**Surgical procedures**

The surgical procedures carried out in the department of paediatric dentistry involved mainly minor oral surgery. The most commonly performed procedures involved removal of supernumerary teeth and odontomes, removal of impacted teeth, exposure +/- bonding of unerupted permanent teeth, dento-alveolar trauma, minor soft tissue surgery (tongue tie release, biopsy procedures, mucoceles). Cases involving complicated facial and mandibular fractures, osteotomies, and more invasive surgical procedures are referred to the department of Oral and Maxillofacial Surgery (OMFS) within Westmead Hospital.

**Other data**

**Medical condition**

The medical status of patients was recorded in order to compare this study with others. A basic subdivision was made, and patients were classified as:

- None
- Medical

The percentage of medically compromised patients was recorded for the two years selected. This group of patients included any medical condition (mild to severe) and patients that were physically or intellectually handicapped. It was not in our scope to analyse individual medical conditions, however comments were made in regards to the most common medical problems found in children undergoing general anaesthesia.

**Follow up history**

All patients undergoing a GA were provided with a follow up appointment a week later. This is done to assess that all work performed is satisfactory and review the overall level of satisfaction by parents and patients. However, not all patients comply with post-operative
37% review visits, and three categories were made to assess the number of patients attending these appointments: no follow up, single review or routine checks.

Two groups of patients were considered important in terms of further investigation: first, patients presenting to the hospital with no referrals or as emergency patients; and second, patients that did not present for follow up after their GA. The first group is important as these patients have not accessed dental care through conventional or preferred channels; therefore, their numbers vary constantly and their levels of dental disease may be high. The second group may have individual characteristics that could predispose these children to undergo GA more often. Only 1996 was studied with respect to these two groups. These two groups of patients were divided as: ‘self/emergency’ patients or ‘all others’ with respect to referral source, and ‘no follow up’ and ‘attendance’ for the follow up patients.

**Repeat general anaesthetics**

A number of children require more than just one occasion under general anaesthesia to complete dental procedures. These repeat events can be related to medical conditions, behaviour, trauma, or the nature of the procedure itself. It is important to assess this parameter and to see if there are any special characteristics of the children falling in this group. Provision was made to record all subsequent dates for repeat GA procedures in the database sheet.

**Morbidity of GA**

All complications arising from the general anaesthetic procedure were noted in the data collected. This involved complications such as nausea, vomiting, pain, bleeding (prolonged), respiratory difficulties, and need for overnight admission.
Comments

Any other information considered relevant but not included in any of the previous headings was recorded in this section. These were mainly comments considered relevant at the time of data input. Information such as details of the reason for subsequent GA procedures, parent comments, or long term difficulties arising from dental treatment (medico-legal or clinical).

Statistical analysis

All data was statistically analysed with the help of a research officer from The University of Sydney, Faculty of Dentistry. The data obtained from the Microsoft® Access Database was cleaned and checked for operator induced errors. Then this data was copied to a Microsoft® Excel document for ease of handling due to preference by the author. Copies were made and finally analysed using the program SPSS for Windows.

All data was analysed by using Chi-square test and t-tests. Chi-square tests involved the use of Fisher Exact test and Pearson’s test. Student’s t-tests were used for comparison of means such as age and waiting time. Tables containing insufficient number of cases/data (less than 5 occurrences) were either collapsed or not statistically tested. The results were considered significant at p < 0.05 (the acceptable probability level).
CHAPTER 4. RESULTS

The demand for GA has increased steadily over the last 13 years. At first sessions were provided on demand, but since 1984 regular sessions were organised. As demand increased, so did the number of hours and the number of personnel involved. A summary of this change is shown in Table 4.1. Up until 1990 the number of patients treated reflected the number of operating theatre sessions available at the time. However from 1990 onwards, the number of operating sessions remained stable (4 per week) but the total number of children receiving treatment continued to increase (595 in 1990 to 777 in 1996).

<table>
<thead>
<tr>
<th>Year</th>
<th>No. patients</th>
<th>No. operators</th>
<th>No. theatre sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>105</td>
<td>1</td>
<td>on demand</td>
</tr>
<tr>
<td>1984</td>
<td>209</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1985</td>
<td>334</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>1986</td>
<td>271</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>1987</td>
<td>398</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>1988</td>
<td>543</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>1989</td>
<td>535</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>1990</td>
<td>595</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>1991</td>
<td>679</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>1992</td>
<td>733</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>1993</td>
<td>691</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>1994</td>
<td>728</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>1995</td>
<td>740</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>1996</td>
<td>777</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4.1: Total number of patients, operators and sessions per year.

Patient details

The results stated from here onwards were obtained using the 189 patient records found for the year 1984, and the random sample of 213 records for the year 1996.
Gender

Using the Fisher's Exact Test, no significant difference was found between the male:female ratio in the two years (p=0.52). A summary of these results is shown in Table 4.2.

<table>
<thead>
<tr>
<th></th>
<th>1984</th>
<th>1996</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>106</td>
<td>120</td>
</tr>
<tr>
<td>Female</td>
<td>83</td>
<td>93</td>
</tr>
<tr>
<td>Total no. patients</td>
<td>189</td>
<td>213</td>
</tr>
<tr>
<td>Ratio m:f</td>
<td>1.28</td>
<td>1.29</td>
</tr>
<tr>
<td>Chi-Square</td>
<td>2.799</td>
<td>3.423</td>
</tr>
<tr>
<td>p value</td>
<td>0.094</td>
<td>0.064</td>
</tr>
</tbody>
</table>

Table 4.2: Gender by year group: number of patients, ratio of male to female, and statistical values per year.

Age

Figure 4.1 shows the distribution of age for all children. The most significant finding was that approximately two thirds of patients in both years were 6 years of age or younger. The increase in the number of patients in the 4-6 age group in 1996 was the only statistically significant difference.

Figure 4.1: Age distribution expressed as percentage of patients for years 1984 and 1996.
Table 4.3 shows the number of patients in each age group, as well as the overall percentage for the two years examined. Statistical analysis was carried out to compare years 1984 and 1996. Significance was tested at a p value of 0.05 or less. In statistical terms, children aged 4-6 years showed the only significant increase at a level of p<0.05, however the increase in 7-10 year olds was close to statistical significance (p=0.066).

<table>
<thead>
<tr>
<th>Patients by Age-group</th>
<th>1984</th>
<th></th>
<th>1996</th>
<th></th>
<th>Statistical Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. pts.</td>
<td>% pts.</td>
<td>No. pts.</td>
<td>% pts.</td>
<td>Chi² value</td>
</tr>
<tr>
<td>1-3 yrs</td>
<td>75</td>
<td>39.7</td>
<td>59</td>
<td>27.7</td>
<td>1.9104</td>
</tr>
<tr>
<td>4-6 yrs</td>
<td>64</td>
<td>33.8</td>
<td>97</td>
<td>45.5</td>
<td>6.7640</td>
</tr>
<tr>
<td>7-10 yrs</td>
<td>30</td>
<td>15.9</td>
<td>46</td>
<td>21.6</td>
<td>3.3684</td>
</tr>
<tr>
<td>11+ yrs</td>
<td>20</td>
<td>10.6</td>
<td>11</td>
<td>5.2</td>
<td>2.6129</td>
</tr>
<tr>
<td>Total</td>
<td>189</td>
<td>100</td>
<td>213</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

**Table 4.3:** Age groups for 1984 & 1996 and statistical values.

Table 4.4 shows the mean ages for years 1984 and 1996. There was no significant difference between the two years examined.

<table>
<thead>
<tr>
<th>Year</th>
<th>No. cases</th>
<th>Mean</th>
<th>SD¹</th>
<th>SE² of mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>189</td>
<td>5.3915</td>
<td>4.141</td>
<td>0.301</td>
</tr>
<tr>
<td>1996</td>
<td>213</td>
<td>5.2488</td>
<td>2.626</td>
<td>0.180</td>
</tr>
</tbody>
</table>

**Table 4.4:** T-tests for independent samples of year-group to determine mean age.

¹ SD: Standard deviation
² SE: Standard error
**Ethnicity**

Ethnicity was assigned to patients according to data from the Australian Bureau of Statistics (ABS). Using this information as a guide, all patients were classified into five major groups. Assigning ethnicity was difficult to achieve and other data such as country of birth, time living in Australia, language spoken at home, and citizenship were considered when available. Table 4.5 summarises the findings for both year groups.

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>1984</th>
<th></th>
<th>1996</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. patients</td>
<td>% patients</td>
<td>No. patients</td>
<td>% patients</td>
</tr>
<tr>
<td>Anglo-Saxon</td>
<td>136</td>
<td>72.0</td>
<td>143</td>
<td>67.1</td>
</tr>
<tr>
<td>Asian</td>
<td>12</td>
<td>6.3</td>
<td>21</td>
<td>9.9</td>
</tr>
<tr>
<td>Middle-Eastern</td>
<td>12</td>
<td>6.3</td>
<td>29</td>
<td>13.6</td>
</tr>
<tr>
<td>Aboriginal</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1.4</td>
</tr>
<tr>
<td>Other</td>
<td>29</td>
<td>15.3</td>
<td>17</td>
<td>8.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>189</td>
<td>100%</td>
<td>213</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Table 4.5:** Ethnicity of child patients for years 1984 & 1996.

This last table shows a clear predominance of Anglo-Saxon patients. Statistical analysis of individual ethnic groups was not carried out, but Chi-Square testing (Pearson’s Test) between the two years approached significance \((p=0.0605)\). In other words, differences between the two year-groups as a whole was only tested, but not individual comparisons for any one ethnic group. The reason for this was that several groups had few patients included and interpretation of such data becomes meaningless. Although the Aboriginal patients were too few to assess properly, the changes seen in the Asian and Middle-Eastern groups may be clinically important.
Health Insurance

Children were assessed with regards to their health insurance status and classified as either public or private patients. Public patients included those eligible to be treated through the public health system (Medicare); and private patients those that had private insurance. The results for both years were statistically significant (Table 4.6).

<table>
<thead>
<tr>
<th>Health Insurance</th>
<th>1984</th>
<th>1996</th>
<th>Statistical analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. pts.</td>
<td>% pts.</td>
<td>No. pts.</td>
</tr>
<tr>
<td>Public health patients</td>
<td>133</td>
<td>70.37%</td>
<td>211</td>
</tr>
<tr>
<td>Private insurance holders</td>
<td>56</td>
<td>29.63%</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>189</td>
<td>100.0%</td>
<td>213</td>
</tr>
</tbody>
</table>

Table 4.6: Number of patients according to health insurance status for years 1984 & 1996.
Demographic data

Suburb of Residence

All patients were divided according to Health Areas (as described by the NSW Department of Health) in order to determine where these patients live. Westmead Hospital is located in the Western Sydney Area and it is the major provider of GA services for children in NSW. The results are presented in Figures 4.2 and 4.3. Statistical analysis was not carried out on the individual groups examined.

Figure 4.2: Patient’s suburb of residence by health area in 1984

Figure 4.3: Patient’s suburb of residence by health area in 1996.
The Western Sydney area was the largest area followed by the Southwestern Health Area. The Southeastern Area increased more than any of the other Health Areas, with some increase also noted for Central Sydney, whereas the Wentworth Area decreased from 1984 to 1996.

**Reason for Referral**

Reasons for referral were subdivided into four main groups. Dental caries was by far the most common referral reason for GA in children. Results can be seen in Figure 4.4.

![Graph showing referral reasons per year-group](image)

**Figure 4.4:** Referral reason per year-group

Statistical analysis was carried out using a Chi-Square test (Pearson’s Test) at a significance level of $p<0.05$. The increase in the number of children referred with caries was highly significant, with an increase from 70% to 83%. These results are shown in Table 4.7.
<table>
<thead>
<tr>
<th>Referral Reason</th>
<th>1984</th>
<th>1996</th>
<th>Statistical analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. pts.</td>
<td>% pts.</td>
<td>No. pts.</td>
</tr>
<tr>
<td>Caries</td>
<td>132</td>
<td>69.8</td>
<td>176</td>
</tr>
<tr>
<td>Trauma</td>
<td>17</td>
<td>9.0</td>
<td>10</td>
</tr>
<tr>
<td>Dental Anomaly</td>
<td>27</td>
<td>14.3</td>
<td>17</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>6.9</td>
<td>10</td>
</tr>
<tr>
<td>Total No. pts</td>
<td>189</td>
<td>100</td>
<td>213</td>
</tr>
</tbody>
</table>

Table 4.7: Statistical results for referral reason groups for 1984 & 1996.

Cross reference tables were made up by age and reason for referral. This was tabulated in order to determine any trends between these two variables. No statistical analysis was carried out as the numbers in most categories were too small to interpret; caries was the predominant reason for GA referral. Dental anomalies made an important proportion of patients in the 7-10 year old group. These results are shown in Tables 4.8 and 4.9.

