DIABETES: 
SERVICE PLANNING GUIDELINES

CONTENTS

<table>
<thead>
<tr>
<th>CONTENTS</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>ii</td>
</tr>
<tr>
<td>THE WORKING PARTY</td>
<td>iii</td>
</tr>
<tr>
<td>FOREWORD</td>
<td>iv</td>
</tr>
<tr>
<td>1] THE PROBLEM DEFINED</td>
<td>1</td>
</tr>
<tr>
<td>2] SERVICE AIMS, PHILOSOPHY AND DEFINITIONS</td>
<td>17</td>
</tr>
<tr>
<td>3] PREVENTION OF DIABETES MELLITUS</td>
<td>33</td>
</tr>
<tr>
<td>4] SERVICE LEVELS</td>
<td>37</td>
</tr>
<tr>
<td>5] OPHTHALMIC SERVICES FOR DIABETES</td>
<td>45</td>
</tr>
<tr>
<td>APPENDICES 1-17</td>
<td>53</td>
</tr>
</tbody>
</table>

Issued By: The Department of Health, PO Box 5013, Wellington August, 1988
Edited By: Dorothy Neal and Don Beaven
Department of Medicine, Christchurch School of Medicine
The Princess Margaret Hospital, Christchurch 2
Cover Design By: Fiona Van Oyen, Department of Medical Illustrations
The Princess Margaret Hospital, Christchurch 2
Printed By: The Caxton Press, 113 Victoria Street, Christchurch

086397 Information Centre Ministry of Health Wellington
ACKNOWLEDGEMENTS

We are much indebted to Gillian Clover whose sub-committee supplied Section 5, "Ophthalmic Services", and to David Scott who provided substantial sections of the text and Appendices 6, 7 and 8.

The following people and organisations have made the final drafts both more acceptable and more intelligible, and we are grateful for their comments, advice and interest. Although we have incorporated their views and written comments as far as possible, our recommendations are the consensus of the Working Party.

John Baker
Christchurch Diabetes Soc.
Gillian Clover
Christine Cook
Heather Fear
Barbara Harris
Garth Harris
Peter Hatfield
Murray Jones
Kelvin Lynn
Jane Meikle
Peter Moore
NZ Diabetes Assn Inc.
John O'Brien
David Scott
Russell Scott
Heather Simms
Bob Smith
HJ Steffans
Marie Thomas
Bruce Thompson
Malcolm Watson

Various hospitals, the Health Statistics Centre and area health boards have made major contributions; we are grateful for their help.

Finally, without the persistence, diligence and skills of Brian Collinge of the Department of Health Service Planning, this report could not have been completed.
THE WORKING PARTY

Donald W Beaven
Professor of Medicine
Department of Medicine
Christchurch School of Medicine
Christchurch

(Chairperson)

AJ (Sandy) Cooke
Acting General Manager
Nelson Area Health Board
PO Box 132
Nelson

Peter J Dunn
Endocrinologist
Waikato Hospital
Private Bag
Hamilton

Margaret Llewellyn
Diabetes Specialist Nurse
Community Health Nursing Services
Wellington Hospital
Private Bag
Wellington

Ian G McPherson
Physician
Memorial Hospital
Private Bag
Hastings

Susan LR Pollard
Charge Dietitian
North Shore Hospital
Shakespeare Road, Takapuna
Auckland 9

Anne V Waterman
Diabetes Nurse Educator
Auckland Diabetes Education
and Advisory Service
97a Grafton Road
Auckland 1

E Marie Wilson
Secretary
Department of Health
Head Office
PO Box 5013
Wellington
The prevalence and consequences of diabetes are poorly recognised. The late consequences of the disease lead to care being given in many different specialist units. The link with diabetes in causation of the presenting disability is frequently overlooked, thus obscuring cost to the hospital system.

In recent years much relevant information has become available. The inadequacy of New Zealand data makes it necessary to use overseas studies, although there are factors that make diabetes in New Zealand more important than in comparable developed countries.

Changes in management of diabetes have evolved rapidly. It is time to advise a major change in approach. The vital concept of a team that facilitates patient self-care is detailed later. The technological revolution that allows self-monitoring of blood glucose levels, accurate delivery of insulin and use of computers to store serial data and co-ordinate care must be linked to an educational revolution that helps diabetics know how to maintain their health, and why.

These guidelines provide service levels and their justification. A documented summary of present knowledge of the physical, social and financial costs of the disease is given with indications as to how some of these costs can be reduced.

The ophthalmological review comprising Section 5 concerns the future vision, or blindness, of an appreciable number of New Zealanders.

Service levels are set with maximum times for implementation. Service levels must be regarded as essential and minimal within the time scale given.

The Appendices contain expansion of statements or recommendations made in the main text.

Many of these recommendations concern treatment of established disease. Its long-time course dictates that, even should preventive measures prove effective and acceptable to New Zealanders, there will be a substantial number still in need of treatment.

The guidelines should be modified to meet local circumstances. They are "service guidelines" which should also encompass the measurement and audit of clinical performance. Resulting gains in cost-effectiveness could be adversely affected by factors such as excessive patient load and inadequate staffing.

It is crucial that these guidelines are reviewed five years after their initial publication.
APPENDICES

1. SERVICE DEVELOPMENT GROUP FOR DIABETES: SUGGESTED GUIDELINES
2. WORKFORCE REQUIREMENTS: DIETITIANS
3. WORKFORCE REQUIREMENTS: DIABETES NURSES
4. WORKFORCE REQUIREMENTS: MEDICAL SPECIALISTS
5. SURVEY OF DIABETES SERVICES WITHIN NEW ZEALAND HOSPITALS
6. DIABETES IN MAORI AND POLYNESIAN PEOPLE
7. DIABETES IN PREGNANCY
8. ESTIMATED RATES OF GESTATIONAL DIABETES IN NEW ZEALAND
9. RENAL DISEASE AND DIABETES
10. COST EFFECTIVENESS OF DIABETES EDUCATION
11. THE DIABETES SOCIETY
12. EXAMPLES OF DIABETES RESOURCE CENTRES
13. HOSPITAL DAYS STAY
14. POPULATION
15. GLOSSARY
16. BIBLIOGRAPHY
A Service Development Group needs to evolve specific plans:
- To emphasise prevention and early detection in diabetes
- To establish responsibility for screening in the work place
- To provide regular reports on progress

Membership of the Service Development Group could include those people with technical knowledge in the field of diabetes and consumers, or representatives of consumers, such as diabetes societies and cultural groups. Members of the area health board working group could include a diabetes nurse, dietitian, diabetes social worker, podiatrist, ophthalmologist, general practitioner, practice nurse, diabetes physician or specialist, and a hospital administrator or community medicine physician. At least one third to half of the members should be lay persons.

The Area Health Board Staff would initiate the mechanics of administration, meetings, secretarial help and budget.

Summary: It is perceived that the working group should not have a rigid framework of guidelines, so that different working groups with different objectives could evolve in each major centre, allowing natural experimentation and new ideas to develop. However, a series of checklists to assist development follows:

**SUGGESTED AIMS AND CHECKLIST FOR DIABETES SERVICES AREA PLANNING TEAMS**

<table>
<thead>
<tr>
<th>Data Sets:</th>
<th>Deadline Dates</th>
<th>Plan</th>
<th>Pilot</th>
<th>Introduction</th>
<th>In Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Prevalence Rates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2 Incidence Rates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3 Morbidity Rates (primary care)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4 Days Stay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5 Primary Mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6 Secondary Mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.7 Social Indicators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.8 Economic Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Community Initiatives:**

| 2.1 Update Groups                  |                |      |       |              |          |
| 2.2 Seek Initiatives               |                |      |       |              |          |
| 2.3 Access? Equity?               |                |      |       |              |          |
| 2.4 Develop Accountability        |                |      |       |              |          |
| 2.5 Lay Groups                    |                |      |       |              |          |
| 2.6 Health Workers                |                |      |       |              |          |

**Develop Timetables:**

| 3.1 To develop education resource material: |
| - Professional                          |      |       |              |          |
| - Patient                               |      |       |              |          |
| - Public                                |      |       |              |          |
| 3.2 Towards Specific Objectives        |      |       |              |          |

**Timetable for Evaluation & Audit Development:**

| 4.1 Hospital                          |    |      |       |              |          |
| 4.2 Medical Staff                     |    |      |       |              |          |
| - Junior                               |    |      |       |              |          |
| - Family Medicine                      |    |      |       |              |          |
| - Specialist                           |    |      |       |              |          |
| 4.3 Other Health Professionals        |    |      |       |              |          |
| 4.4 Overall Programme                 |    |      |       |              |          |
WORKFORCE REQUIREMENTS: DIETITIAN

HOW TO ESTIMATE HOURS REQUIRED

1 INPATIENT MANAGEMENT:

a] Admission Tasks: Interview, nutritional assessment, diet calculation, initiation of appropriate meal plan = 1 hour/admission

b] Ongoing Management Tasks: Review of diet management, biochemical data, patient interview, diet adjustment = 0.5 - 1 hour per inpatient / week

c] Admissions Numbers: Christchurch hospitals averages 66 diabetes admissions per month* = 792 p.a./400,000 population = 198 p.a./100,000 approximately

If number of admissions = 200 p.a./100,000 and total dietitian time per admission (including a] and b] as above = average 1.5 hours

Then, Dietitian time needed for Inpatient Management = 200 x 1.5 = 300 hours p.a. = 6 hours/100,000 per week

NOTE: 1 The above example is from one hospital and may not be representative of the whole country. It would need to be adjusted according to local data on admissions to hospitals for diabetes.

2 Actual requirements for a specific hospital can also be estimated using statistics on the number of inpatients receiving "diabetic" diets. For example, the average number of "diabetic" diets x 1.5 = the number of dietitian hours per week for inpatient management.

These are estimated requirements for management only. Education/counselling requirements are calculated separately (see 2) but need to be taken in conjunction with the overlapping roles of nurse-educators.

* FEAR, H. Personal communication, 1987
PATIENT EDUCATION AND COUNSELLING:

a] Newly Diagnosed Diabetes
(all types, including GDM):

2-3 sessions (one-to-one)
1 3-day education course* or equivalent
3 follow-up sessions
= 8 hrs/patient/p.a.

Childhood & Adolescent: 4/100,000 p.a. = 32 hours
Adulthood (assume 50% of NIDDM group diagnosed): 114/100,000 p.a. = 912 hours
Gestational Diabetes: 40/100,000 p.a. = 320 hours

TOTAL = 1264 HOURS P.A.

* ie., 3 x 8 = 24 hours.

If 8 people attend
= 24 = 3 hrs dietitian time/person

b] Follow-up Education and Counselling:

Adult IDDMs: 2 sessions p.a.
Prevalence = 150 per 100,000
= 1 hr/patient p.a.
= 150 hours p.a.

Child and Teenage IDDMs:
4 sessions p.a.
Prevalence = 30 per 100,000
= 2 hr/patient p.a.
= 60 hours p.a.

NIDDMs - Non-Obese
1 session/5 years
Prevalence = 600 per 100,000
but only half diagnosed
= 1/10 hr/patient p.a.
= 60 hours p.a.

NIDDMs Obese & Postnatal GDMs:
1 session monthly in groups of 2
Prevalence = 2400 NIDDM
40 Postnatal GDM
(half diagnosed)
= 1 hr/patient p.a.
= 1200 hours p.a.

TOTAL = 1490 HOURS P.A.

TOTAL = 27 HOURS PER WEEK PER 100,000
3 HEALTH PROMOTION:

Allow 5% of time or 2 hours per dietitian per week

4 EDUCATION:

a] Self and other health professionals. Allow 10% of time or 4 hours per dietitian/week/100,000 *

b] Lay people, eg, community health workers: Allow 5% of time of 2 hours per dietitian/week/100,000

SUMMARY

Estimated Requirements per week/100,000 population

<table>
<thead>
<tr>
<th>Dietitian Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>hrs/week/100,000</td>
</tr>
<tr>
<td>1 Inpatient Management</td>
</tr>
<tr>
<td>2 Patient Education &amp; Counselling</td>
</tr>
<tr>
<td>3 Health Promotion</td>
</tr>
<tr>
<td>4 Education</td>
</tr>
</tbody>
</table>

\[ \text{Total} = 67 \]

Note: Inpatient Management = 6 hours
Patient Education & Counselling = 51 hours

Therefore, the number of dietitians required per 100,000 population = 2.0 FTE

1 **Total Dietitians Employed:**

<table>
<thead>
<tr>
<th>Full-time</th>
<th>Part-time</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>79</td>
</tr>
</tbody>
</table>

Full-Time Equivalents: 152

2 **Clinical Dietetics (FTE),**

<table>
<thead>
<tr>
<th>Solely Clinical</th>
<th>Generalist &amp; Community Dietitians</th>
</tr>
</thead>
<tbody>
<tr>
<td>41.5</td>
<td>58.8</td>
</tr>
</tbody>
</table>

(source: Health Department 1987)

**IF**

it is assumed that on the average, 50% of clinical dietetic time is spent on diabetes care and education

**AND**

If it is assumed that generalist and community dietitians spend 50% of their time on clinical dietetics (of which 50% is diabetes care and education)

**THEN**

Dietetic resources available in New Zealand for diabetes could be estimated to be:

Total FTE Clinical Dietitians: 41.5 + 29.4 = 71

= 36 FTE dietetic resources for diabetes

Number of Dietitians Required = 2.0 FTE per 100,000 population

Population of New Zealand = 3,000,000

Therefore, for the whole country, the number of dietitians required = 60

Shortfall = Nearly 50%

**Note:** These are the best available figures, but indicate how much diabetes services are under-resourced for dietitians.
Diabetes nurses reaching out into the community.
Blood glucose testing in a shopping mall.
WORKFORCE REQUIREMENTS:
NURSE-EDUCATORS PER 100,000 POPULATION

INTRODUCTION

The basic data is scant and to date, most diabetes services concentrate on survival education and have limited time for long-term review and reinforcement of education for longer-term diabetics. There is undoubted need for surveillance of glycaemic and other management in diabetic inpatients, and a need to update education that is not being met. Figures given are based on calculated needs, and use the experience of Waikato Hospital where such a service is being attempted. Final figures appear to be minimum requirements.

This information has been prepared with the use of questionnaires sent to 17 full-time diabetes nurse-educators. Statistics are expressed from both the estimated needs of these respondents but also calculated from best available epidemiological data.

<table>
<thead>
<tr>
<th>Estimated Requirements/Week</th>
<th>Nurse-Educator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inpatient Management</td>
<td>5 hours</td>
</tr>
<tr>
<td>2. Patient Education &amp; Counselling</td>
<td>80 hours</td>
</tr>
<tr>
<td>3. Health Promotion</td>
<td>2.5 hours</td>
</tr>
<tr>
<td>(per full-time nurse)</td>
<td></td>
</tr>
<tr>
<td>4. Education (of other health professionals)</td>
<td>3.5 hours</td>
</tr>
</tbody>
</table>

If each nurse-educator spends six hours on health promotion, there are 34 hours per week remaining for 1. and 2. above.

**Therefore, the number of nurse-educators required** = 2.5 FTE per 100,000
INPATIENT MANAGEMENT:

1. New Patients:

Interviews, start of survival education, teaching blood glucose monitoring, injection techniques, etc., repeat consultations while in hospital: 2 hrs/admission

2. On-going Management Tasks:

Identification of those diabetics admitted to hospital, review of educational and glycaemic status, review of physical & social problems, plus management with patient, medical, dietary and nursing staff. Arrangement for referral to diabetologist if indicated. Further review in a proportion of patients. 0.5-1 hour per inpatient/week

3. Number of Admissions:

Christchurch Hospital averages 66 diabetes admissions per month*.

= 792 p.a./400,000 population

= 198 p.a./100,000 population

a. New Patients:

Approximately 1 patient/week/100,000

= 50 p.a./100,000 = 2 x 50 = 100 hrs p.a. 2 hrs/100,000/wk

b. On-going Management Tasks:

150 patients p.a./100,000 = 150 hrs p.a. 3 hrs/100,000/wk

TOTAL (a. and b.) = 5 hours/100,000/week

NB: This example is not representative for the whole country and requires adjustment for local prevalence and incidence figures. These will be higher in areas with greater Maori and Pacific Island populations, compared with Christchurch.

