the past 11 years has been prepared for publication. It demonstrates improvements in mortality across all types of procedures with results that compare favourably internationally.
Table 1. Early Mortality by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Early Deaths</th>
<th>Total</th>
<th>Percent Early Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-01</td>
<td>10</td>
<td>337</td>
<td>2.97%</td>
</tr>
<tr>
<td>2001-02</td>
<td>12</td>
<td>330</td>
<td>3.64%</td>
</tr>
<tr>
<td>2002-03</td>
<td>5</td>
<td>347</td>
<td>1.44%</td>
</tr>
<tr>
<td>2003-04</td>
<td>8</td>
<td>348</td>
<td>2.30%</td>
</tr>
<tr>
<td>2004-05</td>
<td>6</td>
<td>347</td>
<td>1.73%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>41</strong></td>
<td><strong>1709</strong></td>
<td><strong>2.40%</strong></td>
</tr>
</tbody>
</table>

Table 2. Early mortality by Operation Type (2000-01 to 2004-05)

<table>
<thead>
<tr>
<th>Type</th>
<th>Early Deaths</th>
<th>Total</th>
<th>Percent Early Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bypass</td>
<td>34</td>
<td>1383</td>
<td>2.46%</td>
</tr>
<tr>
<td>Non Bypass</td>
<td>7</td>
<td>326</td>
<td>2.15%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>41</strong></td>
<td><strong>1709</strong></td>
<td><strong>2.40%</strong></td>
</tr>
</tbody>
</table>

Table 3. Early mortality by age (2000-01 to 2004-05)

<table>
<thead>
<tr>
<th>Age</th>
<th>Early Deaths</th>
<th>Total</th>
<th>Percent Early Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1month</td>
<td>19</td>
<td>302</td>
<td>6.29%</td>
</tr>
<tr>
<td>1-12 month</td>
<td>13</td>
<td>522</td>
<td>2.49%</td>
</tr>
<tr>
<td>1-5 years</td>
<td>2</td>
<td>351</td>
<td>0.57%</td>
</tr>
<tr>
<td>5-15 years</td>
<td>2</td>
<td>356</td>
<td>0.56%</td>
</tr>
<tr>
<td>&gt;15 years</td>
<td>5</td>
<td>178</td>
<td>2.81%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>41</strong></td>
<td><strong>1709</strong></td>
<td><strong>2.40%</strong></td>
</tr>
</tbody>
</table>

Much of this improvement is related to increasing specialisation of paediatric services, culminating in the move to the Starship Children’s Hospital in December 2003. The focus is now on reducing neurological morbidity, particularly in the neonates, and study in this area is underway with collaboration from Melbourne. A second and future focus is on reducing the interval mortality in infants with single ventricle undergoing staged palliative procedures by improving surveillance – a particular challenge given our widely dispersed patient population. Surgical patients are admitted from throughout New Zealand and the South Pacific. There have been no changes in referring patterns (Figure 3).
Inpatient reimbursement is measured in Weiss – an algorithm an imperfect measure of output, that attempts to account for complexity and total cost of patient care. The range of cases, intervention and complexity makes this system inaccurate (Figure 4).

![Figure 4. Weiss by year](image)

### 2.3.2 Theatre utilisation

A single theatre is utilised for nine sessions (1/2 days) per week and often runs into the evenings. (Two bypass cases per day are performed and as case complexity has increased the average operation time now approaches five hours.)

When the service moved to the Starship Hospital it was planned to open to two cardiac theatres. The second theatre was never commissioned despite an established need as manifested by a deterioration in waiting times over the past five years with a significant proportion of children waiting beyond the recommended time for surgery. This presents a risk to patients and to the hospital; several sentinel events have occurred in waiting list patients. In addition the current arrangement results in significant overtime for theatre staff and an inability to schedule with any degree of flexibility.

A proposal to commission a second theatre two days per week is currently with hospital management. This will allow an increase in throughput without further extending the work hours and overtime requirements for staff, by increasing flexibility to schedule the longer cases. There will also be the added advantage of allowing an increase the throughput in summer and autumn, when PICU and ward beds available. Recruitment and training of staff may be problematic and may delay commissioning a further six months.

### 2.4 Paediatric Outpatients

There are 8 outpatient clinics per week, including an arrhythmia clinic and two Day Stay sessions. Eighty percent of outpatients are tertiary (referred from paediatricians or cardiologists). Secondary referrals reside almost entirely in the ADHB region.