<table>
<thead>
<tr>
<th>1984</th>
<th>Caries</th>
<th>Trauma</th>
<th>D. Anomaly</th>
<th>Other</th>
<th>Row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3 years</td>
<td>58</td>
<td>13</td>
<td>1</td>
<td>3</td>
<td>75 (39.7%)</td>
</tr>
<tr>
<td>4-6 years</td>
<td>54</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>64 (33.8%)</td>
</tr>
<tr>
<td>7-10 years</td>
<td>10</td>
<td>2</td>
<td>16</td>
<td>2</td>
<td>30 (15.9%)</td>
</tr>
<tr>
<td>11+ years</td>
<td>10</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>20 (10.6%)</td>
</tr>
<tr>
<td>Column Total</td>
<td>132</td>
<td>17</td>
<td>27</td>
<td>13</td>
<td>189</td>
</tr>
</tbody>
</table>

Table 4.8: Age group by referral reason for year 1984.
<table>
<thead>
<tr>
<th>1996</th>
<th>Caries</th>
<th>Trauma</th>
<th>D. Anomaly</th>
<th>Other</th>
<th>Row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3 years</td>
<td>50</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>59 (27.7%)</td>
</tr>
<tr>
<td>4-6 years</td>
<td>92</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>97 (45.5%)</td>
</tr>
<tr>
<td>7-10 years</td>
<td>29</td>
<td>2</td>
<td>13</td>
<td>2</td>
<td>46 (21.6%)</td>
</tr>
<tr>
<td>11+ years</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>11 (5.2%)</td>
</tr>
<tr>
<td>Column</td>
<td>176</td>
<td>10</td>
<td>17</td>
<td>10</td>
<td>213</td>
</tr>
<tr>
<td>Total</td>
<td>82.6%</td>
<td>4.7%</td>
<td>8.0%</td>
<td>4.7%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4.9: Age group by referral reason for year 1996.

**Source of Referral**

Patients access general anaesthetic services in a number of ways. Some come from established referral sources whilst others are self-referred, such as patients seen through the emergency department. Therefore several referral source subgroups were defined and these are shown in figure 4.5.

![Figure 4.5: Referral source expressed as percentage of patients for years 1984 and 1996.](image-url)
The number of patients in each referral source group for both years are shown in Table 4.10. Statistical analysis was carried out at a significance of $p<0.05$ using Chi-Square Test. The only statistically significant result was in the group called ‘other’. The patients included in this group are patients referred within the Westmead Dental Clinical School by other dentists or therapists. It also included patients that after receiving some treatment in the department of Paediatric Dentistry where considered to be better managed under GA. The increase in the number of patients referred by the School Dental Service approached significance, a finding that deserves further attention.

<table>
<thead>
<tr>
<th>Referral Source</th>
<th>Cases Observed</th>
<th>Statistical Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1984</td>
<td>1996</td>
</tr>
<tr>
<td>GP Dentist</td>
<td>44 (23.3%)</td>
<td>42 (19.7%)</td>
</tr>
<tr>
<td>Specialist Dentist</td>
<td>9 (4.8%)</td>
<td>14 (6.6%)</td>
</tr>
<tr>
<td>School Dental</td>
<td>23 (12.2%)</td>
<td>38 (17.8%)</td>
</tr>
<tr>
<td>Doctors</td>
<td>12 (6.3%)</td>
<td>6 (2.8%)</td>
</tr>
<tr>
<td>Self/Emergency</td>
<td>79 (41.8%)</td>
<td>73 (34.3%)</td>
</tr>
<tr>
<td>Other</td>
<td>22 (11.6%)</td>
<td>40 (18.8%)</td>
</tr>
<tr>
<td>Total No. pts.</td>
<td>189</td>
<td>213</td>
</tr>
</tbody>
</table>

Table 4.10: Referral source groups for years 1984 & 1996 and statistical values.

A comparison was made between source of referral and ethnicity of patients. Certain subpopulations of patients accessed general anaesthetic services through specific channels. The actual figures are shown in Tables 4.11 and 4.12. For the year 1984, it can be seen that 62% of the Anglo-Saxon population accessed the GA hospital service through an established referral channel. Whilst, approximately half of the “Middle-Eastern” and “Other” patients
accessed services through the emergency department, and therefore used the hospital as a primary health care provider. Patients of Aboriginal background were not identified in 1984. For the year 1996, more than half of the Middle-Eastern patients (52%) accessed Westmead GA services through the emergency department. Anglo-Saxon patients (100 out of 143 patients or 70%) continued to access this service from a variety of established referral sources. It was also noted that medical practitioners did not refer as many patients as compared to 1984. No statistical analysis was carried out on this information as the numbers were too small.

<table>
<thead>
<tr>
<th></th>
<th>Anglo-Saxon</th>
<th>Asian</th>
<th>Middle-East</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP Dentist</td>
<td>31</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>44 (23.3%)</td>
</tr>
<tr>
<td>Spec. Dentist</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>9 (4.8%)</td>
</tr>
<tr>
<td>School Dental</td>
<td>17</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>23 (12.2%)</td>
</tr>
<tr>
<td>Doctors</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>12 (6.3%)</td>
</tr>
<tr>
<td>Self/Emergency</td>
<td>52</td>
<td>5</td>
<td>7</td>
<td>15</td>
<td>79 (41.8%)</td>
</tr>
<tr>
<td>Other</td>
<td>19</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>22 (11.6%)</td>
</tr>
<tr>
<td><strong>Column Total</strong></td>
<td><strong>136 (72%)</strong></td>
<td><strong>12 (6.3%)</strong></td>
<td><strong>12 (6.3%)</strong></td>
<td><strong>29 (15.3%)</strong></td>
<td><strong>189 (100%)</strong></td>
</tr>
</tbody>
</table>

Table 4.11: Referral Source by Ethnicity for year 1984. No “Aboriginal” patients were identified in 1984.
Table 4.12: Referral Source by Ethnicity for year 1996.

Waiting Time

The waiting time between consultation and treatment under GA was recorded for years 1984 and 1996. These were subdivided into four categories as shown in Figure 4.6. The average waiting time was also recorded and statistically analysed (Table 4.13). It can be seen that the demand for GA has greatly increased in terms of waiting time, as this period has more than doubled in the last 12 years. Comparison by statistical analysis (t-test) of the waiting times proved highly significant (p=0.000). It can be seen from Figure 4.6 that in 1996, over two thirds (67%) of the children had to wait two or more months, and 39% had to wait three months or more to receive treatment.
Figure 4.6: Waiting times for years 1984 and 1996.

<table>
<thead>
<tr>
<th>Waiting time</th>
<th>No. of patients</th>
<th>Mean No. days on waiting list</th>
<th>SE of Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>189</td>
<td>37.34</td>
<td>4.28</td>
</tr>
<tr>
<td>1996</td>
<td>213</td>
<td>81.41</td>
<td>4.07</td>
</tr>
</tbody>
</table>

Table 4.13: Average waiting time in days for years 1984 and 1996.
Treatment provided under GA

Treatment was recorded for both the primary and permanent dentition as well as any surgical procedures performed. The number and type of restorations were recorded for both years and for both dentitions. The number of extractions of teeth was also recorded in both dentitions.

Extractions

Results of the treatment carried out in the primary dentition showed a clear trend towards an increase in the number of extractions in 1984 to 1996 (Table 4.14), this finding being highly significant (p=0.0008). There was a significant increase in the number of patients having one tooth (p=0.0422) or 5-8 teeth (p=0.0003) extracted. Individual trends in numbers of extracted primary teeth can be seen in Figure 4.7. This is illustrated to show that certain subgroups have increased during the period of this study.

![Figure 4.7: Extractions of primary teeth in categories for years 1984 and 1996.](chart.png)
<table>
<thead>
<tr>
<th></th>
<th>1984</th>
<th></th>
<th>1996</th>
<th></th>
<th>Statistical Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. pts.</td>
<td>% pts.</td>
<td>No. pts.</td>
<td>% pts.</td>
<td>Chi² test</td>
</tr>
<tr>
<td>NO exos</td>
<td>77</td>
<td>40.7%</td>
<td>45</td>
<td>21.1%</td>
<td>8.3934</td>
</tr>
<tr>
<td>Extractions</td>
<td>112</td>
<td>59.3%</td>
<td>168</td>
<td>78.9%</td>
<td>11.200</td>
</tr>
<tr>
<td>1 exo</td>
<td>23</td>
<td>20.5%</td>
<td>39</td>
<td>23.2%</td>
<td>4.1290</td>
</tr>
<tr>
<td>2-4 exos</td>
<td>68</td>
<td>60.7%</td>
<td>73</td>
<td>43.5%</td>
<td>0.1773</td>
</tr>
<tr>
<td>5-8 exos</td>
<td>18</td>
<td>16.1%</td>
<td>47</td>
<td>28.0%</td>
<td>12.9385</td>
</tr>
<tr>
<td>9+ exos</td>
<td>3</td>
<td>2.7%</td>
<td>9</td>
<td>5.3%</td>
<td>3.0000</td>
</tr>
</tbody>
</table>

Table 4.14: Statistical analysis of extraction groups in the primary dentition

The number of permanent teeth extracted was small for both years examined. In 1984, 10.6% of patients (37 extractions in 20 children) had one or more extractions. Comparatively in 1996, 5.6% children (18 extractions in 12 patients) had extractions. There was a tendency to extract less permanent teeth in 1996, but this result was not statistically analysed.
Primary Dentition

Restorative trends in the primary dentition changed from 1984 to 1996. The mean number or restorations in the primary dentition decreased from 4.84 in 1984 to 4.05 in 1996. The restoration/extraction ratio for the primary dentition decreased from 2.4 in 1984 to 1.3 in 1996. The most evident result was that no amalgams or stainless steel crowns (SSCs) were recorded in 1984. Glass Ionomer restorations (GIC) were by far the most common material used during this year. It is interesting to note that although the number of glass ionomer restorations nearly halved from 1984 to 1996, the actual number of patients receiving this treatment modality remained virtually unchanged. In contrast, 1996 revealed a wider choice of materials when restoring primary teeth. Although GICs were still popular, materials such as SSCs, amalgam, and composite were used with increased frequency (Table 4.15). The use of stainless steel crowns showed the greatest increase. No statistical analysis was carried out on this data.
<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. restorations</th>
<th>No. patients receiving this tx.</th>
<th>% patients out of total for year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amalgam</td>
<td>0</td>
<td>39</td>
<td>0</td>
</tr>
<tr>
<td>CR</td>
<td>16</td>
<td>84</td>
<td>3</td>
</tr>
<tr>
<td>GIC</td>
<td>647</td>
<td>368</td>
<td>0</td>
</tr>
<tr>
<td>SSC*</td>
<td>118</td>
<td>90</td>
<td>57</td>
</tr>
<tr>
<td>Pulp Therapy</td>
<td>134</td>
<td>129</td>
<td>45</td>
</tr>
<tr>
<td>Other</td>
<td>915</td>
<td>862</td>
<td>38</td>
</tr>
</tbody>
</table>

*Abbreviations: Composite Resin Restoration (CR); Glass Ionomer Restoration (GIC); Stainless Steel Crown (SSC)
Permanent Dentition

The results obtained in the permanent dentition were related to the type of restorations and their number. It was not in the scope of this study to make any other analysis. This information was tabulated in Table 4.16. From this table it can be seen that 22% of children had a restoration of some description in 1984 as compared to 25% in 1996.

It is apparent from this data that the number of fissure sealants has greatly increased during the period of this study. Also, amalgam and composite resin restorations were used with increased frequency, whereas the number of glass ionomer restorations in permanent teeth decreased markedly in 1996. Meaningful description of other procedures was not possible as the number of restorations was too small.
<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. restorations</th>
<th>No. patients receiving procedure.</th>
<th>% patients out of total for year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amalgam</td>
<td>6</td>
<td>22</td>
<td>6</td>
</tr>
<tr>
<td>CR*</td>
<td>6</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td>GIC*</td>
<td>40</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>CRFS*</td>
<td>42</td>
<td>87</td>
<td>14</td>
</tr>
<tr>
<td>PRR*</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>SSC*</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Ant. Aesth.*</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>RCT*</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96</strong></td>
<td><strong>146</strong></td>
<td><strong>41</strong></td>
</tr>
</tbody>
</table>

Table 4.16: Treatment provided in the permanent dentition for years 1984 and 1996. Percentage figures given for the total number of patients for that particular year.

*Abbreviations*: Composite Resin Restoration (CR); Glass Ionomer Restoration (GIC); Composite Resin Fissure Sealant (CRFS); Preventive Resin Restoration (PRR); Stainless Steel Crown (SSC); Anterior Aesthetic Restoration (Ant. Aesth.); Root Canal Therapy (RCT).
**Surgical procedures**

A total of 38 (20%) children required surgical intervention in 1984, as compared with 25 (12%) children in 1996. Surgical procedures were recorded into five subgroups: dental anomalies, orthodontic procedures, oral pathology, soft tissue, and medical condition. There was a decline in the number of surgical procedures carried out from 1984 to 1996; no statistical analysis was carried out due to the small number of patients. Dental anomalies were the main reason for surgical intervention in the unit, with removal of supernumeraries being the most frequent procedure. Surgical procedures involving soft tissue (e.g. lingual or labial frenectomy) and oral pathology were also common (Table 4.17). Surgical procedures in children carried out in the department of Oral & Maxillofacial Surgery were not included in this study.