Actual requirements for a specific hospital can also be estimated using statistics of number of inpatients receiving "diabetic" diets.

PATIENT EDUCATION AND MANAGEMENT:

1. Newly-Diagnosed Diabetes (all types):
   3-4 initial sessions (3 hours)
   Group sessions, i.e., Education (3 hours)
   (i.e., 3 days x 3 hours = \( \frac{24}{8} = 3 \) hours)
   3 follow-up sessions - 3 hours
   (i.e., at 3, 6 and 12 months)
   So, 4 + 3 = 3 = 10 hours
   Incidence: 13 IDDMs/100,000 p.a.
   250 NIDDM/100,000 p.a.
   40 GDM /100,000 p.a.
   = 10 hours
   = 130 hours
   = 2500 hours
   = 400 hours
   = 3030 hours p.a.
   61 hours/week

2. Follow-up, Education & Counselling:
   Adult IDDMs: 1 session p.a.
   Prevalence: 250/100,000 p.a.
   Adolescents & Children: 9 sessions p.a.
   (includes individual & group sessions)
   Prevalence: 33 per 100,000 p.a.
   NIDDMs, obese and non-obese
   1 session per 5 years of 1 hour
   Prevalence: 3000/100,000 p.a.
   Postnatal GDM: 1 session/5 years of 1 hour

3. Health Promotion:
   2.5 hours/week per diabetes nurse

4. Education:
   (of other health professionals)
   3.5 hours/week per diabetes nurse
APPENDIX 4

WORKFORCE REQUIREMENTS:

SPECIALIST ENDOCRINOLOGISTS, DIABETOLOGISTS, PAEDIATRICIANS

Initial Medical Assessment - Outpatients

a] New IDDMs: About 11/100,000/year
   Allow one hour per consultations
   = 11 hours/year

b] New NIDDMs: About 200/100,000/year
   Allow one hour per consultation
   = 100 hours/year

Subsequent Specialist Medical Review:

a] IDDM < 20 years of age: About 100 per 100,000/year: Allow 30-minute review at 3-monthly intervals
   = 70 hours/year

b] IDDM > 20 years of age: About 200 per 100,000/year: Allow 30-minute review at yearly intervals
   = 100 hours/year

c] NIDDM: Allow 10% of 3000 patients (per 100,000) referred each year,
   = 300 x 3
   Sub-Total:

   = 150 hours/year
   = 431 hours/year

At 3.5 hours per session, this 431 hours equals 130 sessions per year or 3 sessions per week (at 40 working weeks per year, allowing for leave, etc).

Administration, teaching, self-education, research, health promotion: allow 2 sessions per week.

Inpatients - approximately 1.5% of inpatient beds are under diabetes physicians' care.

Allow 2 sessions per week.

GRAND TOTAL = 7 SESSIONS/WEEK or 0.7 FTE
INTRODUCTION:

Diabetes mellitus is a common disorder in New Zealand and a cause of much morbidity and mortality. There has been substantial progress in the management of this disorder, particularly in the areas of diabetic retinopathy, foot disorders and diabetic pregnancies, providing diabetic patients and their families are given adequate education and on-going skilled supervision. These facilities are provided jointly in the community and by hospital boards in this country. To provide an estimate of the services provided by New Zealand hospital boards, the New Zealand Society for the Study of Diabetes (NZSSD) conducted a postal survey of hospital boards in 1986. The results form the basis of this report and are compared with a similar survey conducted in the United Kingdom.

METHODS:

A questionnaire developed by the NZSSD was sent to the superintendent-in-chief of every hospital board in the country and was then completed by appropriate clinicians/physicians in each hospital. Some boards have a number of hospitals under their jurisdiction and there may be marked inter-hospital variation in services available. In general, we have given results for the boards as a whole. In the larger towns and cities there were commonly members of the NZSSD to help with the questionnaire.

RESULTS:

Return Rate: 28 of the 29 boards responded to the questionnaires, a return rate of 95%.

Outpatients Clinics Solely for Diabetes Physicians:

11 of the 28 boards provided medical diabetic clinics (38%) including clinics for children, and teenagers. Of the 17 boards without a diabetes clinic, two have populations greater than 100,000 (Northland & Taranaki) and five have populations of between 40,000 and 100,000. Figures for numbers of clinics per week (this does not include general physicians or clinical biochemists) and approximate populations served (provisional, estimated as at 31 March 1985 using 1981 census figures and calculated clinics per 100,000 of population) are listed in Table 1

Five of the boards have endocrinologists/diabetologists working in the clinics, the others are staffed by general physicians. In Auckland, the clinics are supplemented by two chemical pathologists, registrars, general practitioners (in one hospital), house surgeons and trainee interns under the supervision of a clinical instructor. Registrars are also used in clinics in Waikato, Palmerston North, Wellington, Canterbury, Otago and Southland. There are no full-time specialist diabetologists in New Zealand, all having some general medical duties.
New Patient and Follow-up Numbers Seen per Month: The number of new and follow-up patients seen per month is summarised in Table 2. The figures will not reflect the prevalence of diabetes in each area and will naturally vary depending on a number of factors, including general practitioner referral patterns and individual clinics' discharge and follow-up patterns.

Out of Hours Clinics: Only two boards run "out of hours clinics" (Auckland and Palmerston North) both for adolescents. In Auckland's case, this is done on a weekly basis. Southland also runs a clinic for adolescents, but during routine hours.

Care of Pregnant Diabetic Patients: Six boards (21%) operate conjoint medical and obstetric care clinics. These include Auckland (National Women's and Middlemore Hospitals), Waikato, Wellington, Canterbury, South Canterbury and Otago.

Paediatric Diabetes Clinics: 6 boards (21%) provide separate paediatric diabetic clinics (20%): Auckland, Waikato, Wellington, Otago and Palmerston North.

Renal Care: Only one board provides a combined diabetes/renal clinic (Otago). Approximate numbers taken onto dialysis programme in the five centres providing dialysis facilities is indicated in Table 3.

Eye Care: Only two boards have a diabetologist and ophthalmologist working in the same clinic (Auckland and Waikato). Canterbury, Otago, Taranaki and Wellington have separate eye clinics for diabetic patients. Other boards see patients in separate general eye clinics. One board (Otago) has a retinal photography screening service. Nine boards (32% of respondents) have Argon laser therapy available. Four boards have Xenon available, while five boards (17%) have a vitrectomy service available. The number of patients treated per week by laser is indicated in Table 4. In general, only one or two patients per month require vitrectomies, with Auckland's figures up to four per month.

Diabetes Nurse-Educators: 14 boards (50% of respondents) have at least one full-time specialist diabetes nurse-educator. Only Waikato and Auckland have more than one, with Auckland having 8 spread throughout its hospitals and extramural services. 17 boards (60% of respondents) have at least a half-time equivalent nurse-educator, with one other board having a 2/10ths position. Three boards with populations greater than 40,000 have no educator. With respect to distribution of nursing hours there is generally very little time for home visits, this being reserved for general district nurses. 16 hospital boards provide one-to-one interviews for patients referred by general practitioners (57%), 9 boards (32%) stated they have sessions available for GP referrals for group education, including Auckland, Waikato, Hawkes Bay, Canterbury, Wanganui, Taranaki, Marlborough and Ashburton. Out-of-hours teaching occurred in 9 boards (32%), mainly in the evenings (these included Auckland, Canterbury, Hawkes Bay, Palmerston North, Ashburton, Nelson, Otago, South Canterbury and Taranaki).

Dietitian Services: 13 boards (45%) had no dietitian in outpatient clinics. It would appear that in 5 boards (17%) there are no dietitian services at all, though these were all very small boards. The number of boards with the dietitian working simultaneously in the diabetes clinic is likely to be less than 10 but the exact figure is not clear. 12 boards had dietitians available from the extramural service. The number of dietitian hours available for diabetic services is demonstrated in Table 5 and averages 21 hours per 100,000 population.
Podiatry Services: A total of 22 boards (76%) had a podiatrist available but not exclusively for diabetes (see Table 5).

Social Workers: There are no social workers or psychologists specifically dedicated to diabetes. Only one centre (Waikato) has a general social worker closely linked with the diabetes clinic. All other boards use general social workers as necessary.

Urology Services: 10 boards (34%) have a counselling service available for impotent diabetic patients, while 13 boards (44%) have a urologist available for assessment of impotence. 9 boards (32%) have the expertise to do penile implants although the number of implants performed to date have been very low and most boards do not pay for these.

Insulin Pumps: 7 boards (25%) have insulin infusion pumps available but only two (Canterbury and Auckland) have them in sufficient numbers to have real experience. Auckland has 16 pumps with almost all of these allocated to Middlemore Hospital where they are predominantly used for pregnant diabetic women. Canterbury has 10 pumps, Hawkes Bay 4, Taranaki 3, Otago 2, and one in Palmerston North and Wellington. Pumps have been supplied in some cases as a result of private funding.

Examination Facilities: In general, examination facilities in clinics were considered adequate. One hospital considered inadequate space a problem. Three boards did not have a darkroom available to examine eyes, including Canterbury, Waikato and Otago. Visual acuity charts were not available in Hawkes Bay, Northland and Middlemore Hospital in Auckland. 9 boards (36%) did not have rooms for educators, including Canterbury, Hawkes Bay and Northland. Similarly, 8 boards did not have a room for a podiatrist (32%).

Laboratory Facilities: 12 boards (43%) have hospitals measuring HbA1 (mostly South Island). 14 hospital boards (50%) have facilities to measure fructosamine. 15 boards (50%) are also able to have fructosamines measured in private laboratories. 10 boards (34%) have both HbA1c and fructosamine tests available, while 7 boards (25%) had neither and sent blood to larger centres. Availability of serum glucose determination during clinics was not ascertained.

Other Clinic Data: As well as diabetes clinics, there were two diabetes centres with special secretarial support. Waikato has specialised secretarial support for their clinic. Four boards (14%) have computerised registers of patients (Canterbury, Otago, Waikato and Thames) while two plan to computerise in the near future. Most boards state that they refer NIDDM patients back to their general practitioner, while larger centres especially attempt regular contact with most IDDM patients on a 3-12 monthly basis. Canterbury has an organised annual review for all their patients. Waiting lists vary from clinic to clinic. Urgent referrals can be seen immediately but non-urgent patients wait from 3 weeks to 3 months. Ophthalmology referrals vary from 3 weeks to 12 months, with most around 2-3 months.

A summary of diabetes services in New Zealand compared with the UK is shown in Table 7. It should be noted that the UK health districts serve much larger populations on average, as well as the figures noted in the tables. It is of interest that the UK has between 0.76 and 1.06 specialist clinics per week per 100,000 and see 10-11 new patients per 100,000 per clinic per month and approximately 130 follow-up patients.
DISCUSSION:

The assessment of the adequacy of diabetic services in New Zealand requires an estimate of the prevalence and incidence of Type I and Type II diabetes (IDDM and NIDDM). Such figures are not readily available but in a Christchurch population the prevalence for all types of diabetes is approximately 3%, in keeping with the Australian estimate of 3.6% in Busselton. This probably underestimates the figures for parts of New Zealand with high Maori and Pacific Island numbers. The prevalence of diabetes in Australia has increased by 50% from 1966 to 1981 and the rate in Australasia is estimated to increase by a further 50% in the next 15 years based on U.S. figures. The incidence of Type II diabetes is unclear in Australasia but in the USA an estimate of 258 per 100,000 has been made.

With respect to Type I diabetes, estimates in Christchurch and Auckland show an incidence of approximately 104 per 100,000 in the under-20-year-old age-group. The prevalence of Type I diabetes, although unknown in New Zealand, has been estimated in the USA as 200 per 100,000. These figures can be used to help calculate guidelines for projected diabetes services in this country (Table 8).

Looking at physician services, if we assume that all patients with IDDM should have regular specialist review, then 200 patients per 200,000 per year should be seen. Of these, about 50 will be children or teenagers requiring 3-monthly review for 20-30 months and 150 will be adults seen about 6-monthly for 20 minutes. This approximates 220 hours per year per 100,000. Add to this about 10% of the NIDDM population, which a GP survey in Waikato suggested is referred for specialist consultation annually, and there are a further 220 hours of specialist time required (10% of 3,000 at about 45 minutes per patient). This 440 hours per 100,000 population requires about 2.5 to 3 sessions per week in outpatient clinics. This, of course, does not include the in-service diabetes load or obstetric patients. These projections agree remarkably well with a recent UK review which recommended 3.2 sessions per week per 100,000 to be provided by a specialist diabetologist or shared by two general physicians with an interest in diabetes.

In Auckland, Canterbury, Waikato and Wellington there are about half the number of sessions that we have projected above. Other than Auckland, Wellington and Canterbury, at present diabetes is entirely treated by general physicians, admittedly some of whom have considerable experience. There are still no diabetologists in New Zealand.

Registrars are used to help in clinics in the larger centres, but they need supervision. Compared to the UK where 88% of health districts have a specialised diabetes, 38% of New Zealand boards do, though it is recognised that the UK has larger populations in each district. However, two large boards do not have specialist clinics and five boards with populations of 40,000 to 100,000 do not. The average number of new patients seen per month per 100,000 in diabetes clinics is 9.8 compared to 12.3 in the UK while we see on average half the number of follow-up patients per month per 100,000 (622 compared to about 130 in the UK). This may relate to earlier discharge back to general practitioners or perhaps less frequent visits in New Zealand clinics.

Both New Zealand and the UK seem to have very few out-of-hours clinics. Of course, this is practically difficult but after-school clinics may be important for children and adolescents, while age specific clinics in general need to be developed to cater for special needs for children and teenagers.

Similar projections can be made for diabetes educators and dietitians. On average there will be 100 new IDDM and 258 new NIDDM patients per year. Assuming all need some form of diabetes education (5-10 hours for NIDDM and 15-20 hours for IDDM) and assuming there will be the need to see those with pre-existing diabetes on a 2-3 yearly basis, it requires about 40 hours of educator time per 100,000 population just to cope with this. Patients require a similar amount of time for dietary education. On-going dietary advice particularly for non-insulin-dependent diabetes is a continuing problem.
Though a full-time nurse-educator is available in 48% of our boards, three boards with populations greater than 44,000 have no educator and two of the larger boards, Wellington and Canterbury, are clearly under-staffed.

Dietary hours provided at present are only half the projected number (21 hours per week per 100,000 compared with 40 hours per week projected). Wellington, Palmerston North and Northland are large boards that seem to be worst off.

Podiatry services are available in 76% of board areas but only Palmerston North, Cook, South Canterbury and Thames exceed 6 hours per 100,000 population. Podiatry services are provided in private but considerable numbers of patients are still requiring hospital-based podiatry services and the hours provided are generally insufficient. As well as this, rooms for podiatrists are often not evident. Remuneration for hospital-based work for podiatrists at present seems to be a major reason for the dissatisfaction and difficulties getting hours.

Only two boards have an ophthalmologist working in the diabetes clinic. Four other boards have separate eye clinics for diabetics. Assuming retinopathy is detected, laser facilities are available in 32% of boards which, however, represent 9 boards with a total population of 2.5 million. It seems that boards should have ready access to an expert ophthalmic surgeon with laser facilities and, in most, this is provided for most of the population. Examination facilities in all areas should include a dark room and visual acuity charts. It is disturbing to see that these are not always available.

Obstetric clinics looking after pre-gestational or gestational diabetes are best provided with an obstetrician and diabetologist working in the same clinic. This occurs in only 6 boards (21%) but is not occurring in 5 boards with populations greater than 100,000.

Only one board runs a diabetes-renal clinic and this is another area where liaison between diabetologists and renal physicians is very important. Urologists are available to see patients with impotence in many boards but the number of penile implants performed in this country is very small.

Social workers or psychologists are extensively used in diabetes clinics overseas and are known to be a valuable adjunct to the diabetes team. We have no such specialised people.

Laboratory facilities need to be efficient, reliable and closely linked to the diabetes clinic. They need to be open early to allow patients to have fasting blood tests and allow results to be released quickly. Laboratories country are generally evenly split in their availability of haemoglobin A1 or fructosamines to monitor diabetes control. What is more important is that some boards have neither facility and these should be available for every board if at all possible.