Volumes have increased over the past 5 years (Figure 5). This has largely been related to an increase in follow-up visits. These trends are indicative of multiple changes in practice.

- Primary referrals from out of region have been devolved to paediatricians in West, North, and South Auckland
- There has been an increasing trend for heart disease to be diagnosed prenatally or in the new born nursery
- Increased numbers of infants and children are surviving complex cardiac surgery
- More intensive surveillance of at risk groups has resulted in earlier treatment and reduction in long-term morbidity and mortality.
Cardiac investigation is frequently included as part of the outpatient visit (Figure 6).
2.5 Peripheral Clinics

Peripheral paediatric cardiology clinics are undertaken in all major metropolitan centres and in most regional centres. There are 103 clinic days per year including 5 in dedicated adult congenital clinics). The 1057 patients seen in 2004-05 were solely the result of tertiary referral.

In addition to outreach clinics the service places considerable emphasis on maintaining children in their home regions. Although there are no paediatric cardiologists resident outside Auckland there are a number of paediatricians and cardiologists with subspecialty skills in this area who provide high quality surveillance of cardiac children. There is close liaison between these clinicians and the Green Lane Paediatric and Congenital Cardiac Service. The degree of support is considerable and involves telephone consultation and frequently review of echocardiograms, electrocardiograms and other cardiac investigations. Consultation of this nature that resulted in written responses are summarised below (Figure 7).

<table>
<thead>
<tr>
<th>Clinic</th>
<th>2002-03</th>
<th>2003-04</th>
<th>2004-05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blenheim</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Christchurch</td>
<td>47</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>Dunedin</td>
<td></td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Gisborne</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Hastings</td>
<td>5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Invercargill</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Nelson</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Palmerston North</td>
<td>4</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Rotorua</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Tahiti</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Taranaki</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Tauranga</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Waikato</td>
<td>11</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Wellington</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Whakatane</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Whangarei</td>
<td>5</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>97</strong></td>
<td><strong>91</strong></td>
<td><strong>103</strong></td>
</tr>
</tbody>
</table>

Figure 7. Consultation where the patient was not seen by a cardiologist but a written opinion was given based on review of patient data (clinical summary, and/or echocardiogram, MRI, Holter monitor, or electrocardiogram) between April and September 2005.
2.6 Fetal cardiology

There are 1.5 clinics per week in conjunction with the high risk obstetric service. Volumes of fetal echocardiograms have been steady (Figure 8).

Patients are referred from the upper half of the North Island (Figure 9) while fetal diagnosis from the rest of the country is dealt with via review of video tapes of echocardiograms.

Forty percent of referrals are for known or suspected fetal cardiac anomalies. The remainder are referral for high risk screening.
2.7 Adult Congenital Heart Disease Service

The Adult Congenital Heart Disease (ACHD) Service has continued to develop in response to the needs of this rapidly expanding population. The core team comprises two cardiologists (Drs Tim Hornung and Clare O’Donnell) from the PCCS staff, Dr Ivor Gerber from the adult cardiac service and the adult congenital specialist nurse, Annette Neugebauer, who work closely with the PCCS surgical and ICU teams. In addition, an adult cardiac registrar is rotated to the PCCS team and spends much of their attachment gaining experience with this group of patients. We have valuable input from a health psychologist, Lucy Barnes, but have been unable to secure funding to allow Lucy to become a permanent team member.

Cardiac surgeons from the Paediatric and Congenital Cardiac Service (Mrs Finucane and Dr Rumball) undertake surgical procedures on these patients in the adult cardiology operating theatres. Patients convalesce in the adult cardiac ICU and adult cardiac surgical ward.

The service has conducted a weekly clinic at Green Lane Hospital with also a developing network of Outreach Clinics (currently Tauranga, Waikato, Christchurch, Wellington, Palmerston North and New Plymouth). We are fortunate to have cardiologists with an interest in congenital heart disease in a number of centres around the country and close liaison is maintained to assist with evaluation and care of adult congenital patients, with transfer to Auckland as necessary for assessment or treatment. Inpatients over the age of 15 are accommodated in Wards 31, 42 and the Cardiothoracic ICU and a number of study days have been held to assist staff from these and other departments in the hospital in caring for these complex patients.