<table>
<thead>
<tr>
<th>Year</th>
<th>1984</th>
<th>1996</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. patients</td>
<td>% patients</td>
</tr>
<tr>
<td><strong>Surgical</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental Anomaly</td>
<td>25</td>
<td>13.2%</td>
</tr>
<tr>
<td>Orthodontic</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Oral Pathology</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td>Soft Tissue</td>
<td>8</td>
<td>4.2%</td>
</tr>
<tr>
<td>Medical Reason</td>
<td>2</td>
<td>1.1%</td>
</tr>
<tr>
<td><strong>Total Number</strong></td>
<td><strong>38</strong></td>
<td><strong>20.1%</strong></td>
</tr>
<tr>
<td>No surgical</td>
<td>151</td>
<td>79.9%</td>
</tr>
<tr>
<td><strong>Total No. patients</strong></td>
<td><strong>189</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Table 4.17: Surgical procedures carried out in 1984 and 1996.
Other Data

Medical Condition

All patients included in the study were screened for medical conditions. These patients were classified into two groups: 'none' and 'medical'. Table 4.18 shows the results obtained for this variable.

<table>
<thead>
<tr>
<th>Medical Condition</th>
<th>1984 No. pts.</th>
<th>1984 % pts.</th>
<th>1996 No. pts.</th>
<th>1996 % pts.</th>
<th>Chi-Square</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>147</td>
<td>77.8</td>
<td>155</td>
<td>72.8</td>
<td>0.2119</td>
<td>0.6453</td>
</tr>
<tr>
<td>Medical</td>
<td>42</td>
<td>22.2</td>
<td>58</td>
<td>27.2</td>
<td>2.5600</td>
<td>0.1096</td>
</tr>
<tr>
<td>Total</td>
<td>189</td>
<td>100</td>
<td>213</td>
<td>100</td>
<td></td>
<td>0.25076</td>
</tr>
</tbody>
</table>

Table 4.18: Medical condition of child patients undergoing GA for 1984 & 1996.

Statistical analysis found no significant differences for the two years examined (Two-Tail Fisher’s Exact Test). Furthermore, no significant differences were found when testing each group individually.

Follow up history

As a routine measure all paediatric patients having a GA are given at least one post-operative review appointment. This is done with the purpose of assessing the work carried out, reinforcing oral hygiene and dietary control and evaluating the overall experience to this treatment modality. Data gathering however showed that not all patients presented to this follow appointment. Therefore patients were assigned into one of three major groups as shown in Figure 4.8.
Figure 4.8: Percentage of patients by follow up history in 1984 and 1996.

Evaluation of this data showed that all observed changes in each group were statistically significant. The most striking change was the increase in the number of patients in the "none" group (Table 4.19).

<table>
<thead>
<tr>
<th>FOLLOW UP</th>
<th>Cases Observed</th>
<th>Statistical analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1984</td>
<td>1996</td>
</tr>
<tr>
<td>None</td>
<td>25</td>
<td>54</td>
</tr>
<tr>
<td>Single</td>
<td>57</td>
<td>83</td>
</tr>
<tr>
<td>Routine</td>
<td>107</td>
<td>76</td>
</tr>
<tr>
<td>Total</td>
<td>189</td>
<td>213</td>
</tr>
</tbody>
</table>

Table 4.19: Statistical results of follow up history for patients in 1984 and 1996.
In 1996, two groups of patients were evaluated more closely: self/emergency patients and those patients that failed to attend their post-operative review appointments. Table 4.20 summarises the data with respect to the patient characteristics. No statistical analysis was carried out as some of the numbers were too small to draw meaningful results. In 1996 a total of 73 children (34%) accessed the GA service as a self/emergency attendance, that is using Westmead Hospital as a primary healthcare provider. Out of these, 62 children (85%) were under six years of age which is similar to the overall number of children below this age (83%). Approximately half of the Asian and Middle-Eastern patients (48%) accessed the hospital through the emergency department. The number of Anglo-Saxon patients accessing Westmead Hospital directly was significantly less (43 out of 73 children, or 30%) as compared to the total numbers in the population (143 out of 213, or 67%) for that year.

Fifty-four children (25%) failed to attend any recall appointment in 1996. Of these patients, 42 (78%) were 6 years or younger. This result is slightly higher than the number of children of the same age (73%) for the overall population. The proportion of Anglo-Saxon patients was relatively similar in this group as compared to the overall ethnicity for 1996 (63% and 67% respectively). What is not known is whether there is any relation between the two groups, that is the primary healthcare users and the no follow up group.
<table>
<thead>
<tr>
<th>Categories</th>
<th>Self/emergency patients</th>
<th>No follow up patients</th>
<th>Total patients</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENDER</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>42 (19.7%)</td>
<td>23 (10.8%)</td>
<td>120 (56.3%)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>31 (14.6%)</td>
<td>31 (14.6%)</td>
<td>93 (43.7%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>73 (34.3%)</td>
<td>54 (25.4%)</td>
<td>213 (100%)</td>
<td></td>
</tr>
<tr>
<td><strong>AGE-GRP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 years</td>
<td>21 (9.9%)</td>
<td>18 (8.5%)</td>
<td>59 (27.7%)</td>
<td></td>
</tr>
<tr>
<td>4-6 years</td>
<td>41 (19.2%)</td>
<td>24 (11.3%)</td>
<td>97 (45.5%)</td>
<td></td>
</tr>
<tr>
<td>7-10 years</td>
<td>10 (4.7%)</td>
<td>9 (4.2%)</td>
<td>46 (21.6%)</td>
<td></td>
</tr>
<tr>
<td>11+ years</td>
<td>1 (0.5%)</td>
<td>3 (1.4%)</td>
<td>11 (5.2%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>73 (34.3%)</td>
<td>54 (25.4%)</td>
<td>213 (100%)</td>
<td></td>
</tr>
<tr>
<td><strong>ETHNICITY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anglo-Saxon</td>
<td>43 (20.2%)</td>
<td>34 (16.0%)</td>
<td>143 (67.1%)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>9 (4.2%)</td>
<td>5 (2.3%)</td>
<td>21 (9.9%)</td>
<td></td>
</tr>
<tr>
<td>Middle-East</td>
<td>15 (7.1%)</td>
<td>7 (3.3%)</td>
<td>29 (13.6%)</td>
<td></td>
</tr>
<tr>
<td>Aboriginal</td>
<td>1 (0.5%)</td>
<td>2 (1.0%)</td>
<td>3 (1.4%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>5 (2.3%)</td>
<td>6 (2.8%)</td>
<td>17 (8.0%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>73 (34.3%)</td>
<td>54 (25.4%)</td>
<td>213 (100%)</td>
<td></td>
</tr>
<tr>
<td><strong>MEDICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>57 (26.8%)</td>
<td>43 (20.2%)</td>
<td>155 (72.8%)</td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>16 (7.5%)</td>
<td>11 (5.2%)</td>
<td>58 (27.2%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>73 (34.3%)</td>
<td>54 (25.4%)</td>
<td>213 (100%)</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.20: Patient detail characteristics of follow up and referral source groups in 1996. Note that all percentages quoted are out of 213 patients for that year.
Table 4.21 shows that 92% (67 out of 73) of emergency paediatric patients that required a GA did so due to dental caries. This is significantly higher compared to the overall population that required GA due to caries (83%). Furthermore, 46% of children (25 out of 54) that presented as emergency patients in 1996 failed to attend their follow up appointment. This is highly relevant as these patients do not appear to access regular dental care.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Self/emergency patients</th>
<th>No follow up patients</th>
<th>Total patients</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caries</td>
<td>67 (31.5%)</td>
<td>44 (20.7%)</td>
<td>176 (82.6%)</td>
<td></td>
</tr>
<tr>
<td>Trauma</td>
<td>5 (2.3%)</td>
<td>5 (2.3%)</td>
<td>10 (4.7%)</td>
<td></td>
</tr>
<tr>
<td>Dental Anom.</td>
<td>1 (0.5%)</td>
<td>3 (1.4%)</td>
<td>17 (8.0%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>2 (1.0%)</td>
<td>10 (4.7%)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>73 (34.3%)</strong></td>
<td><strong>54 (25.4%)</strong></td>
<td><strong>213 (100%)</strong></td>
<td></td>
</tr>
<tr>
<td>Dentist</td>
<td></td>
<td>11 (5.2%)</td>
<td>42 (19.7%)</td>
<td></td>
</tr>
<tr>
<td>Spec. dentist</td>
<td></td>
<td>5 (2.3%)</td>
<td>14 (6.6%)</td>
<td></td>
</tr>
<tr>
<td>School dental</td>
<td></td>
<td>10 (4.7%)</td>
<td>38 (17.8%)</td>
<td></td>
</tr>
<tr>
<td>Doctors</td>
<td></td>
<td>1 (0.5%)</td>
<td>6 (2.8%)</td>
<td></td>
</tr>
<tr>
<td>Self/emerg.</td>
<td>73 (34.3%)</td>
<td>25 (11.7%)</td>
<td>73 (34.3%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>2 (1.0%)</td>
<td>40 (18.8%)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54 (25.4%)</strong></td>
<td><strong>213 (100%)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.21: Demographic data of follow up and referral source groups for year 1996.

Note that all percentages quoted are out of 213 patients for the year.

Table 4.22 showed that neither the 'no follow up' nor self/emergency patients were likely to require a surgical procedure under GA. In regards to extractions of primary teeth,
self/emergency patients required one or more extractions in 87% of cases (64 out of 73 children) and the no follow up group in 82% (44 out of 54). Again, this proportion is higher (but not statistically proven) when compared to the overall number of children that required extractions of primary teeth (79%).

<table>
<thead>
<tr>
<th>Categories</th>
<th>Self/emergency patients</th>
<th>No follow up patients</th>
<th>Total patients</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical</td>
<td>2 (0.9%)</td>
<td>4 (1.9%)</td>
<td>25 (11.7%)</td>
<td></td>
</tr>
<tr>
<td>No surgical</td>
<td>70 (32.9%)</td>
<td>50 (23.5%)</td>
<td>187 (87.8%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>72 (34.0%)</td>
<td>54 (25.5%)</td>
<td>212</td>
<td></td>
</tr>
<tr>
<td>1 exo</td>
<td>17 (8.0%)</td>
<td>17 (8.0%)</td>
<td>39 (18.3%)</td>
<td></td>
</tr>
<tr>
<td>2-4 exos</td>
<td>25 (11.7%)</td>
<td>16 (7.5%)</td>
<td>73 (34.3%)</td>
<td></td>
</tr>
<tr>
<td>5-8 exos</td>
<td>17 (8.0%)</td>
<td>9 (4.2%)</td>
<td>47 (22.1%)</td>
<td></td>
</tr>
<tr>
<td>9+ exos</td>
<td>5 (2.3%)</td>
<td>2 (0.9%)</td>
<td>9 (4.2%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>73 (34.3%)</td>
<td>54 (25.4%)</td>
<td>213 (100%)</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.22: Treatment provided for patients of follow up and referral source groups for year 1996.
CHAPTER 5 . DISCUSSION

Despite the decline in caries experience in young people over the last 20 years, there remains groups of children and young people who still have high treatment needs (Blinkhorn and Davies, 1996; Downer, 1994). There is, in addition, a proportion of children and young adults who, because of a disability, are unable to accept routine dental care and for whom, treatment under general anaesthesia may be the only means of providing that dental care (Murray, 1993). The demand for general anaesthesia in paediatric dentistry at Westmead hospital has significantly increased since the opening of this unit in 1983. In general terms it can be seen that since 1983 the number of patients treated increased more than seven-fold (from 105 in 1983 to 777 patients in 1996). A significant development that directly allowed for this increase was the number of theatre sessions available per week. During 1983 GA sessions were provided on demand, but from then on services were restructured and regular sessions were provided. Between 1987 and 1990 the number of sessions increased to two theatres operating all day long. In addition, the number of paediatric dentists and registrars increased from two in 1984 to four in 1996 which allowed for better staffing and rostering and therefore increased efficiency. In 1996, this allowed an average of 16 children to be treated under GA per week. These two changes allowed this unit to directly cope with the increased demand in the number of patients. It is clear that as demand increases, the provision for more staff and more hours will allow a greater number of patients to be seen. However there is a need to assess those factors that explain why demand has increased and to compare our experience to other studies in the literature.

The increase in demand seen in the current study is in line with worldwide trends (Smallridge et al. 1990; Vermeulen et al. 1991; Holt et al. 1992; Thomson, 1994; Mason et al. 1995; Nunn et al. 1995). It is also apparent that the use of GA in Europe, UK, Australia and New Zealand is more common than in the USA, where other forms of sedation are used more frequently (Wright et al. 1991b; Wright et al. 1991a). The reasons for this increase
appear to be different in each study. The nature of the healthcare system, the culture of the country, and other factors within each study may influence demand.

**Patient characteristics**

**Gender**

Although the ratio of male to female is recorded in most studies of this type, there is no clear consensus whether any one sex predominates in studies of general anaesthesia in children. Our study is in accordance with this finding as there were no statistically significant differences between male and females for the two years studied. However, a slight predominance of males over females was noted for both periods, a finding consistent with several papers (Bohaty and Spencer, 1992; Harrison and Roberts, 1998; Enger and Mourino, 1985; Holt et al. 1992; Keniry, 1974; Mitchell et al. 1985; Thomson, 1994; Vermeulen et al. 1991; Wong et al. 1997). In contrast, an equal number of studies found the opposite to be true, with more females than males in their populations (Barclay, 1974; Grytten et al. 1989; Holt et al. 1991; McLaughlin et al. 1987; Whitehead, 1971).