Clinics need to be better organised. Computerised registers are just being introduced in a few boards but this is important for all clinics so that patients can be followed. Annual reviews will then become easier to organise and evaluation of clinics done efficiently.

When we compare services in New Zealand with those in the UK there are generally many comparable deficiencies. We seem to have specific deficiencies with respect to dietary hours and podiatrists and in general we need more specialist physician time, educatory and dietary time and podiatry time. It is appreciated that very small boards with populations of less than 30,000 cannot have all of these facilities but that does not mean that we should ignore services in these areas. Nor should we be happy with the inadequate services in many of our larger boards.
<table>
<thead>
<tr>
<th>Board</th>
<th>Population</th>
<th>Clinics per Week</th>
<th>Clinics/100,000 per Week</th>
<th>Endo Diab per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland</td>
<td>894,000</td>
<td>7.0</td>
<td>0.78</td>
<td>4.5</td>
</tr>
<tr>
<td>Canterbury</td>
<td>344,000</td>
<td>3.0</td>
<td>0.87</td>
<td>3.0</td>
</tr>
<tr>
<td>Waikato</td>
<td>342,000</td>
<td>4.0</td>
<td>1.17</td>
<td>2.0</td>
</tr>
<tr>
<td>Wellington</td>
<td>337,000</td>
<td>4.25</td>
<td>1.26</td>
<td>3.0</td>
</tr>
<tr>
<td>Otago</td>
<td>120,000</td>
<td>2.0</td>
<td>1.66</td>
<td>-</td>
</tr>
<tr>
<td>Palmerston Nth</td>
<td>134,000</td>
<td>3.5</td>
<td>2.69</td>
<td>1.0</td>
</tr>
<tr>
<td>Hawkes Bay</td>
<td>130,000</td>
<td>0.5</td>
<td>0.38</td>
<td>-</td>
</tr>
<tr>
<td>Southland</td>
<td>118,000</td>
<td>3.0</td>
<td>2.54</td>
<td>-</td>
</tr>
<tr>
<td>Sth Canterbury</td>
<td>57,000</td>
<td>0.5</td>
<td>0.88</td>
<td>-</td>
</tr>
<tr>
<td>Cook</td>
<td>42,000</td>
<td>0.5</td>
<td>1.99</td>
<td>-</td>
</tr>
<tr>
<td>Thames</td>
<td>38,000</td>
<td>1.0</td>
<td>2.63</td>
<td>-</td>
</tr>
</tbody>
</table>

Board population is provisional, estimated at 31 March 1985 using 1981 census figures.

<table>
<thead>
<tr>
<th>Board</th>
<th>New Patients per Month</th>
<th>New Patients per 100,000</th>
<th>Follow-ups per Month</th>
<th>Follow-ups per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland</td>
<td>74</td>
<td>8.3</td>
<td>315</td>
<td>35.2</td>
</tr>
<tr>
<td>Canterbury</td>
<td>20</td>
<td>5.8</td>
<td>115</td>
<td>33.4</td>
</tr>
<tr>
<td>Waikato</td>
<td>28</td>
<td>8.2</td>
<td>197</td>
<td>57.6</td>
</tr>
<tr>
<td>Wellington</td>
<td>23</td>
<td>6.8</td>
<td>246</td>
<td>72.9</td>
</tr>
<tr>
<td>Otago</td>
<td>25</td>
<td>20.8</td>
<td>150</td>
<td>125.0</td>
</tr>
<tr>
<td>Palmerston Nth</td>
<td>10</td>
<td>7.5</td>
<td>100</td>
<td>74.6</td>
</tr>
<tr>
<td>Hawkes Bay</td>
<td>14</td>
<td>10.8</td>
<td>35</td>
<td>26.9</td>
</tr>
<tr>
<td>Southland</td>
<td>8</td>
<td>6.7</td>
<td>120</td>
<td>101.7</td>
</tr>
<tr>
<td>Thames</td>
<td>10</td>
<td>26.0</td>
<td>40</td>
<td>105.2</td>
</tr>
<tr>
<td>Sth Canterbury</td>
<td>3</td>
<td>5.0</td>
<td>19</td>
<td>33.3</td>
</tr>
<tr>
<td>Westland</td>
<td>2</td>
<td>5.9</td>
<td>8</td>
<td>23.5</td>
</tr>
<tr>
<td>Bay of Plenty</td>
<td>2</td>
<td>4.1</td>
<td>11</td>
<td>22.9</td>
</tr>
<tr>
<td>Cook</td>
<td>1</td>
<td>2.5</td>
<td>8</td>
<td>19.0</td>
</tr>
<tr>
<td>Northland</td>
<td>1</td>
<td>0.8</td>
<td>6</td>
<td>4.8</td>
</tr>
<tr>
<td>Nelson</td>
<td>0-1</td>
<td></td>
<td>6</td>
<td>8.8</td>
</tr>
</tbody>
</table>

**Table 3:**

**Diabetic Patients on Dialysis Programmes in NZ**

<table>
<thead>
<tr>
<th>Board</th>
<th>Total Diabetics on Dialysis</th>
<th>New Diabetics on Dialysis in 1984</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland</td>
<td>25</td>
<td>9</td>
</tr>
<tr>
<td>Wellington</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Canterbury</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Waikato</td>
<td>6</td>
<td>?</td>
</tr>
<tr>
<td>Otago</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
### TABLE 4: LASER THERAPY FOR RETINOPATHY

<table>
<thead>
<tr>
<th>Board</th>
<th>Patients Treated by Laser per Week</th>
<th>Patients Treated per 100,000 per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland*</td>
<td>16</td>
<td>1.8</td>
</tr>
<tr>
<td>Palmerston Nth*</td>
<td>10</td>
<td>7.5</td>
</tr>
<tr>
<td>Canterbury*</td>
<td>7</td>
<td>2.0</td>
</tr>
<tr>
<td>Waikato</td>
<td>5</td>
<td>1.5</td>
</tr>
<tr>
<td>Wellington*</td>
<td>5</td>
<td>1.5</td>
</tr>
<tr>
<td>Hawkes Bay</td>
<td>6</td>
<td>4.6</td>
</tr>
<tr>
<td>Northland</td>
<td>5</td>
<td>4.0</td>
</tr>
<tr>
<td>Taranaki*</td>
<td>3</td>
<td>2.9</td>
</tr>
</tbody>
</table>

* Argon Laser (32%); Xenon Arc (12%); Vitrectomy (17%)

### TABLE 5: DIETITIAN SERVICES

<table>
<thead>
<tr>
<th>Board</th>
<th>Outpatient Hours</th>
<th>Total Hours per 100,000 Population*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland</td>
<td>96</td>
<td>23.5</td>
</tr>
<tr>
<td>Canterbury</td>
<td>51</td>
<td>20.3</td>
</tr>
<tr>
<td>Waikato</td>
<td>42</td>
<td>20.5</td>
</tr>
<tr>
<td>Wellington</td>
<td>22</td>
<td>13.6</td>
</tr>
<tr>
<td>Taranaki</td>
<td>12.5</td>
<td>18.1</td>
</tr>
<tr>
<td>Nelson</td>
<td>8</td>
<td>17.6</td>
</tr>
<tr>
<td>Palmerston Nth</td>
<td>8</td>
<td>13.4</td>
</tr>
<tr>
<td>Otago</td>
<td>6</td>
<td>33.3</td>
</tr>
<tr>
<td>Cook</td>
<td>6</td>
<td>35.7</td>
</tr>
<tr>
<td>Southland</td>
<td>5</td>
<td>20.3</td>
</tr>
<tr>
<td>Northland</td>
<td>4</td>
<td>6.5</td>
</tr>
<tr>
<td>Sth Canterbury</td>
<td>2</td>
<td>29.8</td>
</tr>
<tr>
<td>Hawkes Bay</td>
<td>-</td>
<td>21.5</td>
</tr>
</tbody>
</table>

* Clinic, Ward, Extramural

### TABLE 6: PODIATRISTS

<table>
<thead>
<tr>
<th>Board</th>
<th>Hours/100,000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland</td>
<td>2.2</td>
</tr>
<tr>
<td>Canterbury</td>
<td>2.9</td>
</tr>
<tr>
<td>Waikato</td>
<td>3.2</td>
</tr>
<tr>
<td>Wellington</td>
<td>2.2</td>
</tr>
<tr>
<td>Otago</td>
<td>3.3</td>
</tr>
<tr>
<td>Palmerston Nth</td>
<td>8.9</td>
</tr>
<tr>
<td>Cook</td>
<td>9.5</td>
</tr>
<tr>
<td>Southland</td>
<td>3.4</td>
</tr>
<tr>
<td>Sth Canterbury</td>
<td>11.0</td>
</tr>
<tr>
<td>Taranaki</td>
<td>5.9</td>
</tr>
<tr>
<td>Nelson</td>
<td>5.9</td>
</tr>
<tr>
<td>Thames</td>
<td>44.7</td>
</tr>
</tbody>
</table>

A Podiatrist was available in 22 boards (76%)
### TABLE 7: AVAILABILITY OF DIABETES SERVICES IN THE UNITED KINGDOM AND NEW ZEALAND

<table>
<thead>
<tr>
<th>Service</th>
<th>UK (%)</th>
<th>NZ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialist Diabetes Clinic</td>
<td>88</td>
<td>38</td>
</tr>
<tr>
<td>Out-of-Hours Clinics</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Combined Clinic (Obstetrics)</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>Combined Clinic (Ophthalmology)</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Dietitian Present at Any Time</td>
<td>97</td>
<td>83</td>
</tr>
<tr>
<td><strong>Dietitian Present in Clinic</strong></td>
<td>86</td>
<td>55</td>
</tr>
<tr>
<td>Podiatrist</td>
<td>89</td>
<td>76</td>
</tr>
<tr>
<td>Specialist Nurse</td>
<td>47</td>
<td>48</td>
</tr>
<tr>
<td>Blood Glucose in Clinic</td>
<td>81</td>
<td></td>
</tr>
<tr>
<td>HbA1c or Fructosamine at Any Time</td>
<td>78</td>
<td>76</td>
</tr>
<tr>
<td>Adequate Examination Room</td>
<td>90</td>
<td>96</td>
</tr>
<tr>
<td>Dark Room</td>
<td>52</td>
<td>88</td>
</tr>
<tr>
<td>Access to Laser</td>
<td>89</td>
<td>31</td>
</tr>
</tbody>
</table>

### REQUIREMENTS PER 100,000 POPULATION SUGGESTED BY THE N.Z.S.S.D.

- 1 Diabetes Physician: 3 outpatient sessions/week
- 1+ Nurse-Educator: in clinic
- 1 Dietitian for Diabetes: in clinic
- 8-10 hours Podiatrist/week: preferably available in clinic
- 1 Ophthalmic Surgeon: regular screening
- Renal Care: Close liaison with clinic
- Obstetric Care: Conjoint clinic with diabetes specialist
- Paediatric Care: Adolescent clinic: Age-specific clinics with close liaison between physician and paediatrician
- Out-of-Hours Clinics/Education: Desirable
- Biochemical Service: Efficient, rapid
- Clinic Organisation: Computerised patient register
- Adequate secretarial assistance
- System for annual review of patients
Introduction:

Declining physical activity in middle age, together with diets high in fats and simple sugars, a tradition for feasting and the cultural respect for large body-size, have all led to considerable obesity among the Maori and Polynesian adults. This obesity and multiple pregnancies in the women are bringing to light a genetic tendency to diabetes. Westernisation through obesity appears to have converted an evolutionary advantage of diabetes (as postulated in the "thrifty" genome hypothesis) to a major threat to health and survival and it explains the 2.7 x to the 4.1 x ratio of prevalence of diabetes in the Maori and Polynesian compared with the European.[1]. Stress, hypertension, smoking and hypercholesterolaemia aggravate the late metabolic complications.

<table>
<thead>
<tr>
<th>Survey</th>
<th>Maori Men %</th>
<th>Maori Women %</th>
<th>Adult Maori Polynesians %</th>
<th>Europeans %</th>
<th>Ratio: Maori &amp; Polynesian to Europeans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ian Prior 1962-78 [2]</td>
<td>12.0</td>
<td>12.5</td>
<td>-</td>
<td>3.1</td>
<td>4 x</td>
</tr>
<tr>
<td>Russell Scott ChCh workplace 1986 [3]</td>
<td>11.27</td>
<td>2.75</td>
<td></td>
<td>2.75</td>
<td>4.1 x</td>
</tr>
<tr>
<td>John Baker 1986. Kawerau township</td>
<td>9.5</td>
<td>2.5</td>
<td></td>
<td>2.5</td>
<td>3.8 x</td>
</tr>
<tr>
<td>David Scott 1986 Middlemore Hosp.</td>
<td>4.8</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
<td>2.7 x</td>
</tr>
</tbody>
</table>

These generalisations about diabetes in Maori and Polynesian people are not exclusive, in that they also apply to some pakeha patients:

1. Neglect and lack of understanding of early symptoms delay diagnosis
2. Diabetes is often considered a mild and transitory condition
3. Knowledge of the diabetic state is suppressed because it challenges life-long eating habits and engenders social isolation.
4. A tendency to live in the present diminishes the perceived threat of late diabetic complications in the future.
Problems in the work, community and family areas have greater priority of concern than threats to physical health.

Language and cultural barriers hamper communications between the patient and the health professional.

European management solutions and their implementation are often inappropriate for the Maori and Polynesian.

Adequate finance is not available to pay doctors' fees.

The late metabolic complications seem more numerous and extensive in Maori and Polynesian patients at the time of specialist referral.

Diabetic nephropathy with chronic renal failure appears more common

Maori and Polynesian patients are entering hospital with the late complications of diabetes, some 9 and 7 years younger respectively, than Europeans.

Rural Maoris live remote from centres with well-developed health care expertise.

Dimensions:

The 2.8 - 4.1 times increase in prevalence of diabetes, coupled with the 6.7 times greater mortality, compared with Europeans in the 45-64 year age-group and the present hospital morbidity patterns make diabetes among the Maori and Polynesians a health problem of frightening dimensions.

While foot lesions and ischaemic heart disease from diabetes are major groups in the hospital admissions, chronic renal failure from diabetic nephropathy is posing a more easily-recognised threat to the strained renal dialysis services. At present the bulk of the health dollars and specialised medical manpower are devoted to end-stage complications in the hospital setting.

Virtually no effort is being allocated to the preventive education of the large numbers of Maori and Polynesian children and young adults sharing the same genetic tendency and possibly damaging environmental influences.

The problem warrants both careful research and a number of innovative interventions early in the pathogenesis of obesity and diabetes.

Recommendations for the Care of Maori and Polynesian Diabetics

Two Taskforces:

Two taskforces could be set up by area health boards: one where urban Maori and Polynesians co-exist in large numbers and one in an area where there is a substantial number of rural Maoris. Staff would need to be broad-based with Maori and Polynesian lay or professional members, a sociologist, educationalist, health economist, epidemiologist, as well as the traditional members such as the dietitian, physician, nurse and general practitioner. These two units would have information-gathering tasks as well as setting up and evaluating a range of interventions.
School Curricula Incorporating Common Health Problems, Including Diabetes

A knowledge of the special health problems affecting Maori and Polynesians (especially nutrition) should be included in the new health education, biology and social sciences curricula. Practical experience and information-gathering, testing, interventions and discussions by affected patients would reinforce the learning.

Lay Community Health Workers:

A group of these working at the Whai Ora Marae appear to have been successful in educating and helping Maori and Polynesian diabetics understand diabetes, achieve better glycaemic control and cope with the complications. This concept deserves developing in other centres, exploring the impact of an additional tier of health workers having the advantage of a common language and ethnic background with the patients. This may be particularly important as, to date, we have not sufficient numbers of Maori and Polynesian doctors and nurses. An initial year's practical training coupled with close professional supervision and continuing in-service education would suffice. Workers would concentrate on nutrition, weight control and deal with hypertension, diabetes, gout, smoking asthma and chronic obstructive respiratory disease.