A Transition Clinic has been launched to assist in patients transferring from the paediatric service to the adult congenital service and other educational resources have been developed, including web-based information, handouts and personal credit card sized cards to assist patients and their families.

Patient volumes are summarised below (Figure 11).

![Figure 11. Adult Congenital Heart Disease 2004-05](image-url)
2.8 Cardiac Inherited Disease Group (CIDG)

CIDG locally comprises the coordinator (Jackie Crawford) and the clinical leader, Dr Jon Skinner. The laboratory diagnostics for LQTS has transferred from the University to the Auckland District Health Board (Lab Plus). Carey Nel is the Auckland University based full time research assistant. She will be focusing on the gene negative cohort.

There have been 23 referrals from Australia. In New Zealand there are 85 LQTS referrals, (40 gene positive), a registry of 62 families with HCM, 12 with DCM, 4 with Marfans, 55 with ARVC- including 15 referrals over the last year. Sudden death post mortem referrals continue to arrive at about 1-2 per month. 40 have been or are in processing.

Clinical innovations have included the coordinated HCM/genetic counselling clinic, coordinated by Jackie and led by Dr Jim Stewart and Jenny Warrington.

Other time has been spent on Grant applications, political representation- re the new Coroners Bill. The development of Tragady, the trans-Tasman task force on Sudden Death in the Young. The CIDG website is being further developed (www.cidg.org) and monthly teleconferences are held between Auckland, Wellington, Waikato and Christchurch. The coordinator has spent much time in organising these meetings, taking and scribing the minutes and developing the many and complex ethics applications.

The database, though still not in use, continues to be developed and is planned to go into operation for the onset of the national LQTS gene forensic testing sometime in 2006.
3. Investigative services

3.1 Echocardiography

The service employs 4 sonographers working 3 FTE. Two of the sonographers rotate 6 months about with the adult cardiology service.

Equipment includes 4 cardiac ultrasound machines (Sonos 5500), one of which was donated by the Variety Club (1998), and another by the Starship Foundation (2003). Paediatric inpatient and outpatients and Adult Congenital inpatients are examined at the Starship Hospital facility, while Adult Congenital Outpatients are examined at the Green Lane Clinical Centre by sonographers from the Paediatric and Congenital Cardiac Service.

The number of echocardiograms is increasing at an annual rate of 8-10% in inpatients and outpatients (Figure 12) reflecting the growing importance of echocardiography in diagnosis and surveillance. There has been a greater increment in Adult Congenital Heart echocardiography although overall numbers are considerably smaller.

Figure 12a. Paediatric Echocardiograms
– Total and Transthoracic

Figure 12b. Paediatric Echocardiograms
– Epicardial and transoesophageal

Figure 12c. Echocardiograms
In patient and Outpatient

Figure 12d. Echocardiograms - Adult Congenital Heart Disease (ACHD)
A number of paediatric echocardiograms involve sedation particularly in infants aged 3 – 24 months. These are undertaken within the clinic area of the department and are supervised by a cardiologist and a suitably qualified nurse. There were no adverse events in the 173 infants sedated over the past year.

Numbers of echocardiograms undertaken for other services have increased since moving to The Starship Children’s Hospital from Green Lane Hospital (Figure 13).

3.2 Cardiac MRI

The Cardiac MR Service, run jointly by Dr Chris Occleshaw and Dr Tim Hornung, performed 170 MR scans on children and adults with congenital cardiac disease, including approximately 40 cases performed under general anaesthesia. Additional cases on patients from the South Island were performed by Dr Sharyn MacDonald in Christchurch. The opening of the Centre for Advanced MR Imaging at Auckland University in December 2004 allowed for the majority of our cases to be performed in this facility, which was purpose-designed for cardiac patients and has full anaesthesia and resuscitation facilities. The waiting time for a booking was sharply reduced and the cost per case was also reduced due to the very advantageous contract arranged between the University of Auckland and the ADHB. (Figure 14)
3.3 Cardiac Catheterisation

Cardiac catheterisation is undertaken with a dedicated paediatric laboratory using Siemens biplane equipment. A number of personnel are involved in addition to the catheterising cardiologist including nursing staff, physiology technicians, radiographers, anaesthesia staff, a cardiac radiologist and, on occasion an echocardiologist.