**Age**

The current study suggests that it is the younger age group that have greater need of GA, with approximately two thirds of our patients being six years of age or younger. This finding is in agreement with several other studies (Bohaty and Spencer, 1992; Chippendale and Storey, 1988; Grytten et al. 1989; Holt et al. 1992; Keniry, 1974; Nunn et al. 1995; O'Brien and Suthers, 1983; O'Sullivan and Curzon, 1991; Thomson, 1994; Vermeulen et al. 1991). Median age is commonly referred to in these studies as it provides an easy way to compare age distribution (see Table 1.4, page 62). The Sydney study showed no significant change in the mean age of the patients (5.39 years in 1984 compared to 5.25 in 1996). In other words, most of these children were of preschool age for the two periods examined.
This view is supported by long term studies that show the median age of patients falling significantly over the last two to three decades, to mostly include preschool children (McLaughlin et al. 1987; Nunn et al. 1995; Wong et al. 1997). However one study exclusive to children found an increase in the number of children 10-14 years of age, and suggested that this may be due to more minor oral surgery procedures being now carried out (Mason et al. 1995).

The significant increase of the 4-6 year old group may be related to caries trends in the Australian population, as there is evidence that caries is high in some groups of children (Davies et al. 1997). This particular increase in 4-6 year olds, and the decrease of 1-3 year olds have also been observed in America (Bohaty and Spencer, 1992) and the UK (Nunn et al. 1995). It is possible that these 4-6 year old children had heavily restored dentitions requiring maintenance but were still not prepared to accept routine dental care. Another reason that may have influenced this increase in the 4-6-year-old group are the changes brought about by the SOKS program. This program now screens the dental health of all children in the state of NSW attending public primary schools. This means that greater proportions of children 5-6 years (in Kindergarten) were checked in 1996 as compared to 1984. This screening was intended to increase parental awareness and to increase the number of children seeking dental care. Other factors that may influence the age of children undergoing GA include caries trends of the population (Bohaty and Spencer, 1992; Chippendale and Storey, 1988), availability of GA services (Bohaty and Spencer, 1992), referral patterns (Grytten et al. 1989), medical conditions (Boulanger, 1990; Persliden and Magnusson, 1980), and the amount and type of treatment required (Nunn et al. 1995). The young age of some children and their high caries rate is consistent with caries trends in Australia, where a small proportion of children account for most of the caries seen in the child population (Davies et al. 1997; Widmer and Mekertichian, 1996). Overall, the findings of the Sydney study may not be as surprising as health programs in NSW are well developed for children of school age and the fact that most older children accept dentistry more readily
than their younger counterparts. However, it is apparent that there is a lack of dental health screening in children of preschool age.

**Ethnicity**

There was little significant change in ethnicity of the population group. The results showed a clear predominance of Anglo-Saxon patients (72% in 1984 and 67% in 1996), a finding consistent with the overall ethnicity of the Sydney population. There was a significant increase in the number of Asian and Middle-Eastern children for the two periods examined (from 12.6% in 1983 to 23.5% in 1996), a finding which is in line with changing Sydney demographics. Similar trends were noted in a USA study where the ethnicity of their population changed over a 12-year period (Bohaty and Spencer, 1992). They found an increase in the Black population (16 to 22%) compared to a significant decrease in the White population (82 to 73%). Asian and Hispanic patients made a smaller group with an increase from 2 to 5%. Although it is clear that ethnicity is very specific to each country, it is worth noting that changes in migrant minority groups are reflected in GA studies of developed countries such as the US and Australia.

A ten-year review of the use of general anaesthesia in paediatric dentistry in the UK reported similar trends on the ethnicity of their patients. Although most of their patients were of Caucasian origin, there was a clear increase in the number of Asian children being treated. This change over time may have reflected local population changes, but also suggested that the non-Caucasian groups (especially the Asian) may have changed their attitude to dentistry. That is, desiring to have comprehensive treatments rather than just extractions when in pain (Wong et al. 1997). The Sydney study also showed changes in the Asian groups, although in our experience these patients continued to have high levels of dental disease, high number of extractions, and a large proportion (approximately 50%) accessed the GA service through the emergency department.
The increase of specific ethnic groups has clinical implications as it suggests that these children have high levels of disease as compared to other children. Furthermore, many of these children and their families may not be long term residents in Sydney and may have language difficulties. This requires the use of interpreter services so appropriate instructions are given and consent is obtained, which further increases the cost to the provider and the time required to deliver such care. It is interesting to note that in one Australian study 35% of their patients were not lifetime residents in the city of interest (Melbourne). Of these, Asian children had significantly more extractions of teeth than children of European and other ethnic origins did (Chippendale and Storey, 1988). Our study did not investigate whether patients were lifetime residents, but supports the finding of the high treatment demands of the Asian children, as well as the Middle-Eastern group of children. Aboriginal children made a small proportion of patients and were only represented in 1996 (1.4%). It is our belief that Aboriginal children were under-represented in the sample chosen, as several centres in Sydney refer aboriginal children to our department, many of whom require GA due to their high caries levels. In comparison, a study from New Zealand suggested that Maori and Pacific Island children might be more represented than their European counterparts in proportion to the overall ethnicity of their population. They also believed that patients from a lower socio-economic status were over-represented in their study (Thomson, 1994).

Two groups were considered for further investigation in our study for the year 1996. These were patients that did not present for follow up and children that presented to our unit through the emergency department without a formal referral. Most children accessing GA through emergency (85%) were below the age of six years. Therefore, it is apparent that these children have no routine dental care and they are of preschool age, so public screening programs (such as SOKS) cannot detect them. 46% of the children that failed to attend their post-operative appointments presented to our hospital through the emergency department. 92% of the children presenting to the emergency department that required GA, did so
because of caries or its effects (compared to 83% of children for the overall population for 1996). Approximately half of the children of Asian/Middle-Eastern background accessed the GA services through the emergency department. This is an important consideration as it is thought that many of these families learn of these services by word of mouth and therefore bypass more traditional channels. It is apparent from these results that patients accessing the GA service with no proper referrals are an important group due to their young age, their high caries levels and the fact that they are not interested in normal follow up procedures.

**Demographic data**

**Suburb of Residence**

The subdivision of the Sydney metropolitan area into Health Areas allows evaluation of location of demand for GA services. From the results it is apparent that patients from the Western Sydney and Southwestern Areas comprised the largest group using the service. Westmead Hospital is the major provider of paediatric dental general anaesthesia in NSW as no other centres provide GA services with such regularity. Despite having a small proportion of patients coming from far away distances within this state, there has been no major shift in the patient place of residence. However, the fact that a proportion of patients travel from outside Sydney to seek dental care at Westmead Hospital highlights the difficulties in access to GA services that some areas experience.

There is increasing emphasis in health services administration on accountability to the consumer. Therefore, the acceptability of the service to those using it is a major topic of investigation. It is also apparent that attending for treatment has a cost to the families in terms of both time spent at the hospital and in travelling and the financial cost involved (Holt et al. 1991). Several studies have reported on the significance of travelling times for patients seeking treatment under general anaesthesia (Holt et al. 1991; Grytten et al. 1989;
Holt et al. 1992; Smallridge et al. 1990; Wong et al. 1997). Unlike the Norwegian study (Grytten et al. 1989) in which a gradual shift in the place of residence of their patients was noted between 1975-83, the Sydney study did not show this particular trend as the proportion of patients from different areas remained virtually unchanged. It appears that most patients in our study come from centralised suburbs of the Sydney metropolitan area, a finding consistent with certain ethnic groups that appear to concentrate in specific areas of this city.

Studies from the UK have reported more extensively on travelling times and place of residence for child patients undergoing dental general anaesthesia. A study from a London hospital found that out of their 103 child patients, 40 of the children (39%) travelled more than 10 miles and 60 travelled between 2-10 miles. The total time spent travelling varied between 25 minutes and 6 hours, with a mean of two hours. One or more adults accompanied all children, and a total of 79 adults had to take time off work to attend the hospital. Acceptability of this form of treatment was however high (Holt et al. 1991). A comparative study of three London hospitals showed different patterns in travelling times, but in most cases children resided within a ten-mile radius of the operating centre (Holt et al. 1992). A more recent review article of day-stay cases for children found that 25% of patients travelled more than 10 miles for treatment (Wong et al. 1997). These results are consistent with another UK study that found that 20% of patients lived more than 10 miles from the hospital (Smallridge et al. 1990). The Sydney study did not record distances or travelling times for the patients involved and this would be useful in future studies to allow a more direct comparison of this data. In our case, one or usually two adults accompany all children, and families are encouraged to travel back home by private transport. The present study supports the previous ones (Wong et al. 1997) and reflects the fact that only few centres provide GA for children, and that some patients and their families are expected to travel significant distances to access care.
Relative distances of travelling must be considered especially in larger states such as NSW, where some patients may be required to travel six or more hours to access GA services at Westmead Hospital. This is an important factor as many dentists in smaller country areas may opt for other treatment modalities in order to avoid lengthy travelling times to tertiary referral centres such as Westmead Hospital. One US study reported on the likelihood of patients returning to their recall appointments with respect to the place of residence. It was found that patients who lived within the city of interest returned for recall significantly more than those who lived outside. This later group was more likely to return to their referring dentist (Enger and Mourino, 1985). Our follow up group in 1996 did not investigate this trend, although all patients referred from outside Sydney are advised to have a postoperative review visit by their local dentists. Seldom patients are required to attend the hospital a week later if they live more than 1.5 hours of travelling time.

**Reason of referral**

Most studies in the literature show that dental caries and its effects are the most common reason for the provision of GA in paediatric dentistry (Holt et al. 1991; Holt et al. 1992; Mason et al. 1995; McLaughlin et al. 1987; O'Sullivan and Curzon, 1991; Smallridge et al. 1990; Vermeulen et al. 1991). Of these, only seven studies provide data on the numbers of patients treated for caries under GA (see Table 1.6-page 68). Caries and its effects were the main reason for referral in our study, with a statistically significant increase from 70% in 1984 to 83% in 1996. These results are consistent with trends seen previously, and similar to three other studies (O'Sullivan and Curzon, 1991; Vermeulen et al. 1991; Holt et al. 1992). This increase in caries for our sample population is consistent with findings that there are still subgroups of the paediatric population with high caries (Blinkhorn and Davies, 1996; Widmer and Mekertichian, 1996; Davies et al. 1997). Given that the present study shows that most children are of pre-school age, and that there is an increasing percentage of Asian and Middle-Eastern children, this study is in agreement that these “susceptible” children are
mostly very young and come from specific ethnic backgrounds (Holt et al. 1991; Nunn et al. 1995; O'Sullivan and Curzon, 1991; Rule et al. 1967). Our results showed that approximately 27% of children presented with a medical condition in 1996. However, no difference was made between relative simple conditions (e.g. mild asthma or innocent heart murmurs) and those that significantly affect or limit everyday life (e.g. cyanotic heart disease and severe asthma). This means that this 27% figure may be higher than in reality as all patients with a medical background were included in this group. This figure is much lower than the two UK studies that specifically addressed the use of GA in medically compromised children (Harrison and Roberts, 1998; Nunn et al. 1995), but comparable to more general studies of GA in paediatric dentistry (O'Sullivan and Curzon, 1991; Vermeulen et al. 1991).

In 1996, general anaesthesia was used in 4.7% of children suffering from orofacial trauma and in 8% of those with dental anomalies. These small numbers may be due to the increased acceptance of treatment in more conventional ways, and also perhaps to the fact that a proportion of these children are seen by the department of Oral & Maxillofacial Surgery at this same hospital. In regards to extractions, our data gathering did not differentiate between extractions due to caries and those due to orthodontic reasons, whereas several UK studies account for an increase in the number of orthodontic extractions (Holt et al. 1992). Furthermore, no specific reference was made in our study about children with management and behaviour difficulties. The reason for this is that in most cases it is difficult to separate a cause as only due to caries, behaviour only, or as a combination of caries, young age of the patient and reluctance to accept treatment in conventional ways. In order to separate children into these categories, one would have to define at what age one considers a child mature enough to accept treatment in the dental chair. Similarly, one needs to determine what treatment is considered traumatic enough to warrant the use of GA. Therefore all children were categorised as caries related due to the inability to group patients in an objective manner.
Source of Referral

The referral pattern has been investigated extensively, with differences reported in each review. The trends not only vary between studies, but have also changed over time within particular institutions. This may be due to differences in health care services in countries and states over the past 30 years. Results of these findings in the literature have been described earlier in Table 1.7 (page 69). Our study found that out of the established referral sources, general dentists referred 20% of patients in 1996. This result may imply that children in Sydney do not frequently attend general dentists, or that the great majority of them do not have major dental problems. This is consistent with current dmft and DMFT values of Australian children. Although 20% is quite a low figure, GP dentists still made the most important group of referred patients, a finding consistent with other studies (Nunn et al. 1995; Vermeulen et al. 1991; Wong et al. 1997). This was closely followed by the School Dental Service (SDS) which referred 18% of children in 1996. The increase in 1996 in referral numbers from the SDS may be due to the introduction of the SOKS program (see page 81) which now screens a greater number of children in primary schools than the previous program. Studies from the UK have also shown that the Community Dental Service (CDS) is a strong referral source within their health system (Mitchell et al. 1985; Nunn et al. 1995; Smallridge et al. 1990). This is not supported by the Belgium study where less than 1% of patients where referred by the SDS (Vermeulen et al. 1991). It is apparent that the structure of the health system in each country affects the way children are referred to centers for the provision of GA.