Community Initiatives:

While community initiatives involving the rural Maori are a practical alternative, community solutions in the urban setting for diabetes care and support best involve Maori, Polynesian and Pakeha groups. Methods which are more sympathetic to the needs of the Maori and Polynesian should not exclude the interested Pakeha patient. Such multi-cultural activities and support groups have worked successfully in South Auckland.

A Build-up of Top-Graded Dietitians in the Community:

At present all highly paid dietitians work in hospitals. Community dietitians are all mature people with more than 5 years of work experience. Their use by the community and general practitioners is meagre. Such community dietitians need a higher profile in schools, assisting the home economics teachers to provide school meals. They could demonstrate the value of various foods, including breakfast, lunch and afternoon snacks. They need to use the media and be active in the workplace. They could also see groups of diabetic patients in general practitioners' rooms. Building up such a force of community-based dietitians may be a better use of their services in tackling the problem of obesity in the community. Dietitians are not trained for employment in the education service. Their role in relation to school teachers is to act as consultants and resource people, not to assist home economics teachers to provide meals; neither is it the function of home economics teachers to provide meals.
Upgrading Services Provided by General Practitioners:

Schemes are needed to enhance the use of Polynesian languages.

Universal screening for diabetes of pregnancy and care of established diabetics with respect to education, living skills and better glycaemic control, assisted by diabetes team out-reach programmes, are required.

The use of computerised registers would help recall Maori and Polynesian patients for review of their diabetes.

Any improvement in the quality of general practitioner service must involve some scheme which lists the burden of fees from the patient and yet provides the doctor with adequate remuneration for the extra service and times these patients require.

Involvement of Patients' Families in Intervention:

Recommendations on nutritional management by the doctor or health service tends to isolate the patient socially from his family and community. It is particularly important that families of Maori and Polynesian patients understand and participate in the patient's achievement of nutritional goals.

Improving the Environment and Scope of Hospital Outpatient Services:

Where Maori and Polynesian patients constitute a substantial group of outpatients, a welcoming, home-like atmosphere at the clinic will aid intervention and reduce non-attendance. Maori and Polynesian art and a hostess from those ethnic groups make further valuable contributions. Information-gathering, evaluation of interventions and cost-benefit analysis should be written into the job description of the staff and, to a greater extent, be funded by the area health board. The staff need to enter into the community to form fruitful liaisons with health professionals working in the primary care area where these can be shown to be cost-effective and reduce unnecessary hospitalisation.


Summary of the Problem:

Meticulous control of Type I diabetes is especially important prior to conception and in the first 12 weeks of foetal organ formation to prevent life-long congenital abnormalities.

This problem is not being tackled in New Zealand, apart from a few tentative beginnings in 2 or 3 major centres.

Vigilance by general practitioners, as well as enhancing community awareness, is needed to recognise pre-existing Type II diabetes early in the pregnancy.

Detection programmes looking for diabetes in vulnerable groups of women in their 20s & 30s is almost non-existent in general practice.

The prevalence of gestational diabetes is 4.8% among Maori & Polynesian women compared to 1.8% among European women. It is best detected by screening all women for diabetes at 28 weeks gestation.

Universal screening programmes are operational only at National Women's, Middlemore and Christchurch Women's Hospitals.

Combined staff supervision at a joint antenatal clinic is necessary to minimise macrosomia and perinatal foetal morbidity and mortality, as well as the development of diabetes in offspring.

Such clinics at present exist only in the major centres where some are makeshift and inadequate.

Active intervention & detection programmes can prevent or provide early diagnosis of permanent diabetes in women with previous gestational diabetes.

There are few such programmes which could minimise the burden of the late metabolic complications of Type II diabetes in women.

General Principles:

The adequate care of pregnant women with diabetes involves a joint antenatal clinic where obstetrician, physician, dietitian and diabetes nurse-educator all see patients at the one venue, with the paediatrician being consulted closer to delivery.

By facilitating the setting up, staffing and funding of such clinics, hospital boards would reduce perinatal infant mortality, a prevalence of babies with congenital malformations or intellectual handicap, and the later development of diabetes in the offspring of these diabetic mothers. The mothers, once identified as vulnerable for permanent diabetes, could have dietary exercise and weight control intervention to delay and hopefully prevent diabetes.
In pregnancy, it is thought that placental hormones, particularly in the third trimester, cause a resistance to insulin action which, in turn, requires increased insulin release. This aggravates pre-existing diabetes or brings to light a diabetic tendency. Diabetes in pregnancy can exist in three forms:

**Insulin Dependent:** This is the least common, where women are already established diabetics on insulin and who have become pregnant*.

**Non-Insulin-Dependent:** When women with Type II diabetes become pregnant the diabetic state may be unknown or denied. The prompt institution of insulin therapy is required as soon as the pregnancy is confirmed. Often these patients are Maori or Polynesian and are multiparous with a relaxed attitude to antenatal care**.

**Gestational Diabetes** refers to a transient diabetes, developing in the third trimester and usually disappearing at delivery***

Throughout New Zealand, apart from the six major centres, diabetes antenatal care is often rudimentary, while at the major centres there are some deficiencies. Meticulous postnatal follow-up on an annual basis is lacking and so women who have had gestational diabetes and are vulnerable to the development of permanent Type II diabetes, are not receiving intensive preventive intervention in the form of nutritional advice, an exercise programme, family counselling and weight control. The usual pattern is a continuing progressive obesity in middle age, a transition through impaired glucose tolerance to diabetes which is not usually diagnosed for several years. By this time, some of the late metabolic complications are established and may be even the cause for diagnosing diabetes itself. Such women may make up a third of all Type II diabetics. The care of these patients places a heavy burden on the community and the health care system.

* Congenital abnormalities in their offspring are 2-3 times more common [1] where the diabetes is poorly controlled for 3-6 months prior to conception and during the first 12 weeks of foetal life, when all the organs forming. Such children with congenital abnormalities can require expensive medical and custodial care for life, as well as being a burden on the family. Well-organised adolescent and adult diabetic services can provide pre-pregnancy counselling and meticulous diabetic control in preparation for an during pregnancy.

Where care of the adolescent and young adult woman diabetic has been inadequate, many women wanting children have diabetic eye and kidney disease and hypertension, all of which can deteriorate about the 28th to 32nd week of the pregnancy, with superimposed toxoaemia. Preserving the health of these mothers and securing a live but premature baby, requires meticulous, time-consuming management by a bevy of specialists.

** It behoves the general practitioner to be suspicious of both diabetes and pregnancy so that the mothers can be transferred quickly to the base hospital for insulin therapy. Where the condition is diagnosed late in pregnancy, excessive foetal growth has resulted in a large baby with macrosomia, making intra-uterine death or severe perinatal complications likely.

*** It is the most common group in diabetes of pregnancy. In a survey of women at Middlemore Hospital [2] the prevalence was 1.8% of Europeans, and 4.8% of Polynesian women. It is being identified by a universal screening programme at 28 weeks, though where the hospital has few Maori and Polynesian patients, a selective screening programme may be employed. All patients require the services of a joint specialist clinic, with particular attention to diet and home blood glucose monitoring. About 50% require insulin therapy, with about a third of these best managed on a portable insulin pump.
Excessive foetal growth, documented clinically and by repeated ultrasound examinations, occurs when the maternal blood glucose rises above 5.5 mmol/L (121). The slightly elevated maternal glucose crosses the placenta, induces foetal insulin release and fuels the excessive growth. At delivery, the baby's excessive insulin level, with cessation of the maternal glucose supply, can induce hypoglycaemia, resulting in restlessness, hypoglycaemic seizures and irreversible brain damage. This leads to a life-long intellectual handicap. These infants are prone to the respiratory distress syndrome, hypocalcaemia, as well as intra-uterine death.

Where gestational diabetes has been neglected or poorly managed, the offspring are more likely to develop diabetes themselves in the late teens (3).

THE ESTIMATED INCIDENCE OF GESTATIONAL DIABETES MELLITUS IN NEW ZEALAND

It is recognised that assumptions must necessarily be made as, no official statistics are available.

Number of Births:

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polynesian</td>
<td>3,403</td>
</tr>
<tr>
<td>Maori</td>
<td>6,513</td>
</tr>
<tr>
<td>Other</td>
<td>42,908</td>
</tr>
<tr>
<td>TOTAL</td>
<td>52,824 [1]</td>
</tr>
</tbody>
</table>

Incidence of GDM:

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maori and Polynesian (4.8%)</td>
<td>476</td>
</tr>
<tr>
<td>Other (1.8%)</td>
<td>772</td>
</tr>
<tr>
<td>Total cases per year</td>
<td>1,248 [2]</td>
</tr>
</tbody>
</table>

Approximately 1250/300,000 population = 300/100,000 are at risk. Figures will be higher for regional areas with high Maori populations.

2 Scott, D. Personal communication.
RENAL DISEASE AND DIABETES

Incidence and Prevalence:

The data for New Zealand suggests that we have an unusual and important problem. Data is incomplete and much influenced by the selection process that determines who presents for supportive treatment of "end-stage renal failure (ESRF) and which patients are accepted for dialysis treatment or kidney transplant. Despite these various factors that tend to reduce numbers of patients treated for ESRF, New Zealand has one of the highest proportions of diabetics in their treatment group. At about 20% this exceed that of Australia and the United Kingdom and approaches that of the USA (see Table 5).

The economic impact of this is great. In European counties the majority of people with diabetic renal failure are younger people with insulin-dependent diabetes mellitus, the least common form of the disorder. In New Zealand, most belong to the 85% of diabetics with NIDDM and many seem to be Maori. Once again, data is incomplete but it is likely that:

- ESRF is more common in Maori NIDDMs than Europeans
- ESRF is often present at the time that diabetes is diagnosed
- The substantial prevalence of diabetes in a population that is moving rapidly into the diabetes age-group

All these pose a public health and economic problem of great magnitude

Strategies being evolved may delay or prevent the development of such end-stage disease but they will be of no use to our community unless diabetes can be prevented, diagnosed early or adequately treated. We will either have to obtain substantial funding for an adequate renal support programme (diabetics seem to have a poor transplant survival rate) or we may not be able to offer treatment to an increasing number of patients. This will create special ethical problems. Many who present with ESRF require dialysis treatment to control their kidney failure while their other clinical problems are being evaluated. Withdrawal of already instituted dialysis therapy may be morally unacceptable. Additionally, many of those with ESRF will be Maori or Pacific Islanders. The withholding of of treatment might be misconstrued as being discriminatory, in the worst sense of the word.

<table>
<thead>
<tr>
<th>TABLE 1: END-STAGE RENAL FAILURE (ESRF) COSTS IN NZ, 1987*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital Dialysis</td>
</tr>
<tr>
<td>Each Year*</td>
</tr>
<tr>
<td>Training*</td>
</tr>
</tbody>
</table>

Kidney Transplantation Costs: 1st Year: $23,000; 2nd Year: $10,000

* per patient
TABLE 2: NEW PATIENT ACCEPTANCE AND NUMBER OF ESRF TREATED* [1]

<table>
<thead>
<tr>
<th></th>
<th>Dialysis &amp; Transplant</th>
<th>New Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand</td>
<td>217</td>
<td>251</td>
</tr>
<tr>
<td>Australia</td>
<td>263</td>
<td>294</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>195</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>275</td>
<td></td>
</tr>
<tr>
<td>West Germany</td>
<td>326</td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>345</td>
<td></td>
</tr>
<tr>
<td>Israel</td>
<td>340</td>
<td></td>
</tr>
</tbody>
</table>

* per million

TABLE 3: END-STAGE RENAL FAILURE (ESRF) IN NZ RACIAL GROUPS 1986 [2]

<table>
<thead>
<tr>
<th></th>
<th>% of Total Population</th>
<th>Number of New Patients</th>
<th>Rate per Million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maori</td>
<td>12.4</td>
<td>30</td>
<td>74</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>3.9</td>
<td>12</td>
<td>94</td>
</tr>
<tr>
<td>Caucasian/Asian</td>
<td>83.7</td>
<td>81</td>
<td>30</td>
</tr>
</tbody>
</table>

TABLE 4: MAIN CAUSES OF END-STAGE RENAL FAILURE (ESRF) IN NZ, 1986

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glomerulonephritis</td>
<td>34</td>
<td>27</td>
</tr>
<tr>
<td>Diabetes</td>
<td>22</td>
<td>18</td>
</tr>
<tr>
<td>Reflux</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Hypertension</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Polycystic disease</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>Uncertain</td>
<td>11</td>
<td>9</td>
</tr>
</tbody>
</table>

TABLE 5: DIABETES AS A CAUSE OF PRIMARY RENAL DISEASE IN NEW PATIENTS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>6%</td>
<td>8%</td>
<td>9%</td>
<td>8%</td>
<td>9%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>9%</td>
<td>20%</td>
<td>22%</td>
<td>21%</td>
<td>18%</td>
</tr>
</tbody>
</table>

TABLE 6: ESTIMATED COSTS OF END-STAGE RENAL DISEASE IN NZ, 1986 [3]

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemodialysis:</td>
<td></td>
</tr>
<tr>
<td>In Hospital</td>
<td>$2,200,000</td>
</tr>
<tr>
<td>At Home</td>
<td>$3,600,000</td>
</tr>
<tr>
<td>Continuing Ambulatory Peritoneal Dialysis (CAPD)</td>
<td>$4,000,000</td>
</tr>
<tr>
<td>(virtually all at home)</td>
<td></td>
</tr>
<tr>
<td>Kidney Transplantation</td>
<td>$6,900,000</td>
</tr>
<tr>
<td>Total:</td>
<td>$16,700,000</td>
</tr>
</tbody>
</table>

18% of those treated in NZ for ESRF are diabetic
Therefore, costs for diabetes from ESRF = $3,006,000+
These costs do not include those not considered or accepted for treatment of end-stage renal failure, though they do provide a base for future calculations - costly ones on present indications.

COMMENT

The mounting costs of diabetic end-stage renal failure - financial and human - can only be estimated. There is reason to fear a major epidemic of financially and socially costly kidney failure in New Zealand diabetics, especially in Maori and Pacific Island people.

If kidney damage is to be delayed a yearly review of microproteinuria and blood pressure in every diabetic is mandatory. A delay of one year in developing ESRF should save $10,000 to $15,000 per patient (1987 figures).

There is good evidence that this cost benefit can be obtained for many patients if modern techniques of blood glucose and blood pressure controls (to below 140/90) are widely applied in both IDDM and NIDDM.

<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
</tr>
<tr>
<td>Hospital Dialysis</td>
</tr>
<tr>
<td>Continuing Ambulatory Peritoneal Dialysis</td>
</tr>
<tr>
<td>Home Dialysis</td>
</tr>
<tr>
<td>Training</td>
</tr>
<tr>
<td>Home Dialysis</td>
</tr>
</tbody>
</table>

Comparative Costs/patient/year:

| Kidney Transplantation | $14,000   |
| Long-Stay Psychiatric  | $18,800   |
| Mental Handicap        | $32,900   |
| Long-Stay Geriatric    | $32,900   |

*In the study by Chetwynd & Swainson [1] on patients treated in 1982-84, the cost for the first year (when the vast majority of the costs are incurred) was $16,717. The advent of Cyclosporin A (which improves transplant outcome) has added approximately $10,000 in the first year and approximately $7,500 in subsequent years (based on average dose at 12 months of 3mI/day).