There were a total of 341 cardiac catheterisation procedures undertaken in 2004-05 (excluding electrophysiological studies), including 197 (58%) interventional procedures (Figure 13). The median procedure time was 80 minutes (range 2-300) with a median of 17 minutes fluoroscopy (range 1-80 minutes). Over 90% of cases were done under general anaesthesia, and 39% (137) involved transoesophageal (72) or transthoracic (65) echocardiography.

Volumes of procedures are increasing but are constrained by available sessions. The number of sessions increased from 4 to 5 in 2005 with utilisation of the fifth session constrained by cardiologist availability (approximately 65% staffed). Throughput was adversely affected by a series of software and hardware breakdowns with the biplane imaging equipment. Six cases were stopped mid procedure and many cases were cancelled on the same day or the day before the procedure. This culminated in temporary closure of the laboratory while major maintenance and component replacement was undertaken. During this time emergency and suitable elective cases were performed using the adult catheterisation laboratory’s single plane system.

There is a requirement for increased volumes: At the start of 2006 there were 137 pts scheduled mainly in the first half of the year. It remains to be seen whether the addition of a 5th session and functioning equipment will reduce the pressure on the waiting time to 2 months as was previously the case.

![Figure 15. Cardiac Catheterisation volumes (electrophysiology studies excluded)](chart.png)
Age at Catheterisation

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 year</td>
<td>90</td>
<td>(27%)</td>
</tr>
<tr>
<td>1-15 years</td>
<td>172</td>
<td>(51%)</td>
</tr>
<tr>
<td>&gt; 15 years</td>
<td>79</td>
<td>(23%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>341</strong></td>
<td></td>
</tr>
</tbody>
</table>

Dr Nigel Wilson is the team leader in the catheterisation laboratory is the most involved cardiologist. Dr Peter Ruygrok is responsible for atrial septal defect closure in older (adult) patients. A registrar assisted in 309 cases (89%). A second consultant cardiologist will frequently scrub in for complex and high risk interventions and in this occurred in 54 cases (16%).

There is evidence of increasing skill level with a decreased procedure time and fluoroscopy time for ASD closures over the last 7 years (Figure 17).

![Mean FT and PT times (min) from 1997 to 2004](image)

**Figure 17.** Mean FT and PT times (min) from 1997 to 2004

### 3.3.1. Diagnostic Cardiac Catheterisation

Outcomes of Diagnostic Catheterisation (n=143)

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aims achieved</td>
<td>134</td>
<td>(94%)</td>
</tr>
<tr>
<td>Incomplete angiogram</td>
<td>2</td>
<td>(1%)</td>
</tr>
<tr>
<td>Incomplete haemodynamics</td>
<td>1</td>
<td>(1%)</td>
</tr>
<tr>
<td>Not recorded</td>
<td>6</td>
<td>(4%)</td>
</tr>
</tbody>
</table>

### 3.3.2 Interventional Cardiac Catheterisation

Fifty eight percent (196/339) of cardiac catheters were interventional procedures. These included:

- ASD closure: 42 cases
- PDA transcatheter closure: 32 cases
- Vessel angioplasty: 35 cases
- Balloon valvuloplasty: 25 cases
- Stents: 19 cases
- Ventricular septal defect closure: 10 cases
- Balloon atrial septostomy: 9 cases
- Miscellaneous: 24 cases
Outcomes of Intervventional Catheterisation (n=196)

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful</td>
<td>161</td>
<td>82%</td>
</tr>
<tr>
<td>Partially successful</td>
<td>11</td>
<td>6%</td>
</tr>
<tr>
<td>Unsuccessful</td>
<td>18</td>
<td>9%</td>
</tr>
<tr>
<td>Not recorded</td>
<td>6</td>
<td>3%</td>
</tr>
</tbody>
</table>

Transcatheter closure of perimembranous ventricular septal defects was introduced following a visit by Professor Ziyad Hijazi, from the University of Chicago.