Overall, emergency patients made up the largest group of children to subsequently need general anaesthesia in our study (42% in 1984 and 34% in 1996). These are patients that have not accessed dental care by any other means and use Westmead Hospital as a primary health care provider. The results from this study suggest that patients of specific ethnic backgrounds (Middle-Eastern and Asian children) use this approach with increased
frequency as compared to other ethnic groups. Asian and Middle-Eastern patients accounted for 23.5% of all patients in 1996, however 48% of these children accessed the hospital through the emergency department (as compared with 30% of Anglo-Saxon children). This suggests that community based oral health promotion should be targeted at these groups. There are several possible reasons as to why self-referred patients are such a large group. The increase in certain ethnic groups may be explained by the fact that most of these patients are from specific suburbs in Sydney, they come from low socio-economic groups and therefore make use of the public health care system. These are closed ethnic societies where the knowledge of availability of dental services is thought to occur by word of mouth. Also, Westmead Hospital is a well-known referral centre and many patients are aware of the GA dental services available. Furthermore, the high cost of dental treatment in private practice means that many families cannot afford to attend a private dentist for routine dental care. Several other studies have found a significant proportion of self-referred patients accessing GA, which is in agreement with our results, but no explanation is given for their findings (Holt et al. 1992; Vermeulen et al. 1991; Wong et al. 1997). Only one study suggested that the high number of self-referred patients was due to the fact that a large number of children did not have their own dentist; and this could be due to apathy or lack of education/interest by the parents (Keniry, 1974).

In addition, our results showed a statistically significant increase in the number of children grouped as “Other” from 12% in 1984 to 19% in 1996. These are mainly children that have been referred from within the hospital in one way or another. It is therefore important to identify these patients with more accuracy as to determine why they are on the increase. A possible explanation could be that now children are seen in general dental departments throughout the hospital as compared to previous years when they were mainly seen in the Paediatric Dentistry Department. The reason for this is that now fewer dentists work in the paediatric dentistry unit due to increased financial restrictions within the hospital. The increase in internal referrals may suggest that general dentists and therapists may not be as
experienced in handling young children and therefore may abandon regular dental treatment. The net result is that attempts are made by inexperienced dentists to treat children. On failing, many such children are referred to Paediatric Dentistry for GA. Furthermore, several other children with high treatment needs and especially preschool children require specialist management care.

**Waiting time**

Waiting time is a term used in most studies in GA for children to quantify the demand for services provided. In other words, how efficiently a particular unit or hospital deals with the number of patients requiring treatment under GA. Our study showed that provision of GA was kept with the demand up until 1990 (Figure 5.1). From then on the number of GA sessions remained stable but demand for services outstripped the provision of services. Consequently, the average waiting time increased from 37 days in 1984 to 81 days in 1996.

![Figure 5.1: Number of GA patients and sessions per year.](image)

In 1996, over two thirds (67%) of the children had to wait two or more months, and 39% had to wait three months or more to receive treatment under GA. These results are similar to a New Zealand study which found that mean waiting times more than doubled due to the increased demand (Thomson, 1994). Over the five-year period of this last study, only 3.4%
of children had to wait more than 3 months for treatment in 1989-1990 compared with 28.4% in 1993-1994. This was still significantly less than our results for the year 1996. Most other papers addressing waiting time are from the United Kingdom, where waiting times are considerably longer than our study and the New Zealand study. One UK review found a mean waiting time of 3.4 weeks for the initial consultation for a dental GA (Podesta and Watt, 1996). Although 90% of these parents reported that their referring dentist had explained why their child was being referred for a GA, 70% were not offered an alternative form of treatment before being referred. This was considered a major cause of concern as it is likely that a number of these children may have been appropriately managed in other ways thereby decreasing the demand and need for GA (Podesta and Watt, 1996). A waiting period between 10 to 12 weeks was reported in one UK study. This was despite an increase in the provision of facilities from 4 operating lists per month in 1972 to 10 per month in 1992 (Mason et al. 1995). Another study reported waiting times between four to nine months (O'Sullivan and Curzon, 1991). This is in accordance with a ten-year review on the use of GA in children, which found that although the number of patients increased only slightly from 1988 to 1995, the waiting time increased from four to nine months (Wong et al. 1997). Service availability was not specifically addressed in these studies and this presents difficulties when comparing waiting times among different hospitals or institutions.

The results of our study showed that the increase in number of GA sessions per month (from 8 in 1984 to 16-18 in 1996) did not translate in a decrease in waiting times. Several reasons may account for this increase in waiting times. The demand may have increased as more health and dental professionals within the community are aware of the availability of GA in this specialist unit. Also, increased restrictions to provide GA in private practices may have lead to fewer procedures being carried out. Furthermore, with changes to the public sector and the introduction of the SOKS program, this may have well increased the number of children requiring GA. Our results showed that the number of children referred for GA by the SDS increased from 12% in 1984 to 18% in 1996. Lastly, the results suggest that there
are more children with high treatment needs who may require longer operating times and therefore decrease the number of children seen per operating session. This finding is consistent with current trends in caries distribution (Blinkhorn and Davies, 1996; Spencer et al. 1994) and demographic characteristics (Thomson, 1993) reported in the literature.

**Treatment provided**

The results of our study showed that the majority of the treatment done was in the primary dentition. This is consistent with the finding that most children requiring GA were below the age of six years. In the primary dentition, there was a significant increase in the number of extractions made and some definite trends in the restorative treatment carried out between the two periods. Results in the permanent dentition also showed specific trends, with an increase in the number of fissure sealants being the most significant change. These results will be discussed in some detail and compared to relevant papers in the literature. Extractions and restorations, and to a lesser degree surgical procedures are the most commonly mentioned procedures carried out under GA in children. A good summary of services provided in the UK over a ten-year period showed that nearly three times as many primary teeth compared with permanent teeth were restored. Primary teeth were extracted far more often (5:1) than permanent teeth. It also showed that only 23% of teeth treated with pulpotomy procedures received a stainless steel crown (Wong et al. 1997).

**Extractions**

General anaesthesia has often been used for the extraction of teeth particularly in children but also in adults. The most common reason is dental caries and its sequelae. Our study found a significant increase in the number of primary teeth extracted between the two periods. The mean number of primary teeth extracted per child increased from 1.98 in 1984 to 3.11 in 1996. The overall number of children having primary teeth extracted increased
significantly from 59% in 1984 to 79% in 1996. These figures are similar to other studies assessing the number of extractions done under GA. One early study on the use of GA in 225 children showed that the average number of teeth extracted in the primary dentition was 3.8 per child, as compared to 2.8 in the permanent dentition (Rule et al. 1967). The extraction ratio for permanent teeth was quite high for this UK study, but this may be due to the early date of the paper (when caries levels in the UK were generally much higher) and the lack of water fluoridation in London at the time. In comparison, a study in 1974 of 1307 child patients showed that the average number of extracted teeth was 2.3 per case, but did not specify whether primary or permanent; however the peak age quoted was 5 years of age (Keniry, 1974). Other recent studies have also found an increase in the number of teeth extracted per child under GA. One paper reported a mean of 4.1 teeth extracted per child, a number higher than the mean 6 years earlier (Smallridge et al. 1990). A multi-centre study corroborated these results and reported that 83% of the anaesthetics were given for the extraction of primary teeth, with an average of 3.3 teeth per child (Holt et al. 1992). However, these two last studies were done in children having GA extractions only, as opposed to comprehensive care. Similarly, another study (where nearly 70% of children had some form of disability or medical condition) found a mean value of 3.6 teeth extracted per child (for primary teeth) and 2.9 (for permanent teeth) showing an overall increase in the number of teeth extracted (Nunn et al. 1995).

There is general support for the fact that more radical treatment should be carried out on these children in order to avoid repeat procedures in the near future (Nunn et al. 1995). This is not only warranted in medically compromised children, but also in those with high levels of disease and those children that are difficult to treat in more conventional ways. Another consideration is the constant demand and increasing waiting lists affecting most centres providing GA. By carrying out more extractions per child, a greater number of children can be seen per operating lists.
Statistically significant increases in the number of patients having only one primary tooth extracted and 5-8 extractions were noted in our study when comparing 1984 with 1996. This may suggest an increase in the number of children requiring the extraction of a single traumatised tooth. The reason for having more of these trauma cases may be due to increased awareness of services, but also individual management styles of particular clinicians and the fact that regular sessions allow "quick" cases to be added on request. The increase in the group of children having 5-8 extractions highlights the fact that children with high levels of disease are seen, and that more radical treatment is implemented.

Other studies have found the opposite to be true, with fewer patients having extractions under GA. Our study did find a decrease in the number of patients having permanent teeth extracted, with a decline from 11% in 1984 to 6% in 1996. Our mean number of permanent extractions per patient of 0.1 in 1996 was much lower than the value of 2.9 given by a recent UK study (Nunn et al. 1995). This may be due to the different nature of our patient population, with children mostly of preschool age, fewer medically compromised children (27%, compared to nearly 70% in the UK study), water fluoridation, and a more conservative treatment approach when dealing with first permanent molars. This is consistent with a 25-year review of GA usage in Leeds, UK (1960-1984) which showed a fall in the number of permanent teeth extracted annually (McLaughlin et al. 1987).

Water fluoridation has been suggested to have an effect in the number of extractions of children having treatment under GA (Chippendale and Storey, 1988). This Australian study (Melbourne, 1977-1986) found a decrease in the number of extractions of 80% for children aged 1 to 7 years, and suggested that this was due to the introduction of water fluoridation. No such correlation was investigated in the Sydney study. However, both studies found a proportion of children with higher levels of dental disease that on average required more extractions. This last finding is also consistent with current trends of caries in Australia (Davies et al. 1997; Widmer and Mekertichian, 1996).
Treatment of the primary and permanent dentition

Restorative treatment carried out under general anaesthesia can be generally subdivided into treatment in the primary or permanent dentitions (Wong et al. 1997). Unfortunately many studies do not make distinction between the two dentitions and only quote number of restorations or procedures performed (Keniry, 1974; Enger and Mourino, 1985; O'Sullivan and Curzon, 1991). Several studies also describe treatment procedures by comparing the number of restorations and trends in use of particular materials between two or more periods of time (Bohaty and Spencer, 1992; Nunn et al. 1995; Wong et al. 1997).

In the current study the mean number or restorations in the primary dentition decreased slightly (from 4.84 in 1984 to 4.05 in 1996). However, the restoration/ extraction ratio for the primary dentition decreased markedly from 2.4 in 1984 to 1.3 in 1996. This last value is similar to the ratio found by one UK study, which quoted a restoration:extraction ratio for primary and permanent teeth of 1.2 and 2.3 respectively (Wong et al. 1997). These ratios were higher than that reported by another study (0.8 and 0.6 for primary and permanent teeth respectively) (Mason et al. 1995). The overall restoration:extraction ratio in the study by Wong and coworkers was 1.3, which is similar to that reported by others (O'Sullivan and Curzon, 1991; Tarjan et al. 1990). The decrease in our restoration:extraction ratio can be mostly attributed to the increase in the number of extractions.

In regards to the materials used, the most interesting result was that no amalgams or stainless steel crowns (SSCs) were recorded in 1984. Glass ionomer restorations were by far the most popular material in 1984. It is interesting to note that although the number of glass ionomer restorations nearly halved from 1984 to 1996, the actual number of patients receiving this treatment modality remained virtually unchanged. It is hypothesised that in 1984 glass ionomers were recently introduced as a restorative material and due to its properties (fluoride release and bonding capacity) were chosen in preference to the more conventional
amalgam and composite restorations. However, subsequently the literature has shown them to be inadequate in terms of clinical durability (Welbury et al. 1991). This information has lead to a change in treatment philosophy with other materials such as amalgam, composite and SSCs regaining popularity.

In regards to the permanent dentition it can be seen that the number of fissure sealants increased significantly in 1996. This is consistent with other studies that have compared two periods of time and have shown statistical increases in the use of sealants (Nunn et al. 1995; Bobaty and Spencer, 1992). The reason for this change stems from the evidence for fissure sealants in the prevention of occlusal caries (Manton and Brearley Messer, 1995). Since our population seems to have large numbers of children with high levels of disease, maximising preventive strategies is important. A decrease in the number of glass ionomer restorations was also noted in the permanent dentition, a finding consistent with the limited use and lifespan of this material and the availability of more durable materials such as amalgam and composite resins.

**Surgical procedures**

The description of surgical procedures in children under general anaesthesia is limited to a few studies with varied results (Table 1.9, page 71). The most common reported procedures are removal of supernumerary teeth (including odontomes), surgery related to orthodontic procedures (e.g. exposure +/- bonding of unerupted teeth, removal of impacted teeth), and minor soft tissue surgery (frenectomies, biopsies and removal of soft tissue lesions). Our study found a decrease in the number of surgical procedures being performed in the Paediatric Dentistry department under GA. The number of children receiving surgery decreased significantly from 20% in 1984 to 12% in 1996. There are several possible explanations for this result. The most likely one is the fact that more children requiring surgery are currently being referred to the department of OMFS. Only minor oral surgery is
performed in our department with one consultant paediatric dentist performing most of these procedures. It is also possible that some procedures may be delayed to a later stage in development (e.g. removal of a supernumerary tooth) in order to minimise complications of the surgery. This would mean that many children might be older, maturer and therefore able to receive treatment in the chair rather than under GA.