1 Interim Summary, Aust & NZ Combined Dialysis & Transplant Registry to October 1987
2 Australia and New Zealand combined Dialysis and Transplant Registry, 1986.
4 Figures supplied by Dr RBI Morrison, Medical Director, Renal Unit, Wellington Hospital
# Cost-Effectiveness of Diabetes Education


## Summary of Diabetes Ambulant and Outpatient Education Programmes

<table>
<thead>
<tr>
<th>Study</th>
<th>Period</th>
<th>Comment</th>
<th>Follow-up</th>
<th>Outcome and Cost Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maine</td>
<td>'79-84</td>
<td>44 groups and sites, 5 x 2 hours</td>
<td>1 year</td>
<td>32% decrease in hospital stay $293 saving/person/yr</td>
</tr>
<tr>
<td>Memphis</td>
<td>'69-76</td>
<td>Black, female, 7 yrs lower socio-economic group</td>
<td></td>
<td>After 7yrs 26% decrease in hospital stay. 2-yr controls + 77% 2-yr education - 49%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>'69-73</td>
<td>Indigent, poor 2 yrs</td>
<td></td>
<td>$1.8 million in a 2,000 bed hospital</td>
</tr>
<tr>
<td>Atlanta</td>
<td>'74-80</td>
<td>350,000 group, 8 yrs mainly Negro</td>
<td></td>
<td>50% decrease in amputations. $3.5 million saved in 8 yrs</td>
</tr>
<tr>
<td>Christchurch</td>
<td>'77-82</td>
<td>5 4-hr session groups of IDDM</td>
<td>1 year</td>
<td>1st Year: Cost: $35,000 Saving: $350,000</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>'80-84</td>
<td>10 hours</td>
<td>1 year</td>
<td>51% decrease in hospital stay. $355 saving per person per year</td>
</tr>
<tr>
<td>Washington</td>
<td>'81-84</td>
<td>16 hours</td>
<td>1 year</td>
<td>72% decrease in hospital stay</td>
</tr>
<tr>
<td>Hamilton, Ontario</td>
<td>1976</td>
<td>3 x weekly 2 weeks Control group</td>
<td>6 months</td>
<td>9 x savings in hospital stay. $1293 saving per patient vs controls in 6 months.</td>
</tr>
<tr>
<td>Melbourne, Australia</td>
<td>1984</td>
<td>See Selected Bibliography</td>
<td>1 year</td>
<td>90% reduction in hospital stay</td>
</tr>
</tbody>
</table>
A "City to Surf" fun run - the Christchurch Diabetes Society team practicing what they preach.
Diabetes Societies are voluntary, lay organisations which have been formed to help diabetics lead normal lives. There are 28 such societies throughout New Zealand. Each society is autonomous, but all are affiliated with the New Zealand Diabetes Association Inc. This central national body is responsible for co-ordinating the activities of all organisations to promote health, welfare and interest of diabetics. A professional advisory panel of leading specialists in diabetes operated within the New Zealand Association. The national body is affiliated to the worldwide International Diabetes Federation (which has 62 member countries) and is closely linked to World Health Organization regional areas by liaison committees.

The Society recognises the benefits to the community derived from medical research which is accordingly encouraged. It also supports any approved work involving early detection and better personal or professional management of diabetes.

Self-help Role: Societies hold regular meetings on a wide range of topics, including lectures and panel discussions from diabetes specialists, dietitians, health professionals from a variety of disciplines, as well as contributions from members. However, the range of activities offered by each Society is dependent upon available resources. A field officer is usually employed to help members, particularly in the area of social welfare, and to provide guidance and assistance to members, especially to parents of children with diabetes.

Joint Diabetes Centres: In Christchurch and Auckland the diabetes societies are associated with the regional hospital boards in running the diabetes centres. These facilities provide diabetes education for diabetics and their families, and health professionals. The diabetes centres offer a wide range of educational classes for both insulin-dependent and non-insulin dependent diabetics and their families, counselling and advice and instruction on self-monitoring of blood glucose on referral from general practitioners.

The address for the President and Secretary of the Diabetes Association of New Zealand is P.O. Box 54, Oamaru, New Zealand.
ORGANISATION OF DIABETES "CARE"
EXAMPLES OF DIABETES RESOURCE CENTRES

1 Major "Free-Standing" Centres:

Examples are in Auckland and Christchurch. Here a receptionist, secretary and word-processor/computer operator support a multi-disciplinary team of 4 to 5 persons who undertake out-reach programmes and offer education in diabetes to all patients and professional groups in the regional area [1].

2 Dedicated Hospital Area:

An example is Palmerston North where a committed diabetes physician and a strong multi-disciplinary team occupy dedicated hospital space to provide day & evening education courses for patients referred from outside the hospital's area. There is a strong emphasis on courses for young people.

3 Smaller Centres:

Either a full-time nurse-educator or even a joint hypertension/diabetes nurse-educator occupies office and teaching space within a hospital (ie., nurses' classrooms). The services of key hospital and community workers (ie., dietitians, district nurses, Maori elders, etc) are also utilised. Such diabetes nurse-educators receive support form physicians in internal medicine and have telephone and teletype communication with a more major centers (with say twice yearly up-date visits of 1-7days).

The Whai Ora Trust in South Auckland is an excellent example of community outreach by professional experts to a high-risk group.

APPENDIX 13

HOSPITAL DAYS STAY

It is recognised that admission to hospital of persons with diabetes (but without complications) will perpetuate the "sick role" and lead to loss of self-esteem and a feeling of powerlessness. The evolution of ambulant care facilities for those diabetics not "managed" in the primary care sector has not kept pace with the growing prevalence of diabetes. Information on inappropriate admissions to hospital in New Zealand is not widely available.

USA: 1% per decade:
- 1960s - 4%
- 1970s - 5%
- 1980s - 6%

In the United Kingdom 3% of the total population has diabetes. They use 14% of hospital costs for diabetes or its complications. Of this, 7% is used for in-patient costs and 7% for outpatient costs. 5% of the National Health Services domiciliary and community costs are used for diabetes and its complications.

In New Zealand nearly 40% of diabetes diagnoses are omitted from national statistics [1]. In a total hospital population followed over one year in Christchurch, 5% of hospital costs were used by persons with diabetes, whereas known and diagnosed prevalence is about 50% of this (2-3%).

The following figures were kindly supplied by Mr JH Steffens, Assistant Director of the National Health Statistics Centre, Department of Health, Private Bag 2, Upper Willis Street, Wellington.

### Average Hospital Days Stay - All New Zealand Hospital Boards, 1985:

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maori</td>
<td>14.8</td>
<td>19.3</td>
</tr>
<tr>
<td>Non-Maori</td>
<td>22.1</td>
<td>22.5</td>
</tr>
</tbody>
</table>

### Average Hospital Days Stay for Uncomplicated Diabetes:

<table>
<thead>
<tr>
<th>Males:</th>
<th>Auck</th>
<th>Waikato</th>
<th>Palms-</th>
<th>Wgtn</th>
<th>ChCh</th>
<th>Otago</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maori</td>
<td>20</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>3</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Non-Maori</td>
<td>17</td>
<td>40</td>
<td>9</td>
<td>10</td>
<td>13</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>Females:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maori</td>
<td>16</td>
<td>10</td>
<td>9</td>
<td>17</td>
<td>0</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Non-Maori</td>
<td>20</td>
<td>41</td>
<td>45</td>
<td>19</td>
<td>21</td>
<td>10</td>
<td>26</td>
</tr>
<tr>
<td>Mean</td>
<td>18</td>
<td>23</td>
<td>17</td>
<td>13</td>
<td>12</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

---

1 Brown LJ, Scott RS, Beaven DW. Utilisation of health services by diabetic persons.
### Average Hospital Days Stay for Uncomplicated Diabetes Mellitus in Secondary Centres* (Taranaki, Tauranga, Wanganui, Nelson, Timaru)

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Maori</th>
<th>15</th>
<th>Females</th>
<th>Maori</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Maori</td>
<td>21</td>
<td></td>
<td>Non-Maori</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

### Average Hospital Days Stay for Diabetic Ketoacidosis

<table>
<thead>
<tr>
<th></th>
<th>Auck</th>
<th>Waikato</th>
<th>Wgtn</th>
<th>ChCh</th>
<th>Otago</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>8</td>
<td>9</td>
<td>12</td>
<td>7</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Female</td>
<td>7</td>
<td>9</td>
<td>8</td>
<td>10</td>
<td>6</td>
<td>16</td>
</tr>
</tbody>
</table>

### Total Hospital Stay of Diabetics for Preventable Conditions, 1985***

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Total Days</th>
<th>1988 Costs (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes (at diagnosis or non-specified)</td>
<td>43,679</td>
<td>$26.2</td>
</tr>
<tr>
<td>Diabetic Ketoacidosis</td>
<td>2,189</td>
<td>$1.3</td>
</tr>
<tr>
<td>Peripheral Circulation Problems in legs</td>
<td>12,074</td>
<td>$13.0</td>
</tr>
<tr>
<td>Other Specific Diabetes Complications (eyes, infections)</td>
<td>7,075</td>
<td>$4.2</td>
</tr>
<tr>
<td>Amputations in Diabetics Toes</td>
<td>8,981</td>
<td>$5.4</td>
</tr>
<tr>
<td>Feet</td>
<td>4,334</td>
<td></td>
</tr>
<tr>
<td>Lower Legs</td>
<td>3,882</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL HOSPITAL STAY FOR PREVENTABLE CONDITIONS** 73,998

* No significant difference from larger centres

** As few Maori males were admitted, Maori figure omitted

*** Audit of entry data checked by Brown et al., indicates a 38% under-recording of diabetes as a primary diagnosis

**** Conditions included are those deemed to be potentially treatable. Not recorded are large numbers where heart attacks, strokes or renal failure have resulted from diabetes.
### Hospital/Area Health Board Districts
#### Total Population Projections, 1986-2006

<table>
<thead>
<tr>
<th>Hospital Board</th>
<th>1986</th>
<th>1996</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashburton</td>
<td>25000</td>
<td>25000</td>
<td>24000</td>
</tr>
<tr>
<td>Auckland</td>
<td>888000</td>
<td>992000</td>
<td>1076000</td>
</tr>
<tr>
<td>Bay of Plenty</td>
<td>48000</td>
<td>52000</td>
<td>56000</td>
</tr>
<tr>
<td>Canterbury</td>
<td>354000</td>
<td>371000</td>
<td>378000</td>
</tr>
<tr>
<td>Cook</td>
<td>41000</td>
<td>44000</td>
<td>45000</td>
</tr>
<tr>
<td>Dannevirke</td>
<td>13000</td>
<td>13200</td>
<td>13300</td>
</tr>
<tr>
<td>Hawkes Bay</td>
<td>128000</td>
<td>140000</td>
<td>152000</td>
</tr>
<tr>
<td>Maniototo</td>
<td>2400</td>
<td>2400</td>
<td>2400</td>
</tr>
<tr>
<td>Marlborough</td>
<td>35000</td>
<td>35000</td>
<td>35000</td>
</tr>
<tr>
<td>Nelson</td>
<td>70000</td>
<td>74000</td>
<td>75000</td>
</tr>
<tr>
<td>Northland</td>
<td>127000</td>
<td>147000</td>
<td>164000</td>
</tr>
<tr>
<td>Otago</td>
<td>122000</td>
<td>120000</td>
<td>115000</td>
</tr>
<tr>
<td>Palmerston North</td>
<td>134000</td>
<td>145000</td>
<td>152000</td>
</tr>
<tr>
<td>South Canterbury</td>
<td>57000</td>
<td>56000</td>
<td>54000</td>
</tr>
<tr>
<td>Southland</td>
<td>116000</td>
<td>118000</td>
<td>117000</td>
</tr>
<tr>
<td>South Otago</td>
<td>15700</td>
<td>15500</td>
<td>15000</td>
</tr>
<tr>
<td>Taranaki</td>
<td>103000</td>
<td>111000</td>
<td>117000</td>
</tr>
<tr>
<td>Taumarunui</td>
<td>12400</td>
<td>12900</td>
<td>13200</td>
</tr>
<tr>
<td>Tauranga</td>
<td>85000</td>
<td>98000</td>
<td>108000</td>
</tr>
<tr>
<td>Thames</td>
<td>39000</td>
<td>44000</td>
<td>48000</td>
</tr>
<tr>
<td>Vincent</td>
<td>13400</td>
<td>15100</td>
<td>15300</td>
</tr>
<tr>
<td>Waipu</td>
<td>4700</td>
<td>4900</td>
<td>5000</td>
</tr>
<tr>
<td>Waikato</td>
<td>339000</td>
<td>371000</td>
<td>397000</td>
</tr>
<tr>
<td>Waipawa</td>
<td>13100</td>
<td>13600</td>
<td>13800</td>
</tr>
<tr>
<td>Wairarapa</td>
<td>44000</td>
<td>46000</td>
<td>47000</td>
</tr>
<tr>
<td>Waitaki</td>
<td>22000</td>
<td>21000</td>
<td>20000</td>
</tr>
<tr>
<td>Wanganui</td>
<td>74000</td>
<td>78000</td>
<td>81000</td>
</tr>
<tr>
<td>Wellington</td>
<td>346000</td>
<td>369000</td>
<td>386000</td>
</tr>
<tr>
<td>Westland</td>
<td>35000</td>
<td>36000</td>
<td>35000</td>
</tr>
</tbody>
</table>

**Source:**

1981 base, medium assumptions
GLOSSARY

DIURETIC: An agent which increases the output of urine

FRUCTOSAMINE: An amino sugar formed when sugar is bound to protein fractions in the blood. It is detected by the reduction of the osazone of glucosamine

GLYCAEMIA: (HbA1c) Sugar irreversibly bonded to haemoglobin in red cells which has a half-life of 60 days.

GLUCOCORTICOID: A hormone of the adrenal cortex, natural or synthetic, which raises the concentration of liver glycogen and blood sugar

HYPERGLYCAEMIA: The state of raised blood glucose levels (normal levels are 3.6 to 6.8mmol/L)

HYPOGLYCAEMIA: A blood glucose level below 3.0mmol/L and low enough to produce symptoms.

IMMunosUPPRESSIVE THERAPY: Drug therapy used to subdue the body's immune responses

INSULIN-DEPENDENT DIABETES MELLITUS: The lack of virtually all functioning beta cell capacity and the production of so little insulin that if injected insulin is withheld or inadequate, ketoacidosis results.

KETOACIDOSIS: A condition resulting from accumulation of acids in the body caused by insulin deficiency, if untreated, leading to coma (a terminal event before 1922)

MACROSOMIA: High blood sugars during pregnancy cross the placental barrier, leading to excessive growth of the foetus and possibly resulting in uterine death, brain damage or malformations.

NEPHROPATHY: Disease of the glomerular filters of the kidneys resulting from high blood sugar levels

NEUROPATHY: Progressive damage to the nerves sheaths resulting from elevated blood glucose levels over years.
NON-INSULIN-DEPENDENT DIABETES MELLITUS: Initially treatable by calorie reduction, exercise and oral medication. The World Health Organization defines people with blood glucose values of over 8 mmol/l as having IMPAIRED GLUCOSE TOLERANCE and those with blood sugars always over 11 mmol/l, as having non-insulin-dependent diabetes mellitus.

NORMOGLYCAEMIA: Normal blood glucose levels. In a New Zealand ambulant community, blood glucose values of 3.6 - 6.8 mmol/l are reported as being within 95% of normal in 95% of people of all ages.

PANCREATIC BETA CELL FAILURE: Failure of the beta cells within the Islets of Langerhans of the pancreas to produce insulin. This is confirmed by blood sugar levels over 8 mmol per litre.

PANCREATIC HORMONES are insulin which is transported via the blood stream to body cells and glucagon which is stored in the liver and released when blood sugar levels fall.

PANCREATIC TRANSPLANT: Laboratory-cultivated foetal pancreatic beta cells or a segment of the pancreas are used for transplantation. Although most of the insulin-secreting beta cells are in the head of the pancreas, it is easier to transplant the tail segment into the thigh of the recipient with the pancreatic vessels being joined to the thigh vessels.

RETINOPATHY in diabetes is usually the earliest sign of damage to the nerve layers of the eyes and results in visual loss.

SHARED CARE: A conjoint sharing of knowledge, information and management of diabetes by the consumer and the primary care doctor and the diabetologist.

TOXAEMIA OF PREGNANCY: A disorder of unknown cause where salt and water are retained unduly with a rise in blood pressure. Toxaemia is the common name for pre-eclampsia, a disease unique to pregnancy. It causes hypertension and proteinuria, and adverse foetal outcome is common.

VIRAL INDUCTION: Viruses attack beta cells releasing forbidden proteins from inside the cells. These protein fragments generate an immunity reaction setting up a vicious cycle of continuing beta cell destruction.
SECTION 1

THE PROBLEM DEFINED

SUMMARY

Within the next decade, it may be expected that diabetes management will shift to predominantly community-based programmes.