### 3.3.3 Complications

There were 40 complications in the 339 diagnostic and interventional procedures (12%). There were no deaths. Four patients required surgery because of device embolisation (1 immediate and 3 semi-acutely). Complications are listed in the table below:

<table>
<thead>
<tr>
<th>Complication Type</th>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life threatening</td>
<td>8</td>
<td>CPR - 4 (3 closed, one open)</td>
</tr>
<tr>
<td>Significant</td>
<td>7</td>
<td>Brachial plexus injury – 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hypotension requiring treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surgery for device embolisation - 4</td>
</tr>
<tr>
<td>Minor</td>
<td>25</td>
<td>Pulse reduction responding to heparin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Failed access</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arrhythmia requiring antiarrhythmic medication or DC cardioversion</td>
</tr>
</tbody>
</table>

### 3.4 Electrocardiography and Exercise tests

Numbers of electrocardiograms have increased over the past 24 months in part related to increased outpatient clinic volumes and referrals within the Starship Hospital (Figure 17).

![Figure 17. ECGs and Exercise Tests. Numbers exclude cardiopulmonary exercise testing undertaken at the Green Lane Clinical Centre.](image-url)
3.5 Electrophysiology

Paediatric and congenital electrophysiology utilises a biplane electrophysiology laboratory within the adult cardiac catheterisation suite. Technical staff are drawn from the cardiac physiology department. Of the 169 ablations over the past 3 years there have been 15 failures (9%) and no major complications. One patient developed LBBB and mild mitral regurgitation that had resolved 3 months after the procedure (Figure 18).

![Figure 18. Electrophysiology studies. Filled = children, empty = adults. Numbers were reduced 2003-04 because of move to new hospital.](image)

3.6 Pacemaker

From July 2004 to June 2005, 22 permanent pacemakers were implanted, 73% of these were dual chamber rate responsive (DDDR) units. In the ACHD group 7 DDDR pacemakers were implanted. Implantable loop recorders were placed in 4 paediatric patients and in one ACHD patient. Implantable defibrillators were placed in 2 paediatric patients.

Staff from the Department of Cardiac Physiology provide technical support during implantation of devices such as permanent pacemakers, implantable loop recorders and implantable defibrillators. The technical staff perform the follow-up checks on these devices within the Auckland, Northland and Hawkes Bay region. They also act as advisors to other pacemaker follow-up centres throughout NZ with regard to programming, troubleshooting and planning of further pacemaker surgery.

3.7 Cardiac Registry

During this time the Cardiac Registry was returned to being a useful teaching collection. An audit was begun in July 2004 to ascertain the correct data regarding which organs had been retained. It was discovered that several specimens had been affected by formalin crystals and thus an additional audit regarding this problem was undertaken, completed and hopefully corrected.

The Registry was used for individual teaching sessions. After a hiatus of four years, the Registry specimens were again used in an Echocardiographic course which included cardiac morphology demonstrations and hands-on teaching sessions.
4. Nursing

Charge Nurse Ward 23B  Stephanie Hlohovsky  
Nurse Educator  Michal Noonan  
Paediatric Cardiac liaison Nurse  Heather Spinetto  
Paediatric Cardiac Surgical Nurse Specialist  Marion Hamer (acting)

2005 marks the first full calendar year for Stephanie Hlohovsky as Charge Nurse of the Green Lane Paediatric and Congenital Cardiac Service at Starship Hospital. It has been a positive year for nursing with continued low staff turn over, new staff recruitment, ongoing education and the creation of two new nursing roles within the service.

4.1 Nursing Leadership Vision within PCCS

- Provision of a high standard of clinical care at the bedside, striving for excellence.
- A model of nursing care that is innovative, family focused and efficient with high satisfaction from the public consumer.
- Sound basis of research and audit, with evidence based practice.
- Provision of ongoing clinical support and education at the bedside.
- “Growing our own” senior nursing staff.
- Sound documentation and pathways.
- Unit of Nursing Excellence—where nurses want to come and work.

4.2 Occupancy

- Ward 23B has 22 physical beds and is resourced to run at 70% occupancy Monday-Friday i.e. 16 beds and 55% occupancy i.e. 12 beds Saturday and Sunday.
- Based on these figures our average occupancy was 97.8% (Figure 19).
- We have met our target of Nurse Hours/Patient day with an average of 8.1 NHPPD.