In a comprehensive study addressing surgical procedures, a 200% increase in surgery was reported over a 20 year period at a London dental hospital (Mason et al. 1995). This study assessed changes in treatment provided for children under general anaesthesia between 1972-1992. It was found that the main use of GA was still for the management of caries, but oral surgery procedures, especially those related to orthodontic treatment increased significantly in the last decade of the study. Only two out of 202 children were recorded as having a surgical procedure in 1972, but by 1982 the number increased to 18% (53 out of 287). This figure further increased to 34% (157 out of 465) in 1992, with a very marked increase in the number of children having a tooth surgically exposed (+/- bonding of an orthodontic attachment). This increase in orthodontically related minor oral surgery was attributed to the interests and skills at that particular centre. It also reflected links between the departments of children’s dentistry and orthodontics and a combined approach to treatment planning. The mean age of patients having surgery in our study was 8.56 years in 1984 and 8.23 years in 1996. This is clearly much older than the overall population, where the average was 5.39 years in 1984 and 5.25 years in 1996. The study by Mason and others found and older age group in their population, with 50% of patients being 10 years or older in 1992 (Mason et al. 1995).
Other characteristics

**Medical Condition**

All patients were screened for medical conditions and classified as “none” and “medical”. The results showed that the number of patients increased from 22% in 1984 to 27% in 1996, however this increase was not statistically significant. These results are similar to those found by other studies (Rule et al. 1967; Keniry, 1974; Holt et al. 1991; O’Sullivan and Curzon, 1991). This increase in the number of medically compromised children may be related to the relocation of the New Children’s Hospital (NCH) in proximity to the Westmead Dental School (WDCS). It can be argued that more medically compromised children are now referred to the unit for dental GAs, however no clear evidence can be found in the referral patterns of our sample population. Children requiring admission to hospital for their dental work under GA are usually seen at the NCH, where a dental operating list also exists but it is not accounted for in our study.

The Sydney study did not find a significant number of teenage children with special needs due to the fact that most of this patients are seen in the “Special Care Unit” at this same hospital. A study that evaluated the use of GA in children with special needs found that 60% (350 out of 586 children) of their patients had medical and/or mental disabilities, a finding that was expected. Although the number of peri-operative admissions was low (11 planned and 9 emergency), this study highlighted the necessity for these patients to be treated in a hospital (Wong et al. 1997). This high proportion of medically compromised children has also been reported in studies of GA in children with special needs (Nunn et al. 1995; Harrison and Roberts, 1998). A recent study reporting on the dental health of chronically sick children found that dental disease was extensive across the spectrum of medical conditions (Harrison and Roberts, 1998). Furthermore, there was a predominance of extractions over restorations in these children and this treatment modality was a result of the treatment planning philosophy for these patients. The authors concluded that the dental
treatment of chronically sick children under GA is significantly influenced by the underlying medical disorder. The Sydney study did not evaluate this finding, but individual patient notes seem to support this approach to treatment. One final observation about our population is the fact that no distinction was made among patients with moderate to severe chronic illnesses and those with mild conditions that do not affect their everyday life. This may have further increased the proportion of children categorised as medically compromised when in fact the number was actually lower than the one quoted.

**Follow Up**

The success of general anaesthesia in children has been measured in terms of the success of individual procedures performed and also the need to perform repeat GA procedures within a certain time span. Most papers do not directly mention follow up procedures in their samples and only a few quote figures for specific procedures. Our study recorded a significant increase in the number of children failing to attend follow up visits a week later after their GA (13% in 1984 compared to 25% in 1996). This is highly significant as it is hypothesised that many of these children have high treatment needs, come from specific ethnic backgrounds and have habits associated with high caries risk. It would be interesting to note how many of these children require further dental treatment within a five-year period. Comparatively, there was a significant increase (30% in 1984 to 39% in 1996) in the number of children attending for a single review visit. This finding may be due to the desire of parents to have all treatment checked, while subsequent follow-ups can be done by their local dentist. Many other children that received treatment under GA were recalled regularly and for longer periods of time in 1984. At present, most of these children are referred back to their practitioners for continuing care. These changes are due to new departmental protocols in order to reduce waiting lists, and in line with current GA follow up trends in other parts of the world (Vermeulen et al. 1991; Holt et al. 1991; Berkowitz et al. 1997).
The early study by Rule and others assessed follow up with regards to the ability of the dentist to carry out restorative procedures in the mouth without repeated use of general anaesthesia (Rule et al. 1967). The average follow up time was 6 to 12 months. Out of 225 patients, 21% (48 cases) responded favourably to further dental treatment in the chair, with the majority of these children being under 10 years of age. Eight patients (3.5%) remained impossible to treat. Our study did not investigate the future behaviour of children to further treatment, and this area needs further investigation in order to assess the response of this group of patients. The study by Rule also commented on the inadequacy of follow up of many of these patients. This group involved patients that had: surgical procedures that did not require further treatment; patients that failed to attend subsequent appointments; patients that were subsequently treated by their dentists; or patients for whom no follow up notes were entered in their records (Rule et al. 1967).

**Repeat GAs**

The number of repeat GAs in our study could only be assessed for the year 1984. It was found that 16.4% (31 out of 189) of children underwent a second (or more) procedure within the overall period of the study, that is for the 12-year period examined. Of these children, most repeat GAs were for the treatment of caries and to a lesser extent for surgical procedures. This is consistent with the study by Keniry in 1974 that found the majority of patients had only one anaesthetic experience for dental treatment. In this study, out of a total of 1,307 children, 166 (12.7%) had two general anaesthetics, 27 had three sessions, and 4 patients had four GAs. This gives a figure of 17.8% return visits for a time interval ranging from three days to four years. The most frequent revisits occurred in children between the ages of 4-8 years (Keniry, 1974). More recent studies have quoted figures of 5% (Smallridge et al. 1990), 2.5% (O'Sullivan and Curzon, 1991), 4.2% (Thomson, 1994), and 12% (Nunn et al. 1995) for repeat general anaesthetics in children. Only the study by Nunn and others (mostly medically compromised patients) specifically mentioned that children required
further treatment within 5 years of their previous visit (Nunn et al. 1995). Future work needs to be done to look at the number of repeat GAs in our 1996 group. It is possible that with the significant increase in the number of extractions in 1996, the number of repeat GAs may have decreased.

Limitations of the study

The extraction of information from notes in a retrospective manner has limitations. This type of study involves interpreting information written in medical records by several different operators. Not all information is always available. The fact that notes from 1984 were used meant that several records could not be found. In order to minimise errors during data collection, patient files were compared with computer printouts, operation records and anaesthetic records. This assured that the data being recorded was accurate in most cases, but it could not be verified for some. It was not possible to find out what proportion of patients that attend the Paediatric Dentistry department at Westmead Hospital actually required a general anaesthetic. At the time of this study, the number of occasions and the number of new patients were only recorded. There is no record of the total number of patients seen at this unit per year, therefore it was impossible to work out the percentage of patients requiring general anaesthesia. Assigning ethnicity to patients was difficult in our study. Patient files did not always record this information accurately. Therefore other data such as the country of birth, time living in Australia, language spoken at home, and citizenship had to be taken into account when assigning ethnicity. It is possible then that the interpretation of this data may be biased, and this must be taken into consideration.

The financial cost involved in the provision of GA services is substantial for any institution, therefore recording data such as health insurance of the patients treated is extremely relevant. Westmead Hospital is primarily a public hospital and as such, most patients seen
are public or "Medicare" holders. This is reflected in our sample of 1984 where 70% of children treated under GA were classified as Medicare patients and 30% as holders of private insurance. However, most of the 30% that had private insurance were not billed accordingly, and therefore they were still treated as "public" patients. A significant drop in private patients was seen in 1996 with only 1% recorded as private. The main reason for this change may well be the lack of entry of the relevant information. In other words, this 1% figure is likely to be inaccurate. It is also possible that patients that hold private insurance may not disclose this information and therefore increased the burden on the public sector. This finding has immense repercussions in financial terms for any institution. Since it is clear that demand for this type of service is on the rise, this information is vital for any major institution providing such costly services as dental general anaesthesia.

The morbidity experienced during day-stay surgery could not be assessed due to lack of information and the fact that no protocol is currently in force to record such data. However, the most common post-operative complications in our patients were nausea, vomiting, sore throat and oral pain.
CHAPTER 6. CONCLUSIONS

At the beginning of this study several objectives were outlined, with the main purpose of answering five postulates:

1. The number of children receiving dental care under general anaesthesia has increased over the past 13 years. This study supports this postulate. There was over a seven fold increase in the number of patients treated under GA between 1983 (105 children) and 1996 (777 children).

2. The demographic, socio-economic, and cultural characteristics of these patients have altered over the past 13 years. There were no significant changes in the place of residence between the two years examined. Most patients came from the Western Sydney area (where Westmead Hospital is located) and the Southwestern area. Socio-economic variables proved difficult to examine as there was insufficient data.

3. That young children from specific ethnic backgrounds make up an increasing proportion of patients requiring extensive dental treatment under GA. This study showed that in 1996 children of Asian and Middle-Eastern origin made an increasingly important group. Several of these children came from low socio-economic backgrounds, many were born overseas, and a significant proportion presented with high levels of dental disease. The distribution in ethnic groups in our sample is thought to be a reflection of the overall child Sydney population.

4. The treatment need of the children receiving dental care under GA over the past 12 years has changed with increasingly complex restorative work being required.
This finding was not corroborated and in fact, the opposite appeared to be true, with treatment plans involving more extractions and more radical treatment philosophies.

5. That the demand for dental GA has been met by the service commitment as assessed in terms of the length of the waiting list.

This was not the case as demand continued to increase and from 1990 demand outstripped the provision of services, with the average waiting time increasing from 37 days to 81 in 1996.
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Appendix No. 1: American Society of Anesthesiologists Classification

ASA I
There is no organic, physiological, biochemical, or psychiatric disturbance. The pathologic process for which operation is to be performed is localised and is not a systemic disturbance.

ASA II
Mild-to-moderate systemic disturbance caused either by the condition to be treated surgically or by other pathophysiological processes.

ASA III
Severe systemic disturbance or disease from whatever cause, even though it may not be possible to define the degree of disability with finality.

ASA IV
Indicative of the patient with severe systemic disorder already life-threatening, not always correctable by the operative procedure.

ASA V
A moribund patient not expected to survive 24 hours with or without operation.

ASA E
Emergency operation of any variety; $E$ precedes the number indicating the patient’s physical status (e. g., ASA E-III).
Appendix No. 2: Protocols for antibiotic prophylaxis against infective endocarditis

Procedures that require prophylaxis

- All dental procedures likely to induce bleeding.
- First-visit endodontic procedures.
- Endotracheal intubation.

Procedures that do not require prophylaxis

- Simple adjustment of orthodontic appliances.
- Restorations above the gingival margin.
- Endodontic procedures confined to the root canal after pulp extirpation.
- Injection of local intra-oral anaesthetic (except intraligamentary injections).
- Exfoliation of primary teeth.

Relative risk of procedures

It is considered that some procedures subject the patient to a higher level of risk of developing endocarditis than others. An open surgical procedure will produce a significantly greater bacteraemia than gingival scaling or placing a matrix band below the gingival margin. If the procedure is determined to put a potentially susceptible patient at higher risk the use of parenteral antibiotics should be considered.
Protocols for antibiotic prophylaxis

These protocols are based on those published by the Victorian Drug Usage Advisory Committee (1992) and recommended by the Australian Dental Association.

Protocols for susceptible patients

Non-penicillin-allergic patients able to take oral medications

*Amoxicillin*

*Children*  
50 mg/kg orally 1 hour before procedure

*Adults*  
3.0 g

Penicillin-allergic patients

*Clindamycin*

*Children*  
10 mg/kg orally or intravenously followed by 5 mg/kg 6 hours later

*Adults*  
600mg orally 1 hour before procedure followed by 300mg 6 hours after initial dose or

*Vancomycin*

*Children*  
20mg/kg infused over 1 hour before procedure

*Adults*  
1.0 g infused over 1 hour before procedure

Susceptible patients under general anaesthetic

*Ampicillin or amoxicillin*

*Children*  
50mg/kg intravenously just before procedure followed by 25 mg/kg 6 hours later
Adults 1.0 g intravenously just before procedure or intramuscularly 30 min before procedure. Then 500mg intravenously, intramuscularly or orally, 6 hours after initial dose

Protocol for highly susceptible patients or high-risk procedures

Non-penicillin-allergic patients

Children Ampicillin or amoxycillin 50mg/kg intravenously + gentamycin 2.5 mg/kg (up to 80 mg maximum) followed by amoxycillin 25 mg/kg 6 hours later

Adults Ampicillin or amoxycillin 1.0g intravenously + gentamycin 1.5 mg/kg (up to 80 mg maximum) intravenously just before procedure or intramuscularly 30 minutes before procedure followed by amoxycillin 500mg 6 hours later

Penicillin-allergic patients

Children Vancomycin 20mg/kg infused over 1 hour before procedure followed by gentamycin 2.5 mg/kg intravenously (up to 80 mg maximum) before procedure commences

Adults Vancomycin 1.0g infused over 1 hour to end just prior to procedure, followed by gentamycin 1.5 mg/kg intravenously (up to 80 mg maximum) just before procedure commences

Total paediatric dose should not exceed total adult dose.