Diabetes Mellitus is a common disorder and is very widespread in the Maori and Pacific Islanders.

Primary prevention is a realistic possibility for non-insulin-dependent diabetes mellitus.

Effective Education and yearly medical review programmes can be expected to reduce diabetes-related hospital admission rates and costly bed occupancies.

Substantial Improvements in the general health and well-being of diabetic members of the community can be expected with the provision of adequate ambulant resources.
INTRODUCTION

This section provides a review of diabetes mellitus as a background to the Service Planning Guidelines. In particular it addresses the extent of the problem and identifies areas in which intervention programmes can be expected to be successful. It poses a series of questions and attempts answers.

QUESTION 1: What is diabetes mellitus?

Diabetes mellitus is a metabolic disorder in which blood glucose concentrations exceed the normal range of 3.6 to 6.8 mmol per litre. It is caused by an absolute or relative deficiency of the pancreatic hormone insulin.

Symptoms of Diabetes:

There may be none, yet damage to tissues may already be occurring. Thus, blood glucose testing facilities must be readily available for early diagnosis.

Types of Diabetes: Current classifications of diabetes include:

Insulin-Dependent Diabetes Mellitus - IDDM (Type I):

Occurs in about 12-15% of diabetics[1] Insulin production is usually absent. A significant number of older people require insulin at diagnosis or later[2].

Non-Insulin-Dependent Diabetes Mellitus - NIDDM (Type II):

This is more common form (85%). It usually develops in adults in late middle or old-age, but is also seen in younger adults, especially in the Maori and Pacific Island people in New Zealand. There is defective insulin production and release.

Gestational Diabetes - GDM (diabetes developing in pregnancy):

Occurs in about 2.5% of all pregnancies. It is more common in Polynesians[3].

There are substantial risks to mother and child if the disorder is not treated. Later approximately 60% of these women eventually develop overt diabetes[4] (see Appendices 7 and 8).

Impaired Glucose Tolerance:

An intermediate abnormality of glucose metabolism which occurs in people who have increased risk of developing diabetes and arterial disease.

3 Scott DJ. Middlemore Hospital, personal communication.
QUESTION 2:  How common is diabetes?

At least 3% of all New Zealanders have diabetes mellitus [1].

These figures come from the best recent New Zealand study which was made in a Christchurch workplace, where the proportion of Maoris and Polynesians was smaller than that in many other parts of the country, and the upper age was 60 years. The Framingham Study in New England (follow-up 5,200 subjects) found 7.8% of men and 6.2% of women had developed evidence of diabetes at 30 years [2,3].

As will be discussed in detail later, information for New Zealand is inadequate, but it is clear that figures from overseas studies are probably under-estimates of the New Zealand situation. The question may best be answered in terms of:

<table>
<thead>
<tr>
<th>Incidence</th>
<th>(the number of new cases each year, usually per 100,000 population)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence</td>
<td>(number of people with the disorder)</td>
</tr>
</tbody>
</table>

IDDM (Type I): Insulin-Requiring:

Incidence in North Canterbury for all age groups is 13 per 100,000 [5]. Under age 20 it is 11.9 per 100,000 [1].

Prevalence in that area is 330 per 100,000, or 0.33% of all adults. Under age 20 it is 100 per 100,000 [5].

NIDDM (Type II): Non-Insulin-Requiring:

The incidence in the USA is approximately 200 per 100,000 per year (no New Zealand figures available).

The prevalence in New Zealand is given at about 3,000 cases per 100,000 population [1] but this does not make allowance for the Maori and Pacific Islanders who comprise much of the North Island population.

Maori and Pacific Island Polynesians:

NIDDM is much more common in these groups [1,2]. Prevalence of 12,500 per 100,000 population for females and 12,000 cases per 100,000 for males was found by the Wellington Epidemiology Unit between 1962 and 1969.

Incidence was 1714 females & 1128 males per 100,000 population [3]

As numbers of older people and Maoris increase so will the rate of diabetes. Furthermore, Maoris present with serious complications of the disease 10 years earlier than Europeans [4] (Appendix 6).

Diabetes and Carbohydrate Intolerance in Pregnancy:

New Zealand figures suggest at least 2.5 per 100 with Maori and Pacific island rates considerably greater [5] (a funded study is urgently required to determine exact rates).

3 Prior IAM, Proceeding of the NZSSD Conference, 1983
5 Scott DJ, Middlemore Hospital, Personal Communication. Appendix 6
QUESTION 3: What is the cause of diabetes?

No single cause is known.

A number of factors such as genetic makeup [1] increasing age [2] obesity, pregnancy, other illness and certain drugs, may uncover the abnormality and bring a raised blood sugar to notice, especially with NIDDM. The end result is a lack of adequate and appropriate insulin secretion.

IDDM is due to a combination of environmental factors (possibly viral infections) and a genetic disorder in the immune system that allows triggering of continued destruction of injured insulin-producing cells. In the future, intervention may be possible to halt further development of the disorder.

QUESTION 4: Which groups are particularly at risk?

Risk factors include:

Age: The prevalence of diabetes rises to 10% or greater in the population aged 60 years and more [3].

Ethnic Origin: The prevalence of diabetes is much increased in Maori and Pacific Island people. It is over 12% [4]

Obesity: The incidence rises twelve-fold with an increase is percentage ideal body weight from ideal to >145% [3]

Family History: IDDM has a strong genetic component. This is less marked for IDDM but is still important.

Diabetogenic Drugs especially diuretic and steroid medication

Pregnancy.

---

1. Eisenbarth GS. Genes, generator of diversity, glycoconjugates and autoimmune beta-cell insufficiency in IDDM (Type I Diabetes). Diabetes 36: 355-64, 1987
QUESTION 5: Why does it matter?

Because:

- Large numbers of people are involved (over 100,000 in NZ)
- There is extensive ill-health & premature death in this group
- There is considerable potential for prevention of NIDDM
- Effective education and treatment programmes can reduce diabetes complication rates (Appendices 10 and 13)

Outcome:

Early Death (relative mortality) is twice that of the normal population [1,2] for NIDDM and 20 times normal for IDDM [3,4]

Diabetes Coma (metabolic disturbance): Very high (still 5-10% mortality in best units) and very low blood glucose states are life-threatening and costly in hospital time.

Heart Attacks (coronary artery disease) are the cause of death in approximately 35% [1] of NIDDM. The relative risk is increased 3.5-fold in IDDM in those aged 20-24 years [5]

In diabetics the risk of sudden death increases 2-6 times over non-diabetics (females more than males) [6]

Loss of the normal pre-menopausal female protection from myocardial infarction and death [1,6]

Increased risk for painless myocardial infarction in men (50% men vs 14% women) [6]

Causes of Death in NIDDM

- Heart attack
- Myocardial infarction
- Stroke
- Gangrene
- Kidney failure
- Coma
- Infections
- Tuberculosis
- Neoplasm
- Accident/suicide
- Unspecified


Causes of Death IDDM age < 30 years

- Kidney failure
- Low sugars
- Stroke
- Infection
- Heart attack
- Myocardial infarction
- Infection
- Stroke
- Neoplasm
- Suicide
- Accident
- Hypoglycemia
- Ketoacidosis
- Unspecified

Deckert T, Poulsen JE, Larsen M. Diabetologia 14: 363-370, 1978
Blocked Leg Arteries (peripheral vascular disease) is increased 4.2-fold for men, 5-fold for women [1].

Lower limb amputations are 10-20 times more common in diabetics [2]. For example, 56% of lower limb amputations in all Christchurch hospitals were on diabetics [3].

Stroke is four times more common than in the non-diabetic population [4] and more common in women [5,6].

Cataract and Blindness: Retinopathy is one of the three leading causes of blindness [7]. Diabetes is the leading cause of new blindness in the United States of America [6]. It is the dominant cause of cataract requiring operation. In diabetes, cataracts develop more rapidly, frequently require operation, and at a younger age.

30% of all people with diabetes have diabetic changes in the eyes and in 13% this is vision-threatening [6,8,9].

40 to 60% develop serious eye disease with impaired vision after 20 years' duration of diabetes [10]. It is often present at diagnosis in NIDDM (see Section 5).

Damaged Nerves (neuropathy) cause:

- Numbness of the feet
- Risk of infection and ulceration
- Delayed healing
- Leg pain "Burning" limbs
- Loss of muscle power
- Reduced bladder and bowel control
- Male impotence (50%)

Nerve damage was present in 12% of a large group at time of diagnosis and almost 25% after 25 years [11,12,13,14]. This compounds "diabetic foot problems" leading to amputation.

3 Beaven DW, Scott RS, Brown L. Personal communication.
12 Pirart J. Diabetic neuropathy: A metabolic or vascular disease? Diabetes 14: 1, 1965
13 Pfeifer MA, Green DA. Diabetic neuropathy. The Upjohn Co, Kalamazoo, Michigan, 1985
14 Ward JD. Diabetic nephropathy. Diabetes Annual/1, Elsevier, Amsterdam, 288, 1985
Kidney Failure (ESRF = End-Stage Renal Failure):

Once end-stage renal failure occurs, the alternatives are:

DIALYSIS, TRANSPLANT or DEATH

This has major financial and ethical consequences (see Appendix 9)

Renal failure is present in both NIDDM and IDDM. It affects up to 40% of insulin-dependent patients [1]. It was previously thought that IDDMs were most affected but in New Zealand the 20% of dialysis patients who are diabetic include a high percentage of Maoris with Type II diabetes.

Figures for Australia and New Zealand [2] and the United Kingdom [3] reflect both the incidence of this disorder and the selection process that leads to the option of support rather than immediate death. In the United States of America, 1 in 3 kidney dialysis patients has diabetes. In the United States there are 26 cases of ESRF per 100,000 NIDDM. Translated to New Zealand, this is a minimum of 26 per year. In 1986, 22 patients with diabetes were placed on maintenance treatment at a cost of $3,006,000. These numbers have great potential for increase (Appendix 9).

There is good evidence that early and adequate treatment of hypertension delays the development of end-stage renal failure, and the need for dialysis and transplantation [4,5].

Diabetes in Pregnancy:

Gestational diabetics have a substantially increased risk of developing diabetes later in life.

Perinatal mortality rates are greatly increased in pregnancies with poor glucose control. These can be reduced to normal by adequate control of blood sugar during pregnancy and the availability of good obstetric, diabetic and neonatal care.

Major foetal malformation rates (intellectual handicap and birth defects) which are 2-3 times normal, are reduced to normal or nearly so by adequate blood sugar control at time of conception. Tallarigo and co-workers showed a significant increase in macrosomia and toxaemia when mean blood glucose was 5.6 mmol/l or less when compared to a group with mean blood glucose levels of 5.6 to 6.6 mmol/l [6,7]. Neonatal hypoglycaemia is a serious cause of brain damage in the infants of undiagnosed or poorly controlled diabetic mothers.

2 ANZ Transplant and Dialysis Register, 1987
7 Summary of the 2nd International Workshop - Conference on Gestational diabetes mellitus 34 Suppl 2: June 1985
QUESTION 6: What are the financial costs?

Through its complications, people with diabetes come under the care of many medical and surgical specialties. Costs are hidden in the budgets of these sub-specialties.

Costs to the Person with Diabetes:

Medical costs
Life insurance
Lifestyle restrictions unless "well-educated"
Loss of earning power through sickness, limitations in employment and possible early incapacity or death

Costs to the Community:

Hospital costs of approximately $80 to $100 million per year [1]
Loss of earning power during a person's working years
Costs of special medical procedures
(cardiac and vascular surgery; renal support programmes)
Costs of treatment to modify or prevent blindness

For example, $20,000 per year for one person with renal failure. End-stage renal failure can be delayed by early recognition and treatment of hypertension, even once kidneys start to fail. It is likely that earlier treatment plus normalisation of blood sugar levels will delay or prevent this happening [2,3] (Appendix 9)

Costs, both in terms of disease and money, are not well documented, nor is the personal and family suffering but they are considerable. In 1984 diabetes cost the United States US$20 billion in [1] direct costs of medical & paramedical care, hospitalisation, drugs & supplies (54%), plus [ii] indirect costs that included work days lost, pensions provided and loss of productivity (46%). There are similar estimates from Sweden.

On this basis, total community costs of diabetes in New Zealand would be approximately $450 million of which $242 million is in direct medical costs [4,5,6]. Studies from the USA, Sweden, Australia & New Zealand have demonstrated that intensive education programmes can make up to a seven-fold reduction in hospital costs [7,8]. Even if hospitalisation costs could be reduced by 50%, approximately $40 million per year would be saved.

REALISTIC NEW ZEALAND SAVINGS BY 1993: $40 MILLION

Hospital Bed Usage:

In a prospective study [1] on a predominantly European population there were 889 admissions by 689 diabetic people in one-year. Mean hospital stay was 20.1 days with the longest in those over 65 years of age. Bed occupancy was 4.8% with a diabetes prevalence in the community of 3%. This compares with a rate of 4.9% found prospectively in Hastings during a two-month period in 1983 [2].

<table>
<thead>
<tr>
<th>Days Stay</th>
<th>Costs per Patient (1987 rates)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-diabetes</td>
<td>7</td>
</tr>
<tr>
<td>Diabetes</td>
<td>20</td>
</tr>
<tr>
<td>Diabetes with Amputation</td>
<td>52</td>
</tr>
</tbody>
</table>

Cardiovascular disease contributed to over half of the 889 admissions. Those related to peripheral vascular and neurological disease, which are closely inter-related, were especially important in terms of total and mean bed stay.

<table>
<thead>
<tr>
<th>Primary Diagnosis</th>
<th>Bed Days</th>
<th>%</th>
<th>Mean Days Stay (sem)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycaemic Control</td>
<td>848</td>
<td>4.7</td>
<td>11.8</td>
</tr>
<tr>
<td>Infection</td>
<td>1065</td>
<td>6.0</td>
<td>24.2</td>
</tr>
<tr>
<td>Peripheral Vascular Disease</td>
<td>1371</td>
<td>7.7</td>
<td>30.5</td>
</tr>
<tr>
<td>Cardiovascular Disease</td>
<td>2845</td>
<td>15.9</td>
<td>16.4</td>
</tr>
<tr>
<td>Neurological Disease</td>
<td>2126</td>
<td>11.9</td>
<td>48.3</td>
</tr>
<tr>
<td>Renal</td>
<td>197</td>
<td>1.1</td>
<td>8.6</td>
</tr>
<tr>
<td>Eye</td>
<td>534</td>
<td>3.0</td>
<td>8.8</td>
</tr>
<tr>
<td>Social</td>
<td>2505</td>
<td>14.0</td>
<td>51.1</td>
</tr>
<tr>
<td>Other</td>
<td>6387</td>
<td>35.7</td>
<td>16.9</td>
</tr>
</tbody>
</table>

| 17878 | 100.0 | 20.1 | 1.1 |

Inadequacies of Department of Health and Hospital Admission and Discharge Data:

Our difficulties are compounded by clear evidence that New Zealand health statistics underestimate the true figures [1]. Extrapolation from overseas data leads to an underestimate of true figures because of our unique ethnic structure and high Maori rate for diabetes.

An Auckland study of 47 consecutive patients admitted for cataract surgery found 7 patients with diabetes although none was listed in the admission and discharge data [2]. In Hastings, diabetes was coded as first diagnosis 67 times in the whole of 1983. In fact, in the two-month period from 8 May to 11 July, there were 44 admissions of 39 patients with diabetes. Diabetes was coded as first diagnosis 10 times, second 5 times and third twice [3]. A detection rate of 38% at a time of a major diabetes admission survey illustrates our concern that there is an urgent need for accurate data where it is being measured, as well for data which is never recorded.

Middlemore Hospital admissions were studied in 1984 in an attempt to estimate costs to the hospital [4]. An alarming finding was that although Maori and Pacific Islanders had shorter bed-stays, they presented with the costly severe complications of diabetes a whole decade earlier than did Europeans. Details are given below* (also see Appendix 13).

Comment: There are grave defects in the statistical information available in New Zealand which make planning and resource allocation extremely difficult.