![Figure 19. % Occupancy and Registered Nurse hours per patient day.](image-url)
4.3 Nursing Staff and Recruitment

- Currently ward 23B has 30 Staff Nurses giving a FTE of 22.3. The Total budgeted FTE is 24.7 giving 23B a vacancy of 2.4 FTE. Of these 12.5 FTE (56%) are level 3 and 4 Nurses, 5.4 FTE (24%) are level 2 Nurses, 3.6 FTE (16%) are New Graduate Nurses and .8 FTE (3%) are Enrolled Nurses.
- 1 Clinic Nurse (.6 FTE)
- 2 Clinical Nurse Specialists (2 FTE)
- 1 Nurse Educator (.6 FTE)
- 1 Resource Nurse (Temporary Position)

We are actively recruiting and will have our vacancies filled by Feb 2006. We continue to have a low staff turnover and are fortunate to have nurses returning to ward 23B after their experiences overseas.

Recognizing the shortage of experienced paediatric nurses and acknowledging our desire of “Growing our own” senior nursing staff we have taken advantage of the ADHB New graduate program and have successfully supported 4 New Graduates in 2005. Based on the success form 2005 we have decided to increase our quota for New Graduates and will be taking 3 for next intake.

4.4 Nursing Education

Nursing Staff each attended 3 – 5 days of ongoing education offered through Learning and Development at ADHB. We also provided two days of Cardiac Nursing Specific Education and a senior Nurses Professional development Day.

Consistent with our vision of providing ongoing clinical support and education at the bedside, nursing staff attend weekly education sessions every Wednesday at 1100hrs.

Paediatric Cardiology has also been involved with providing education to other clinical areas within ADHB as well as WDHB, CMDHB, NDHB, AUT and Unitec.

Michal Noonan has completed her Masters of Nursing (2005).

We are currently working with PICU and Massey University in developing a paper specific to Paediatric Cardiac Nursing and hope to offer the paper in the latter part of 2006.

4.5 Professional Development

Starship’s Paediatric Cardiology nursing staff were well represented at the World Congress of Paediatric Cardiology in Buenos Aires Argentina. A team of seven nurses attended the conference. Of these seven, three presented posters, one gave a presentation and one moderated a session.

4.6 Development of Nursing Roles

The role of coordinator has been in the PCCS service for some years, and focuses on the operational running of the morning shift, Monday to Friday. With our desire to provide a high standard of clinical care at the bedside and a model of nursing care that is innovative, family focused and efficient with high satisfaction from the public consumer we have expanded the co-ordinator role to a clinical resource nursing position. The purpose of the role is to provide expert clinical assistance and teaching to the nurse at the bedside. The charge nurse has taken on a more clinically visible role. The charge nurse is present for handover,
PICU rounds, and ward rounds. The clinical resource nurse starts later in the morning and provide support later into the day. This role is a trial position that will be evaluated in June 2006.

Given the complexity of our Cardiac Surgical patients and the limited support available for the Cardiac Surgeons we are in the process of Developing a Surgical Nurse Practitioner Role for the Cardiac Services. This new role would incorporate case management, teaching, liaison with families, and through best practice, role modelling good clinical care. Discharge planning is key to the role. This would account for 50% - 60% of the ward workload, ensuring the Charge Nurse has greater input into the standard of care and model of care provided. This role would have to be at a specialist level with an expectation of audit and research attached to the role. Currently Marion Hamer is acting in this role. Pat O’Brien form Boston is coming in February 2006 to help us further explore and develop the Nurse Practitioner and how it would work in the Starship context.

4.7 Home INR testing

Home INR testing programme was reviewed this year.

The finger-prick INR home testing programme was instigated 1999. The programme incorporates
- training of the child and their family for home INR testing,
- quality assurance activities
- risk management practices.

Although initially trialled in Auckland, by 2000 all New Zealand cardiac children discharged from hospital requiring anticoagulant therapy were put on the programme. A five year period, 2000-2004 inclusive was evaluated.

- 181 enrolments (75%, 15yrs of age)
- 147 self testing, 11 assisted by community nursing services, 21 discontinued (2 unrelated deaths)

The review included only cardiac children on warfarin managed by the Auckland Paediatric Cardiac Service (n=60), and identifies age and clinical reason for initiation on to the programme and any bleeding events that have occurred.