- It is always preferable to prescribe on a dose per kilogram basis.
- Paediatric doses should be calculated up to the adult dose.
- It is expected that some cases of endocarditis will occur, despite the use of optimal prophylaxis protocols.
- Good history taking is essential.
- If in doubt, consult relevant medical authorities.
Appendix No. 3: Guidelines for the care of patients recovering from anaesthesia. Review P4 (1995)

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1. GENERAL PRINCIPLES

1.1 Recovery from anaesthesia should take place under supervision in an area designated for the purpose.
1.2 This area should be close to where the anaesthetic was administered.
1.3 The staff working in this area must be trained for their role and able to contact supervising medical staff promptly when the need arises.
1.4 In some situations (for example, paediatric hospitals) minor variations in these Guidelines may be appropriate.

2. THE RECOVERY AREA

2.1 Design Features

2.1.1 The area should be part of the operating or procedural suite. Access should be available to medical staff who are not in operating suite clothing, so that they may continue to supervise the patient's care. Provision should be made for rapid evacuation of patients from the area in an emergency.

2.1.2 It should have ventilation to operating theatre standards.
2.1.3 The space allocated per bed/trolley should be at least 9 square metres. There must be easy access to the patient's head.

2.1.4 The number of bed/trolley spaces must be sufficient for expected peak loads and there should be at least 1.5 spaces per operating room.

2.1.5 Each bed space must be provided with:

2.1.5.1 an oxygen outlet
2.1.5.2 a vacuum outlet complying with the current requirements of the relevant national Standards.
2.1.5.3 two General Power Outlets
2.1.5.4 lighting to allow accurate detection of cyanosis
2.1.5.5 emergency lighting
2.1.5.6 appropriate facilities for mounting and operating any necessary equipment and for the patient's chart.

2.1.6 Space must be provided for a nursing station, storage of drugs, of clean linen as well as a utility room.

2.1.7 There must be appropriate facilities for scrubbing up for procedures.

2.1.8 There should be a wall clock with a sweep second hand or analogue display clearly visible from each bed space.

2.1.9 Communication facilities should include:
   2.1.9.1 an emergency call system to areas such as the Department of Anaesthesia.
   2.1.9.2 a telephone and access to the Hospital paging system.

2.1.10 There should be easy access for portable X-Ray equipment with appropriate power outlets provided in the area. There should also be an X-Ray viewing box. An
emergency power supply should be available in the area.

2.1.11 An emergency power supply should be available in the area

3. EQUIPMENT AND DRUGS

3.1 Each bed space should be provided with:

3.1.1 oxygen flowmeter and patient oxygen delivery systems
3.1.2 suction equipment including a receiver, appropriate hand pieces and a range of suction catheters a pulse oximeter
3.1.4 a sphygmomanometer which may be automated and include cuffs suitable for all patients
3.1.5 a stethoscope
3.1.6 a means of measuring body temperature

3.2 Within the recovery area there must be:

3.2.1 a means of inflating the lungs with oxygen in a ratio of one per two bed spaces, but with a minimum of two such devices
3.2.2 airway management and intubation drugs and equipment
3.2.3 emergency and resuscitative drugs
3.2.4 a range of I.V. equipment and fluids and a means of warming those fluids
3.2.5 drugs for pain control
3.2.6 a range of syringes and needles
3.2.7 electrocardiographs with a minimum of 1 to 3 bed spaces.

3.3 There should be easy access to:

3.3.1 a 12 lead electrocardiograph
3.3.2 a monitor for measurement of direct arterial and venous pressures
3.3.3 a capnometer
3.3.4 a defibrillator
3.3.5 a neuromuscular function monitor
3.3.6 a bronchoscope with sucker and grasping forceps
3.3.7 a warming cupboard
3.3.8 a refrigerator for drugs and blood
3.3.9 a patient warming device
3.3.10 a procedure light
3.3.11 a simple surgical tray
3.3.12 blood gas and electrolyte measuring
3.3.13 diagnostic imaging services

3.4 The recovery trolley/bed must:
3.4.1 have a firm base and mattress
3.4.2 tilt from one or both ends both head up and head down at least 15 degrees
3.4.3 be easy to manoeuvre
3.4.4 have efficient and accessible brakes
3.4.5 provide for sitting the patient up
3.4.6 have secure side rails which must be able to be dropped below the base or be easily removed
3.4.7 have an I.V. pole
3.4.8 have provision for mounting monitoring equipment, patient ventilation equipment, oxygen cylinders, underwater seal drains and suction apparatus during transport of patients.

4. STAFFING

4.1 Staff trained in the care of patients recovering from anaesthesia must be present at all times.
4.2 A registered nurse trained in recovery area care should be in charge.
4.3 Trainee nurses and registered nurses who are not experienced in the care of patients
recovering from anaesthesia must be supervised.

4.4 The ratio of registered nurses to patients needs to be flexible so as to provide no less than one nurse to three patients, and one nurse to each patient who has not recovered protective reflexes or consciousness.

5. MANAGEMENT AND SUPERVISION

5.1 Written protocols for management should be established. The Director of Anaesthesia, or the Anaesthetist-in-Charge, should be responsible for the medical aspects of these policies.

5.2 A written routine for checking the equipment and drugs must be established.

5.3 Observations should be recorded at appropriate intervals and should include state of consciousness, oxygen saturation, respiratory rate, pulse rate, blood pressure and temperature.

5.4 All patients should remain until they are considered safe to be discharged from the recovery area according to established criteria.

5.5 The anaesthetist responsible for the patient should:

5.5.1 accompany the patient until transfer to recovery area staff is completed
5.5.2 provide written and verbal instructions to the recovery area staff
5.5.3 specify the type of apparatus and the flow rate to be used for oxygen therapy
5.5.4 remain in the vicinity until the patient is safe to be left in the care of recovery area staff
5.5.5 supervise the recovery period and authorise the patient's discharge from the recovery area. It is recognised that in some circumstances it may be necessary for the anaesthetist previously responsible for the patient to delegate these duties to a trained recovery area nurse or to another anaesthetist who should be fully informed of the clinical state of the patient.

5.6 The practitioner responsible for the patient's overall care should be available to consult with the anaesthetist should the need arise in the recovery period and, where appropriate, to authorise the discharge of the patient.
This policy document has been prepared having regard to general circumstances, and it is the responsibility of the practitioner to have express regard to the particular circumstances of each case, and the application of this policy document in each case.

Policy documents are reviewed from time to time, and it is the responsibility of the practitioner to ensure that the practitioner has obtained the current version. Policy documents have been prepared having regard to the information available at the time of their preparation, and the practitioner should therefore have regard to any information, research or material which may have been published or become available subsequently.

Whilst the College endeavours to ensure that policy documents are as current as possible at the time of their preparation, it takes no responsibility for matters arising from changed circumstances or information or material which may have become available subsequently.

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Appendix No. 4: Guidelines for the perioperative care of patients selected for day care surgery. Review P15 (1995)

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Day Care Surgery means that the patient will ordinarily be discharged from the hospital or unit later on the day of the procedure. Anaesthesia for the procedure may require general, regional or sedative techniques.

SELECTION GUIDELINES

1. Procedures suitable for day care surgery must entail:

   1.1 A minimal risk of post operative haemorrhage.
   1.2 A minimal risk of post operative airway compromise.
   1.3 Post operative pain controllable by outpatient management techniques.
   1.4 No special post operative nursing requirements.
   1.5 A rapid return to normal fluid and food intake.

2. Patient requirements for day care surgery include:

   2.1 A willingness to have the procedure performed together with an understanding of the process and ability to follow discharge instructions.
   2.2 Physical status of ASA I or II. Medically stable ASA III or IV patients may be accepted for day care surgery following consultation with the anaesthetist concerned.
   2.3 Normal term infants of over three months of age or ax-premature infants (less than
37 weeks gestation) of more than 60 weeks post-conceptual age. Prior consultation with the anaesthetist is essential.

In all cases, the ultimate decision as to the suitability of a patient for day care surgery is that of the anaesthetist. The decision as to the type of anaesthesia must remain in the province of the anaesthetist and will be based on surgical requirements, patient considerations, the experience of the anaesthetist and the facilities of the day care surgical unit.

3. **Social requirements for day care surgery include:**
   3.1 A responsible person able to transport the patient home in a suitable vehicle.
   3.2 A responsible person at home for at least the first night after discharge from the unit.

A responsible person is an adult who understands the instructions given to them and is physically and mentally able to make decisions for the patient's welfare when appropriate.

4. **Patient Preparation**

4.1 ANZCA Policy Document P7 (1992) 'The Pre-Anaesthetic Consultation' describes the essential nature of this consultation for all patients who are to receive anaesthesia.


4.3 Patient assessment can be assisted by:
   4.3.1 A standardised anaesthesia questionnaire.
   4.3.2 Preliminary nurse assessment.
   4.3.3 Prior surgical referral in cases of doubt as to suitability for day care surgery.

4.4 Patient information in an understandable written format must include:
   4.4.1 General information about the processes followed in the day care unit.
4.4.2 Instructions for fasting according to the following guidelines:

4.4.2.1 Limited solid food may be taken up to six hours prior to anaesthesia.

4.4.2.2 Unsweetened clear fluids totaling not more than 200 ml per hour may be taken up to three hours prior to anaesthesia.

4.4.2.3 Only medications or water ordered by the anaesthetist should be taken less than three hours prior to anaesthesia.

4.4.2.4 An Hz-receptor antagonist should be considered for patients with an increased risk of gastric regurgitation.

These guidelines may be modified in some patients, particularly infants and small children, on advice from the anaesthetist.

5. **Recovery from anaesthesia**

5.1 ANZCA Policy Document P4 (1995) 'Guidelines for the Care of Patients Recovering from Anaesthesia in the Recovery Area' establishes requirements for the facilities and staffing of recovery areas. This document is fully applicable to day care units.

5.2 An area must be provided with comfortable reclining seating for patients to complete recovery prior to discharge home. This area must be adequately supervised by nursing staff and should also have ready access to resuscitation equipment, including oxygen and suction equipment. Patients must not leave this area unaccompanied.

6. **Discharge of the patient from the day care unit**

The discharge area should have easy access to wheel chairs, a parking area and ambulance facilities so as to minimise walking for the post operative patient and to aid transfer of the patient to inpatient hospital care when this is necessary. The following criteria apply to patient discharge:

6.1 Stable vital signs for at least one hour.

6.2 Correct orientation as to time, place and relevant people.

6.3 Adequate pain control with oral analgesics.
6.4 Ability to dress and walk should be equivalent to preoperative standards.
6.5 Minimal nausea, vomiting or dizziness.
6.6 May tolerate oral fluids without vomiting.
6.7 Minimal bleeding or wound drainage.
6.8 Has passed urine. This is particularly important after central neural blockade or pelvic surgery.
6.9 A responsible adult to take the patient home. For children, and in other situations where necessary, there should be an adult escort as well as the vehicle driver.
6.10 Discharge should be authorised by surgeon and anaesthetist or their designated alternative after the above criteria have been satisfied.
6.11 Written and verbal instructions for all relevant aspects of post anaesthetic and surgical care must be given to the patient and the accompanying adult. An emergency contact place, person and telephone number must be included.
6.12 Suitable analgesia should be provided for at least the first day after discharge. Advice on any other regular medication is also necessary.
6.13 A telephone enquiry as to the patient's wellbeing on the following day should be made whenever possible.
This policy document has been prepared having regard to general circumstances, and it is the responsibility of the practitioner to have express regard to the particular circumstances of each case, and the application of this policy document in each case.

Policy documents are reviewed from time to time, and it is the responsibility of the practitioner to ensure that the practitioner has obtained the current version. Policy documents have been prepared having regard to the information available at the time of their preparation, and the practitioner should therefore have regard to any information, research or material which may have been published or become available subsequently.

Whilst the College endeavours to ensure that policy documents are as current as possible at the time of their preparation, it takes no responsibility for matters arising from changed circumstances or information or material which may have become available subsequently.

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Appendix No. 5: Monitoring during anaesthesia. Review
P18 (1995)

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INTRODUCTION

Monitoring of certain fundamental physiological variables during anaesthesia is essential. Clinical judgement will determine how long this monitoring should be continued following completion of anaesthesia.

The Health Care Facility in which the procedure is being performed is responsible for provision of equipment for anaesthesia and monitoring on the advice of one or more designated specialist anaesthetists, and for effective maintenance of this equipment (see College Policy Document 'Recommended Minimum Facilities for Safe Anaesthetic Practice in Operating Suites' (T1)).

Some or all of the recommendations in this document may need to be exceeded depending on the physical status of the patient, the type and complexity of the surgery to be performed as well as the requirements of anaesthesia.

The described monitoring must always be used in conjunction with careful clinical observation by the anaesthetist as there are circumstances in which equipment may not detect unfavourable clinical developments.