<table>
<thead>
<tr>
<th>*</th>
<th>Mean Age</th>
<th>Weight</th>
<th>Number</th>
<th>Chronic Renal Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>European</td>
<td>64 yrs</td>
<td>69 kg</td>
<td>157</td>
<td>1</td>
</tr>
<tr>
<td>Non-European</td>
<td>56 yrs</td>
<td>83 kg</td>
<td>66</td>
<td>21</td>
</tr>
</tbody>
</table>

(45 Maori
21 Polynesian)

Cost: Diabetes-Related Admissions: $798,528
Peripheral Vascular Disease: $267,840

3 McPherson IG (in preparation for publication)
QUESTION 7: What are the possibilities for reducing these costs?

Can we Cure Diabetes?

No, but we can modify some of its ill-effects.

There are two areas of rapid development which have implications for planning of immunology and transplant services, i.e., segmental pancreatic transplantation§, and detection and immunosuppression of those developing the slowly evolving beta cell destruction of IDDM*.

Can we Prevent Diabetes?

IDDM: No, but there is new information that raises the possibility of identifying those at risk of developing diabetes and the environmental factors that precipitate it. There are also methods of early intervention under development [1].

NIDDM: Yes, it is possible to reduce the incidence of NIDDM by means of education programmes.

The relative risk of developing diabetes in obese Maori versus non-obese Maori people was 4 times in males and 2 to 3 times in females [2].

In European populations prevalence rates dropped markedly along with food shortage and loss of body weight during both World Wars [3].

§ Segmental pancreatic transplantation appears to be the best form of transplantation at present. The "tail" or outer portion of the pancreas, together with splenic vessels, are removed from a donor and transplanted into the upper thigh of the recipient. In the best centres there is good patient survival and encouraging graft function. Worldwide experience expands exponentially and the possibility of this as a reasonable treatment option exists in the near future in New Zealand.

* Immunosuppressive therapy: If rapid advances in gene structure lead to identification of those at risk of developing IDDM, and this may occur within the next 5 years, screening of initially first degree relatives and later the whole population may lead to identification and intervention with appropriate drugs, and perhaps longer term, immunisation agains identified precipitating environmental factors.

2 Prior IAM. Proceedings, NZSSD Conference, 1983
Can we Prevent Short-term Complications?

Yes,

- By normalising blood sugar levels [1,2]
- By reducing infections [3]
- By reducing the risk of mortality from ketoacidosis
- By reducing the number of admissions for both this and for stabilisation of glycaemic control [4] (Appendix 10 and 13)

Christchurch figures suggest we can reduce New Zealand costs of admission by $40 million per year [5]

Can we Prevent Intermediate Complications?

We can reduce admission rates for intercurrent illness (pneumonia, urinary tract infections, etc), more prevalent when insulin deficiency and higher than normal sugars are present; Reduce loss of vision; Reduce mortality rates in coronary care units; Reduce toe and lower limb amputation rates; Normalise neonatal mortality and morbidity rates

Can we Prevent Long-term Complications?

We can delay the development of end-stage renal failure by good control of blood pressure, even when kidney failure is established [6].

There are indications that new drugs, used early, may delay or even prevent the onset of kidney failure.

---

In a Christchurch study of hospital admissions and bed occupancy [1], a large number of admissions were shown to be directly related to poor glycaemic control and problems with infections. Both these groups of problems can be expected to be avoided with appropriate early intervention and adequate patient education. Leucocyte function is dependent upon near normal blood sugar and insulin levels.

In an earlier study from the same group, 9 of the approximately 450 Type I patients who had attended an education programme required hospital admission. In contrast, over 70 from a similar pool of 450 Type I patients who had not been referred to the programme required hospital admission, i.e., the education programme had a marked influence on admission rate to hospital. Yet, less than 12% of all diabetic patients admitted to the Princess Margaret Hospital over a 10-month period had been referred to or attended an education programme.

The ability of education programmes to reduce both immediate and long-term diabetic problems and subsequent hospitalisation has been demonstrated in a number of studies to date, as reviewed in the article by Brown et al [1].

A diabetes education and control programme established in the south-east of Melbourne in 1984 co-ordinated by Professor Paul Zimmet and his team based at the Lions International Diabetes Institute at the Royal Southern Memorial Hospital, has achieved dramatic reductions in hospitalisation rates. To date this programme, using teams of educators and dietitians, has produced an 81% reduction in diabetes-related admission rates, and a 90% reduction in bed stay for diabetic patients (see Appendix 10).

Programmes using trained podiatrists have achieved substantial reductions in admissions for lower limb complications and may reduce amputation rates by over 50% [2]

Early detection and effective treatment of diabetic eye disease can markedly reduce loss of vision in Type I diabetes with proliferative retinopathy and also in Type II diabetes with maculopathy [3,4,5] (also see Section 5, Ophthalmic Diabetes Services).

Detection of gestational diabetes and appropriate treatment can virtually eliminate the morbid effects of diabetes on pregnancy for both the mother and child [6]

2 Most RS, Sincock P. The epidemiology of lower limb amputation in diabetic individuals Diabetes Care 6: 87, 1983
4 Pirart J. Diabetes neuropathy: A metabolic or a vascular disease? Diabetes 14: 1, 1965
In IDDM in particular, attention to maternal glucose regulation has virtually eliminated the problem previously associated with such pregnancies. Where good care is not available, however, substantial problems with malformation rates, neonatal macrosomia, intra-uterine death, postnatal death and maternal complications are commonplace [1].

The effect on ischaemic heart disease is less certain, but the Study Group of the European Atherosclerosis Society reports the present situation regarding factors that are common to coronary heart disease and diabetes and measures that are believed to affect them favourably. In particular, note is made of the well-established observation that control of blood glucose improves lipid abnormalities, and it is also established that such improvement is beneficial [2].

SECTION 2

SERVICES, AIMS, PHILOSOPHY AND DEFINITIONS

INTRODUCTION

Future developments in health care planning will involve development of preventive and early detection programmes in the community, as well as better hospital ambulant and community-based resources.

The guiding principle of diabetes management is that of shared care; care shared between those with diabetes and those trained to help with its management.

The person with diabetes plays the substantial role in managing the disorder which varies with the individual's abilities and disabilities.

Health professionals must be organised in such a way as to offer their expertise most appropriately and efficiently. Individual patients will have different needs at different times, thus care of those with diabetes must be shared with the patient and many professional people. The system established must be flexible to meet varying needs.
AIMS AND PHILOSOPHY

Prevention, Detection, Education and Treatment:

Programmes must be developed in consultation with the community. In this way it will be possible to ensure that programmes are:

- Aimed at the appropriate group
- Culturally sensitive
- Effective

Given the multi-cultural nature of New Zealand society and the high prevalence of diabetes amongst the New Zealand Maori, Pacific Island, Indian and Asian people, it is recommended that, where possible, health workers have an appropriate cultural mix. The particular status of the Maori as the Tangatawhenua should be recognised in keeping both with the Treaty of Waitangi, and the recommendations of the New Zealand Board of Health Standing Committee on Maori health:

- "That Maori health issues be addressed by the involvement of a greater number of Maori people in the delivery of health services and the setting of priorities
- That for Maori people, the health team must have the support of the Maori community and should include both Western-trained health professionals and those trained in Maori schools of learning
- That training programmes should reflect the bicultural nature of New Zealand society. If teaching institutions are unable to adequately prepare people, they should contract out to those organisations equipped to do so"

Access to Medical and Educational Resources:

All persons with diabetes should have equal access to adequate medical and educational resources to become confident in self-management.

Personal Health Maintenance should be the goal of everyone with diabetes

General Practitioners and associated health professionals will care for and advise all people with diabetes in collaboration with diabetes resource and service teams, using consensus guidelines for shared care.

Review Programmes: Systematic programmes for regular educational and medical review should be implemented to promote adequate metabolic control and to detect diabetes complications at an early treatable stage.

Priority: A major priority of a diabetes service or resource team is to co-ordinate the efforts of those involved in diabetes management, including the person with the disorder. This is very important as diabetes occurs at all ages and continues throughout life.

Access to resources by persons who are trying to maintain their own health is fundamental
Specialist Resource Teams

Primary Care

Individuals with Diabetes

Other Community and Lay Workers
Planning groups within hospital boards must build into their service planning structure very specific methods by which the measurement of effectiveness can be documented and reported.

1) **Adequate evaluation and audit plans** should be built into the development of any new service.

2) This **accountability and evaluation** could be simple or elaborate. For example, merely drop-cards at the place of first patient contact, or as complex as the use of computer registers to assess on-going adequacy of coverage and outcome.

3) **All health professionals** should be trained and subjected to the same standards of evaluation assessment.

4) A percentage of the budget should be set aside for **research and development of better statistics and evaluation** of diabetes services.

5) **Diabetes mellitus lends itself to the evaluation of cost-saving methodologies** [1].

One regional health area may be matched against another in terms of bed-stay or admissions to hospital for preventable disorders such as ketoacidosis, infections associated with diabetes and visual impairment. Even simple studies such as measurement of glycaemic control could be compared between centres.

**SERVICE DEFINITIONS**

Effective management demands an association of professionals with specialised skills, related to diabetes, who work closely together as a multi-disciplinary advisory team.

**DIABETES SERVICE GROUPS**

These teams which will vary in size according to region, act as a resource to support the consumer and primary health care professionals and volunteers across a wide range of services, extending from the community through to the most developed hospital specialties. Suggested teams are:

1) National Referral Centres
2) Diabetes Service Teams
3) Community-based Resource Teams

---

1] National Referral Centres:

These units are needed for the care of those with such disorders as:

- complex diabetic retinopathy
- end-stage renal disease
- those needing microvascular surgery

New scientific advances such as immunotherapy, segmental and islet cell transplantation, would be developed in such centres.

National Referral Centres should have the special resources and skills necessary to prepare educational material for people with diabetes and for the training programmes for all categories of health workers involved in their care.

National Referral Centres must encourage, emphasise and be involved in basic, clinical and epidemiological research. Without this, as at present, diabetes services become inefficient and unnecessarily costly (see Appendices 5 and 13).

It is envisaged that there would be a number of such National Referral Centres. These would normally be associated with a university teaching hospital and an appropriate grouping of diabetes specialists and consumer groups.

2] Diabetes Service Teams

Teams should be established in population centres of 30,000 or greater. Teams would include:

- Diabetes Nurses
- Ophthalmologists
- Social Workers
- Dietitians
- Podiatrists
- Clinical Psychologists
- Medical Staff
- Administrative Staff
- Allied Health Workers

In larger centres teams would be based in separate facilities, frequently in a "diabetes centre", and should:

- Be situated in close proximity to a hospital
- Allow patients easy access
- Be less "institutional" than the usual outpatient services
- Have close functional relationship with laboratory and in-patient services and, most importantly, ophthalmology services

In smaller areas, hospital outpatient clinics may be suitable, provided ease of access and co-ordinated care can be provided.

Diabetes centres located adjacent to hospitals would be ideal.

Function:

Service teams should be given delegated management responsibility to provide outpatient and inpatient clinical management and educational services for patients, the community and health professionals. It is anticipated that service teams will work in collaboration with consumer groups, general practitioners and community health personnel, using consensus guidelines mentioned in the objectives.
Outside the Diabetes Resource and Education Centre, Auckland.

Marion Moore, Diabetes Educator, and Daniel Taylor, aged 9 years, with a blood glucose monitor (Diabetes Review, 24(6): June, 1988).
Community-Based Resource Teams:

It is recommended that area health boards encourage the development of small community-based services, incorporating a dietitian and registered diabetes nurse educator. Allied health workers may also be included.

These are small teams that provide education for diabetic patients and their families, on referral from general practitioners. Funding could be entirely by area health boards, supplemented by private or insurance funding, or could be subsidised by private funding. They could be based occasionally or totally on maraes, in church halls, community houses, Plunket rooms, doctors' surgeries or in their own facilities, but would always receive help from the diabetes team and general practitioners.

Nutrition and general health education for allied disorders such as obesity, hypertension, hyperlipidaemia and coronary artery disease and asthma, could be provided in conjunction with or even by such teams. This approach is particularly suited to small communities and can be tailored to suit Maori health needs. Educative, preventive and detection programmes could be implemented through such groups.

General Practitioners and their teams will have a major and continuing role in the co-ordination of diabetes detection and care, but as the disorder's management is changing so rapidly, frequent assistance from resource teams will be required.

PERSONNEL

Dietitians in New Zealand are university graduates competent to provide nutrition education and counselling for people with diabetes. In larger centres, this function should ideally be co-ordinated by a dietitian who has special training in this field. Dietitians are health professionals with the specialised knowledge and training to undertake the following:

- Nutritional management of inpatients.
- Nutrition education and counselling of persons with newly diagnosed diabetes. Each diet prescription should be tailored to individual needs, circumstances and preferences.
- Follow-up nutrition counselling and education.
- Continuing education of colleagues, other health professionals and lay health workers, for example, Maori health workers.
- Planning and participation in public nutrition education programmes (preventive).
- Liaison and consultation with other members of the health care team.

ALL people with diabetes must see a dietitian on diagnosis and for regular review of the nutritional management of their condition [1] though it is believed that many are not referred [2].

2 Personal communication from Higgins C et alia, Sumner Study of 1 in 2 of all general practitioners in Canterbury, New Zealand, 1985.
Patients make food choices in a "hands-on" dietetic teaching session.

Translating theoretical knowledge at the family level.
Medical Staff:

As is outlined throughout the report, general practitioners or family doctors will provide all primary care with their own teams of health professionals. In smaller centres and with regionalisation, general practitioners are likely to work in close communication with the nearest diabetes resource team and physician.

Specialists should be diabetologists (trained diabetes specialists), endocrinologists or physicians with a special interest and training in diabetes. Other medical staff may include paediatricians, chemical pathologists, registrars-in-training, house physicians, general practitioners and medical officers of special scale.

The physician should have a special interest in diabetes and be available for consultative and liaison purposes with other team members, including outpatient and ward areas, patient education, meetings for service planning, and education of other professionals (Appendix 4).

Ophthalmologist:

The ophthalmic specialist(s) should have a special interest and training in evaluating and medical and surgical management of retinal vascular disease and cataract. They should be available for consultative and liaison work, in hospital or community, as is the physician. (See Section 5). They should:

- Identify people with a high risk of retinal (eye) damage
- Direct the primary screening, monitoring and ophthalmic educational programmes undertaken by the diabetes service team in the community, diabetes centre or hospital diabetes clinic, and organise liaison with general practitioners in eye management
- Ensure an effective and appropriate distribution of ophthalmic staff and equipment resource between peripheral areas and the specialised hospital ophthalmology department, which meets the needs of the community and achieves the object of prevention, early detection and treatment of diabetic retinopathy.
- Train and ensure continuing competence, quality control and cost-effective use of the service where general practitioners, ophthalmic nurse/technician/educator, medical retinal photographer, or other medical staff are employed in programmes.
- Undertake specialised eye assessment and treatment
- Train ophthalmic registrars in management of diabetic eye disease
- In some centres, be involved in basic, clinical and epidemiological diabetes research
The Role of the Diabetes Nurse (Nurse Educator):

These are registered nurses who have undertaken additional training in the management of people with diabetes mellitus and who are competent to carry considerable and clinical responsibilities which include:

- Education of diabetics and their families
- Education of colleagues and other health professionals
- Liaison with practice nurses and general practitioners
- Initiation of insulin therapy and, where requested, on-going daily advice on insulin requirements.
- Development of public awareness programmes
- Education of, co-ordination of, and/or liaison with lay and support groups, for example, Maori health workers, diabetes societies.

These require close liaison with the physician or general practitioner who has developed the management programme and takes responsibility for the prescription and use of drugs.

Podiatrists:

These are specialists trained in foot care. Their role includes education on foot care to prevent complications, and the provision and management of foot problems, in consultation with patients' general practitioners and physicians. General podiatry training should be supplemented by specialised courses in diabetes foot care at appropriate centres of excellence. The aims of podiatry services are:

- To educate diabetics on foot care and to help them realise the importance of this care, thereby reducing hospital admissions.
- To provide clinical treatment to those suffering from diabetic foot problems, in consultation with the patient's physician
- To prescribe custom-made orthoses and padding appliances
- To research various aspects of diabetic foot complications thereby contributing to overall improvement in knowledge and treatment techniques

Secretarial and Administrative Staff:

Adequate numbers of senior secretarial and administrative staff are vital. They collect essential and confidential statistics and optimise the use of the other skilled professionals in the team. They should significantly ease patient contact through their receptionist role. This key public relations and first-contact role is also essential in the shared care concept between general practitioners and the diabetes resource team.