Results of admissions for adverse events showed:
- Total admissions 11 (10 patients one child admitted x2)
- 6.8 hospital admissions /100 patient years of warfarin
- There were no thrombotic events during this study period.
- 1.87 serious bleeds / 100 patient years of warfarin (0.6% serious bleeds per year)

Conclusion
- The Auckland programme for INR home testing achieves a rate of 1.25 serious bleeds per 100 patient years of warfarin. This compare favourably with international published data.
- Spontaneous events were more common in younger age group however risk taking behaviour in adolescents increased the possibility of consequential events in the older age group.
- This programme empowers children, young people and their families to remain in the community and successfully manage an important aspect of their own health.
5. Academic

5.1 Peer Reviewed Articles


Haas NA, Fox S, Skinner JR. Successful use of an intravenous infusion of flecainide and amiodarone for a refractory combination of postoperative junctional and ectopic tachycardias. Cardiol Young 2005;15:1-4


5.2. Book chapters
Catheter interventions in coarctation and recoarctation. TS Hornung, LN Benson, PR McLaughlin. Harrison’s Principles of Internal Medicine Online.


5.3 Other publications


5.4 Invited Presentations
Gentles TL. Echocardiographic evaluation of left ventricular function. Cardiac Society of Australia and New Zealand Annual Scientific Meeting, Brisbane, August 2004.


5.5 Presentations and Abstracts


Al-Salama T, West T, Riddell F, Searby K, Kerr A, Finucane K, Skinner JR.  Outcome for children receiving a pacemaker implantation at Green Lane Hospital over a 40 year period. Heart Lung and Circulation 2005;14S:S141 Abstract 349
6. Medical Staff

6.1 Consultant Medical Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Position/Leaderhips</th>
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<tbody>
<tr>
<td>Tom Gentles</td>
<td>Clinical Director&lt;br&gt;Paediatric &amp; Congenital Cardiac Service&lt;br&gt;Director, Paediatric Cardiology</td>
</tr>
<tr>
<td>Nigel Wilson</td>
<td>Team Leader: Cardiac catheterisation&lt;br&gt;Interventional Cardiology&lt;br&gt;Fetal Cardiology</td>
</tr>
<tr>
<td>Jon Skinner</td>
<td>Team Leader&lt;br&gt;Electrophysiology&lt;br&gt;Inpatient cardiology&lt;br&gt;Invasive and non-invasive electrophysiology&lt;br&gt;Pacing&lt;br&gt;Inherited cardiac disease</td>
</tr>
<tr>
<td>Tim Hornung</td>
<td>Co-team leader&lt;br&gt;Adult congenital heart disease&lt;br&gt;Cardiac Magnetic Resonance Imaging</td>
</tr>
<tr>
<td>Clare O’Donnell</td>
<td>Co-team Leader&lt;br&gt;Adult congenital heart disease&lt;br&gt;Interventional Cardiology&lt;br&gt;Adult Congenital Heart Disease&lt;br&gt;Pulmonary Hypertension</td>
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<tr>
<td>Louise Calder</td>
<td>Paediatric Cardiologist&lt;br&gt;Cardiac Morphology</td>
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6.2 Consultant Surgical Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Position/Leaderhips</th>
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<tbody>
<tr>
<td>Kirsten Finucane</td>
<td>Director Paediatric Cardiac Surgery&lt;br&gt;Paediatric and Congenital Cardiothoracic Surgery</td>
</tr>
<tr>
<td>Elizabeth Rumball</td>
<td>Paediatric and Congenital Cardiac Surgery</td>
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6.3 Junior Medical Staff

<table>
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<tr>
<th>Role</th>
<th>Name</th>
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<tbody>
<tr>
<td>Paediatric Cardiology Fellows</td>
<td>Darshan Kothari&lt;br&gt;Dzung Nguyen</td>
</tr>
<tr>
<td>Paediatric Registrars</td>
<td>Nidal Nahar&lt;br&gt;Jacob Twiss&lt;br&gt;Jamie Speeden&lt;br&gt;Rebecca Griffith&lt;br&gt;Colette Muir&lt;br&gt;Vesna Markovich&lt;br&gt;Janine Whale&lt;br&gt;Mariam Buksh&lt;br&gt;Justin Wilde</td>
</tr>
<tr>
<td>Cardiology Registrars</td>
<td>Ruvin Gabriel&lt;br&gt;Darius Korczyk&lt;br&gt;Boris Lowe</td>
</tr>
<tr>
<td>Cardiac Surgical Registrars</td>
<td>Sunil Sumangala&lt;br&gt;Glenn McKay</td>
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