The following recommendations refer to patients undergoing general anaesthesia or major regional anaesthesia for diagnostic or therapeutic procedures and should be interpreted in conjunction with other Policy Documents published by the Australian and New Zealand College of Anaesthetists.
1. PERSONNEL

Clinical monitoring by a vigilant anaesthetist is the basis of safe patient care during anaesthesia. This should be supplemented by appropriate devices to assist the anaesthetist.

A medical practitioner whose sole responsibility is the provision of anaesthetic care for that patient must be constantly present from induction of anaesthesia until safe transfer to Recovery Room staff or Intensive Care Unit has been accomplished. This medical practitioner must be appropriately trained in Anaesthesia, or be a Trainee Anaesthetist supervised in accordance with College Policy Document 'The Supervision of Trainees in Anaesthesia' (E3).

In exceptional circumstances brief absences of the person primarily responsible for the anaesthetic may be unavoidable. In such circumstances that person may temporarily delegate observation of the patient to an appropriately qualified person who is judged to be competent for the task. Permanent handover of responsibility must be to an anaesthetist who is able to accept continued responsibility for the care of the patient (see College Policy Document 'Handover of Responsibility during an Anaesthetic' (P10)).

The individual anaesthetist is responsible for monitoring the patient and should ensure that appropriate monitoring equipment is available. Some procedures necessitate special monitoring (e.g. MRI scanning) or remote monitoring to reduce hazard to staff (e.g. radiological procedures) (see College Policy Document 'Recommended Minimum Facilities for Safe Anaesthetic Practice in Organ Imaging Facilities' (T3)).

2. PATIENT MONITORING

2.1 Circulation

The circulation must be monitored at frequent and clinically appropriate intervals by detection of the arterial pulse and measurement of arterial blood pressure by indirect or direct means.
2.2 Ventilation
Ventilation must be monitored continuously by both direct and indirect means.

2.3 Oxygenation
Oximetric values must be interpreted in conjunction with clinical observation of the patient. Adequate lighting must be available to aid with assessment of patient colour.

3. EQUIPMENT

3.1 Oxygen Supply Failure Alarm
An automatically activated device to monitor oxygen supply pressure and to warn of low pressure must be fitted to the anaesthetic machine. This device should shut off the nitrous oxide supply and be capable of maintaining oxygen flow for a limited period (see College Policy Document 'Recommended Minimum Facilities for Safe Anaesthetic Practice in Operating Suites' (T1) ).

3.2 Oxygen Analyser
A device incorporating an audible signal to warn of low oxygen concentrations, correctly fitted in the breathing system, must be in continuous operation for every patient when an anaesthetic machine is in use.

3.3 Pulse Oximeter
Pulse oximetry provides evidence of the level of oxygen saturation of the haemoglobin of arterial blood and identifies arterial pulsation at the site of application. A pulse oximeter must be in use for every anaesthetised patient.

3.4 Breathing System Disconnection or Ventilator Failure Alarm
When an automatic ventilator is in use, a device capable of warning promptly of a breathing system disconnection or ventilator failure must be in continuous operation. This device must be automatically activated.

3.5 Electrocardiograph
Equipment to monitor and continually display the electrocardiograph must be
available for every anaesthetised patient.

3.6 Temperature Monitor
Equipment to monitor temperature continuously must be available for every anaesthetised patient.

3.7 Carbon Dioxide Monitor
A monitor of carbon dioxide level in inhaled and exhaled gases must be exclusively available for every patient.

3.8 Neuromuscular Function Monitor
Equipment to monitor neuromuscular function must be available for every patient in whom neuromuscular blockade has been induced.

3.9 Volatile Anaesthetic Agent Monitor
Equipment to monitor the concentration of inhaled anaesthetics must be exclusively available for every patient undergoing general anaesthesia. This recommendation should be implemented as soon as possible but in any case no later than 1 January 1998.

3.10 Other Equipment
When clinically indicated, equipment to monitor other physiological variables such as cardiac output should be available.

RELATED DOCUMENTS

T1 Recommended Minimum Facilities for Safe Anaesthetic Practice in Operating Suites
T3 Recommended Minimum Facilities for Safe Anaesthetic Practice in Organ Imaging Facilities
E3 The Supervision of Trainees in Anaesthesia
P10 Handover of Responsibility During an Anaesthetic
This policy document has been prepared having regard to general circumstances, and it is the responsibility of the practitioner to have express regard to the particular circumstances of each case, and the application of this policy document in each case.

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AUSTRALIAN AND NEW ZEALAND COLLEGE OF ANAESTHETISTS

A.C.N. 055 042 852

The safe provision of anaesthesia in Dental Surgeries requires appropriate staff, facilities and equipment for proper patient safety. These are specified in this Document.

1. PRINCIPLES OF ANAESTHETIC CARE

1.1 Anaesthesia in Dental Surgeries should be administered only by medical practitioners with appropriate training in anaesthesia or by trainees supervised according to College Policy Documents 'The Supervision of Trainees in Anaesthesia' (E3) and 'Privileges in Anaesthesia' (P2).

1.2 Every patient presenting for anaesthesia in Dental Surgeries should have a pre-anaesthetic consultation by a medical practitioner who has appropriate training in anaesthesia. College Policy Document 'Preanaesthetic Consultation' (P7).

1.3 Appropriate monitoring of physiological variables must occur during anaesthesia. College Policy Document 'Monitoring During Anaesthesia' (P18).

1.4 On occasion the anaesthetist may decide that the condition of the patient (having regard to the facilities available and/or the patient's health status) does not permit of safe care in the dental surgery.
2. STAFFING

2.1 In addition to the nursing staff required by the person carrying out the procedure, there must be:

2.1.1 An assistant to the anaesthetist. See College Policy Document 'Minimum Assistance for the Safe Conduct of Anaesthesia' (P8).
2.1.2 Adequate assistance in positioning the patient.
2.1.3 Adequate technical assistance to ensure proper servicing of all equipment used.

3. DENTAL SURGERIES

3.1 Anaesthetic Equipment

3.1.1 Essential requirements are listed below. Where a range of equipment is available, the dental surgery is expected to provide the type most suitable to its needs.

3.1.2 Anaesthetic equipment, agents and drugs in dental surgeries may be provided by the dentist or brought by the anaesthetist to the dental surgery. In the former case, it is essential that the dentist seek advice from an anaesthetist who is experienced in anaesthesia in the dental environment.

3.1.3 There must be an anaesthetic machine for each anaesthetising location which is capable of delivering oxygen and nitrous oxide as well as other anaesthetic agents which are in common use. Essential equipment includes:

3.1.3.1 Suitable calibrated vaporisers for the delivery of inhalational anaesthetic agents.
3.1.3.2 A range of suitable breathing systems.
3.1.3.3 Breathing systems suitable for paediatric use if children are to be anaesthetised.

3.1.4 Safety devices which must be present on every machine include:

3.1.4.1 An indexed gas connection system.
3.1.4.2 A reserve supply of oxygen.
3.1.4.3 An oxygen supply failure warning device. See College Policy...
Document 'Monitoring During Anaesthesia' (P18).

3.1.4.4 A breathing system high pressure relief valve.

3.1.4.5 An oxygen concentration analyser with appropriate alarm limits. See College Policy Document 'Monitoring During Anaesthesia' (P18).

3.1.4.6 Every anaesthetic machine purchased after 1 January 1996 shall have a device to prevent the supply of a hypoxic gas mixture whenever nitrous oxide is administered.

3.1.4.7 Every anaesthetic machine purchased after 1 January 1996 shall have an approved non-slip connection for the common gas outlet whenever a circle system is in use.

3.1.5 A separate means of inflating the lungs with oxygen must be provided in each anaesthetising location. This apparatus should comply with the current requirements of the relevant national Standards. Its oxygen supply should be independent of the anaesthetic machine.

3.1.6 Suction apparatus must be available for the exclusive use of the anaesthetist at all times together with appropriate hand pieces and endotracheal suction catheters. This apparatus should comply with the current requirements of the relevant national Standards. Provision must be made for an alternative suction system in the event of primary suction failure.

3.1.7 In every anaesthetising location there should be:

3.1.7.1 Appropriate protection for the anaesthesia team against biological contaminants which shall include disposable gloves and eye shields.

3.1.7.2 A stethoscope

3.1.7.3 A sphygmomanometer

3.1.7.4 Monitoring equipment complying with College Policy Document 'Monitoring During Anaesthesia' (P18).

3.1.7.5 An appropriate range of face masks.

3.1.7.6 An appropriate range of airways.

3.1.7.7 Two laryoscopes with a range of suitable blades.

3.1.7.8 An appropriate range of endotracheal tubes and connectors.

3.1.7.9 A range of endotracheal tube introducers.

3.1.7.10 Inflating syringe and clamps.

3.1.7.11 Magill's forceps.

3.1.7.12 A suitable range of adhesive and other tapes.
3.1.7.13 Scissors.
3.1.7.14 Sterile endotracheal lubricant.
3.1.7.15 Vascular tourniquets.
3.1.7.16 Intravenous infusion equipment with an appropriate range of cannulae and solutions.
3.1.7.17 Means for the safe disposal of items contaminated with biological fluids as well as of "sharps" and waste glass.
3.1.7.18 Equipment suitable for the establishment of regional anaesthetic nerve blocks.
3.1.7.19 Throat packs.
3.1.7.20 Provision for scavenging of anaesthetic gases and vapours with interface equipment which precludes over-pressurisation of the anaesthesia breathing circuit.
3.1.7.21 A cardiac defibrillator.

3.1.8 Other requirements for safe anaesthesia include:

3.1.8.1 Appropriate lighting for the clinical observation of patients which comply with the current requirements of the relevant national Standards.
3.1.8.2 Emergency lighting.
3.1.8.3 Telephone/Intercom to communicate with persons outside the anaesthetising location.
3.1.8.4 Refrigeration facilities for the storage of drugs and biological products.
3.1.8.5 The means to maintain room temperature in the anaesthetising location within the range of 18-28 °C.
3.1.8.6 A dental operating chair which will allow the patient to be rapidly placed in the horizontal or head-down position.

3.2 Drugs

3.2.1 In addition to the drugs and agents commonly used in anaesthesia, drugs necessary for initial management of conditions which may complicate or co-exist with anaesthesia must also be available:

Anaphylaxis
Cardiac arrhythmias
Cardiac arrest
Pulmonary oedema
Hypotension
Hypertension
Bronchospasm
Respiratory depression
Hypoglycaemia
Hyperglycaemia
Adrenal dysfunction
Malignant hyperpyrexia
Blood coagulopathy

3.2.2 In ensuring the availability of drugs for the treatment of these conditions, the processes outlined in 3.1.2 should be followed.

3.2.3 Appropriate mechanisms must exist for the regular replacement of these drugs after use and/or their expiry date has been reached.

3.2.4 Dantrolene (used in the management of malignant hyperpyrexia) should be rapidly available from a nearby hospital which holds adequate supplies of this drug.

3.3 Routines for Checking, Cleaning and Servicing Equipment

3.3.1 Regular sterilising, cleaning and housekeeping routines for the care of equipment should be established.

3.3.2 Documented servicing of the anaesthetic machine and medical gas equipment by an appropriate organization must be carried out at least twice a year. After any modification to the gas distribution system, gas analysis and flow measurement must be carried out and documented before use.

3.3.3 A copy of the College Policy Document 'Protocol for Checking an Anaesthetic Machine Before Use' (T2) or a similar document should be available on each anaesthetic machine.
3.4 Recovery Area

3.4.1 Recovery from anaesthesia should take place under appropriate supervision in a designated area which conforms with College Policy Document 'Guidelines for the Care of Patients Recovering from Anaesthesia' (P4).

3.4.2 Contingency plans should exist which would allow rapid patient transfer in an emergency from the dental surgery to hospital care under adequate medical supervision.

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Promulgated: 1989

Reviewed: 1994

Date of current document: Oct 1995

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## Appendix No. 7: Microsoft Access database form

### Patient
- **DRN:**
- **OPDate:**
- **RxDate:**
- **DOB:**
- **Suburb:**
- **Wait days:**
- **Male**
- **Female**
- **Medicare patient**
- **Private**
- **Source**
  - GDP
  - Specialist dentist
  - SDS
  - medic GP
  - Specialist medic
  - Self/emergency
  - Other
- **Reason**
  - Caries
  - Trauma
  - Dental anomaly
  - Other
- **Ethnicity**
  - Anglo Saxon
  - Asian
  - Indian
  - Mid East
  - Mediterranean
  - Aboriginal
  - Other
- **Age at Rx (yrs):**
- **MedCond**
  - Medical
  - Physical
  - Syndromes

### Treatment
- **Primary**
  - Exo:
  - Amalgams:
    - SSGs:
  - CRs:
  - GICs:
  - Pulp therapy:
  - Other:
- **Other details:**

### Permanent
- **Exo:**
- **Amalgams:**
- **SSGs:**
- **PPRs:**
- **GICs:**
- **SSGs:**
- **CRs:**
- **Anterior Aesthetics:**
- **Other details:**

### Surgicals
- **Yes**
- **No**
- **Dent Anom:**
- **Ortho:**
- **Oral Path:**
- **Med Cond:**
- **Soft tissue:**

### Follow up history
- **None**
- **Single review**
- **Routine reviews**
- **Morbidty/Post Op admissions:**
- **Comments:**

### Further GA
- **GAID:**
- **DRNNo:**
- **GADate:**

### Record
- **New**
- **of 1**