Social-Workers and Clinical Psychologists:

Psychological, emotional and social problems are widespread amongst diabetic people and their families. The consequent major disruptive effects warrant the inclusion of a social worker and clinical psychologist in the team who should be used in classes, assessments and for on-going support and counselling.
Allied Health Workers:

This term recognises the input of the community into health care programmes. This input will vary from simple secretarial support to the use of trained community health workers who may be involved in particular programmes such as the Whaiora Health Workers in South Auckland. The need for training will depend upon the work carried out.

Stability of staffing is essential to promote effective working relationships, especially as the roles of individual members will overlap. This can be encouraged by selecting staff of adequate seniority, providing good working conditions and by support for the teams by the contributory professional group.

EQUIPMENT AND FACILITIES

Computer Registers:

Computerised registers are seen as vital for such service groups to achieve cost-effectiveness. They should be established by all national referral centres and diabetes service teams and, where possible, in the general practice setting. All registers must contain standard minimal demographic and clinical data, and standards should be developed in collaboration between the New Zealand Society for the Study of Diabetes and the Royal New Zealand College of General Practitioners.

Day Treatment Unit:

This should be a physical space adjacent to that allocated to the diabetes service team. This unit should contain several beds and armchairs, and there should be space for storage and an area to undertake simple laboratory procedures.

Optimal use of such a facility will reduce the need for hospital admission of patients currently admitted for education, stabilisation, review of glucose profiles and similar procedures.

Inpatient Beds:

Two New Zealand studies have shown that approximately 5% of hospital inpatients have diabetes. A substantial portion are in hospital because of their diabetes, or because their diabetes is of special concern in the management of other disorders. These patients would be under the care of a number of specialties, but patients with diabetes-related medical problems should be aggregated under the care of a specialist diabetes physician.
The Diabetes Centre, Christchurch.
SPECIAL CONSIDERATIONS

Ophthalmic Diabetes Services:

Screening and monitoring is not entirely effectively achieved by general practitioners and physicians [1]. This is evidenced by the large number of patients who present initially with established vision loss from diabetic retinopathy. It is proposed that effective screening and monitoring programmes for diabetic retinopathy will only be achieved if the ophthalmic service crosses the boundary from the hospital eye department to the proposed diabetes services/diabetes centre/hospital diabetes clinic. Such ophthalmic involvement has many advantages for the patient and the team.

In its early stage, retinopathy is occult and does not affect vision. Early diabetic retinal disease can be detected reliably only by skilled examination of the retina (ophthalmoscopy), or by retinal photography, both through dilated pupils. Testing of visual acuity alone is inadequate.

(See recommendations in Section 5)

Children and Adolescents with Diabetes:

Children and adolescents with diabetes must be cared for by service teams with paediatricians and/or physicians with a special interest and skills in these age-groups, with primary responsibility for their diabetes management.

In these age groups there are separate and specific problems and the skills required of medical and paramedical staff must be appropriate. Wherever possible there should be separate clinics. In the case of adolescents, evening programmes may be very necessary.

Management needs to be structured to avoid, if possible, any reinforcement of the "sick role" and to be geared to the level of the age group.

Educational programmes should frequently be activity-based, i.e., camps, sporting activities and trips which should be used as practical learning opportunities.

Parents and siblings should be encouraged to attend organised programmes so that they gain a good understanding of diabetes and can handle any problem that may occur. However, family education should not be automatically undertaken at the same session as the child or adolescent.

Diabetes Education:

Education is the foundation upon which good diabetes care is built. It must be an integral part of the health services provided for diabetics by area health boards and hospital boards at all levels.

1 Diabetes Update, Division Diabetes control, CDC, 7(1): 1-11, 1988
Reduction in hospital stay should release resources for the expansion of ambulant care facilities and promote more "self-help" health maintenance through the provision of improved education.
Programmes should be tailored to the needs of the individuals or groups being taught, i.e., ethnicity or age, and should include sessions on:

- Understanding Diabetes
- Food and Diabetes
- Exercise and Diabetes
- Oral Hypoglycaemic Drugs
- Insulins and Insulin-injecting
- Insulin Adjustment
- Hyper- and hypoglycaemia
- Care of the feet, teeth, eyes, etc
- Coping with illness, "sick days, stress"
- Alcohol and diabetes
- Travelling
- Self-management of blood sugar
- Self-adjustment of treatment

The identification of special needs of individuals during the initial stages of educational programmes or in the post-programme questionnaires, would enable patients to receive subsequent individual tutorial instruction on a one-to-one basis in special areas such as:

- Diet planning
- Exercise programmes
- Lifestyle changes
- Relationships
- Personal or family problems
- Emotional difficulties

The association with other diabetics at these sessions is also of advantage for mutual support, providing a resource person is present [1]

Pregnancy Screening:

At 28 weeks gestation, all pregnant women must be screened for diabetes. At present this takes the form of a 50 gram polycose load with blood glucose measured at one hour. If the glucose level is less than or equal to 7.8 mmol/L, a full glucose tolerance test is required. Women with a higher risk of developing diabetes should be screened more frequently.

Pregnancy Management:

Those with hyperglycaemia or diabetes require combined diabetes-obstetrics care.

Diabetes Obstetric Services:

Meticulous blood glucose control is vital in modern pregnancy management. Close co-operation in the care of diabetes in pregnancy between a physician, an obstetrician and a paediatrician, - all with a special interest in diabetes - together with a diabetes nurse and a dietitian, is mandatory.

Wherever possible, appropriate clinics should be jointly staffed. Efforts should also be concentrated on the establishment of pre-pregnancy clinics to obtain normal blood glucose levels at the time of conception, so as to reduce the risk of perinatal mortality, intellectual handicap and congenital malformation of the foetus. Pregnant diabetic patients should be seen almost weekly throughout pregnancy, and it should be realised that the care of these patients will require a good deal of medical time.

Liaison between diabetologists, paediatricians and general practitioners is also desirable and joint clinics should be established wherever possible.

Nephrology Services:

The importance of diabetes to the workload of nephrology services in New Zealand is outlined in Section 1 and also in Appendix 8. On present indications the financial and man-power implications are major.

Hours of Service

As a minimum, diabetes service teams will be accessible to give advice to general practitioners and their patients during the working week. Ideally, in larger centres this would extend to night-times and weekends. Staffing should also allow out-of-hours teaching programmes for day-time workers and adolescents.
To ______________________

Please return or renew by

13 JUL 2001

Please pack carefully if returning by post

MINISTRY OF HEALTH
MANATU HAUORA

133 Molesworth Street
PO Box 5013, Wellington
Tel (04) 496-2133
1] Strategies for the prevention of NIDDM are to:

- be developed as a package to promote healthy and active living
- reduce the incidence of "life-style" disorders
- be tailor-made for and targeted at those at risk

Programmes include:

- Nutrition guidelines for New Zealanders*
- Knowledge of gains from non-smoking, regular and appropriate exercise, improved self-esteem, general health
- Aims to maintain ideal body weight throughout life
- Diabetes awareness - the requirement to have regular blood sugar testing.

The primary objective is to reduce the prevalence of obesity

---

*NUTRITIONAL GUIDELINES FOR NEW ZEALANDERS*
Department of Health Publication No 4158, 1987

Eat a variety of foods
Maintain weight within a reasonable range
Eat adequate dietary fibre
Keep sugar, salt, fat & alcohol consumption to a minimum

The aim of these nutrition guidelines is to encourage people to select wisely from the choice available while eating the kinds of food they enjoy. Wise food choice should not take away the enjoyment of food preparation or consumption. No guidelines can guarantee health and well-being; health is dependent on factors such as heredity, lifestyle, mental health, environment, personality traits and personal attitudes. Good eating habits based on moderation and variety can help maintain and even improve your health.
Rosenstock's concept of breakdown in health maintenance upon discovery of a biochemical abnormality - without professional health education.
2] Strategies for the longer-term prevention of IDDM:
* Screening and identifying for "at risk" families
* Educating such families on new factors which may delay the development of diabetes (ie., diet, etc).
* Immunising designated "at risk" subjects against appropriate viral agents
* Promoting New Zealand-based diabetes research

3] Targets for Programmes to Prevent Diabetes Mellitus:
* Women who have had gestational diabetes should be primary targets as their susceptibility to diabetes is established.
* People with a family history of diabetes, especially if obese
* Maori and other susceptible ethnic groups
* Obese people
* The elderly

4] Design and Implementation of Prevention Programmes:
Traditionally, the District Offices of the Department of Health have had a major role in health promotion. Health development units within newly constituted area health boards will take over this function as their "raison d'etre". This function should be carried out in conjunction with voluntary agencies such as:
* Maori Women's Welfare League
* Obesity and dietary outpatient clinics in hospitals
* The Cancer Society
* Heart Foundation
* Diabetes societies
* Schools and Parent-Teacher Associations
* Church groups

Contributions from the-diabetes teams may include:
* providing resources and ideas
* "teaching the teacher"
* direct contact with clients - individually and/or in groups

Co-operative effort in consultation with client groups ensures:
* credibility and relevancy
* maximum utilisation of scarce resources
* avoidance of duplication or conflicting messages

Strategies for the prevention of diabetes are similar to those for preventing other lifestyle diseases, especially:
Cardiovascular disease (heart attack, stroke, hypertension)
Some types of cancer which may be related to food (bowel)
Diverticular disease of the bowel
Degenerative arthritis
Osteoporosis and fractured hips
Programmes Should Include:

- Nutrition guidelines for New Zealanders
- Non-smoking education
- Strategies for appropriate exercise routines
- Improved self-esteem and self-determination
- Diabetes awareness so that early detection is achieved

The cause of obesity is complex. Incidence is affected by:

- Cultural factors
- Socio-economic factors
- Family history
- Exercise habits
- Eating habits
- Mental health factors, especially self-esteem.

Therefore the cure is also complex and long-term success rates are low. Prevention, starting early in life, may be a more viable option.
SECTION 4

SERVICE LEVELS REQUIRED

RECOMMENDED STAFFING

Current workforce levels are extremely low (see Appendix 5). Minimum recommended workforce levels must be achieved within 5 years. Each board should plan to achieve recommended staffing levels in the next 10 years.

The 10-year figures are derived from careful estimates of likely minimum contact times for each patient seen (new or yearly assessment) from the best available epidemiological data*. Conversion of these figures to service workloads are presented in Appendices 2-4.

The five-year goals are minimum figures derived by arbitrarily reducing the calculated and necessary staffing levels. Only the 10-year requirements would be cost-effective in reducing hospital bed occupancy to achievable and realistic levels.

Area health boards should look at their own catchment populations and divide or multiply the FTE (Full-Time Equivalent, i.e., one person working full time) set out for populations of 100,000. Examples of the structure of such services, as relating to particular population levels, is set out in Section 2.

* Epidemiological Data:*

### Insulin-Requiring Diabetes:

<table>
<thead>
<tr>
<th>Age-Group</th>
<th>Prevalence per 100,000 age-matched population</th>
<th>Prevalence per 100,000 total population</th>
<th>Incidence per 100,000 population</th>
<th>Incidence per 100,000 age-matched population</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-19</td>
<td>100</td>
<td>30</td>
<td>11.9</td>
<td>4.0</td>
</tr>
<tr>
<td>20-90</td>
<td>450</td>
<td>300</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>All Age-Groups</td>
<td>350</td>
<td>330</td>
<td>14</td>
<td>10</td>
</tr>
</tbody>
</table>

### Non-Insulin-Requiring Diabetes:

<table>
<thead>
<tr>
<th>All Age-Groups</th>
<th>Prevalence per 100,000 population</th>
<th>Incidence per 100,000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Obese</td>
<td>600</td>
<td>200 per year</td>
</tr>
<tr>
<td>Obese</td>
<td>2400</td>
<td></td>
</tr>
</tbody>
</table>

* The best available NZ figures are supplied by Dr RS Scott. IDDM prevalence rates expressed per 100,000. The 0-19 age-group represents only one third of the total population and IDDM rates in respective age groups are altered accordingly. NIDDM incidence is estimated at 200/100,000 (USA and Australian figures).
Requirement for Other Specialties:

<table>
<thead>
<tr>
<th>Specialty</th>
<th>10-Year Goal</th>
<th>5-Year Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urology</strong></td>
<td>0.025</td>
<td>0.025</td>
</tr>
<tr>
<td>Particularly for impotence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in men and atonic bladders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>caused by neuropathy</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Neurology</strong> (for neuropathies):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Currently there is little input; thus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>the requirement is difficult to estimate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vascular Surgery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac Surgery</td>
<td>Some sessional time each week</td>
<td></td>
</tr>
<tr>
<td>Community Health Nursing</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Epidemiologists and Research Workers:</strong></td>
<td>Not evaluated</td>
<td></td>
</tr>
</tbody>
</table>
# Principal Staffing Needs for Diabetes Services for 1993

**General Practitioners & Medical Centre Teams** 0.5 (per GP) 3.5 sessions/week/100,000

Diabetes Service Teams

<table>
<thead>
<tr>
<th>Position</th>
<th>FTE/100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietitian</td>
<td>1.5</td>
</tr>
<tr>
<td>Diabetes Nurse</td>
<td>2.0</td>
</tr>
<tr>
<td>Medical Specialists: Adults</td>
<td>0.5</td>
</tr>
<tr>
<td>: Juveniles</td>
<td>0.016</td>
</tr>
<tr>
<td>Podiatrist</td>
<td>0.3</td>
</tr>
<tr>
<td>Social Worker</td>
<td>0.2</td>
</tr>
<tr>
<td>Psychologist</td>
<td>0.1</td>
</tr>
<tr>
<td>Clerk/Administrator</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Ophthalmologists 1.5

Medical Retinal Photographer 0.3

Others Workers 0.3

Nephrologists 0.05

Obstetrics Service Teams

<table>
<thead>
<tr>
<th>Position</th>
<th>FTE/100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstetrician</td>
<td>0.05</td>
</tr>
<tr>
<td>Diabetologist</td>
<td>0.05</td>
</tr>
<tr>
<td>Diabetes Nurse</td>
<td>As above</td>
</tr>
<tr>
<td>Dietitian</td>
<td>As above</td>
</tr>
</tbody>
</table>

Other Specialties

<table>
<thead>
<tr>
<th>Specialty</th>
<th>FTE/100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urology</td>
<td>0.025</td>
</tr>
<tr>
<td>Neurology</td>
<td></td>
</tr>
<tr>
<td>Vascular Surgery</td>
<td></td>
</tr>
<tr>
<td>Community Health Nurses</td>
<td>Some sessional time per week</td>
</tr>
</tbody>
</table>

Epidemiologists Not evaluated

Diabetes Research Workers Not evaluated
The friendly, relaxed approach of a non-uniformed dietitian
FACILITIES

Laboratory Facilities:

An adequate biochemistry service capable of undertaking audited glycated protein assays such as serum fructosamine and glycated haemoglobin estimations, thyroid hormone tests, and a range of clinical biochemical tests including urea, creatinine, liver function tests, urinary albumin and ketone estimation, is required.

Tests available on a referral basis should include urinary micro-albumin and C-peptide levels. Adequate provision should be made for referral to the appropriate laboratory facilities.

Space Allocation, Utilisation and Special Design Features for Diabetes Resource Teams:

Provision should be made for the following areas:

- A comfortable, non-institutionalised waiting room for patients and relatives (which may double as meeting room or additional teaching room)
- Reception area and secretarial office, (large enough to also accommodate voluntary workers) with computer terminals, photocopier, facsimile machine, telephones, and file-storage.
- Office space for doctors, nurses and dietitians, with telephone services* and computer terminals (linkage to other hospital computers, especially to laboratory services, is highly desirable).
- Examination rooms, including blood testing and ophthalmic facilities (Appendix 5)
- Teaching room for group sessions with adequate "black-out".
- Area for library and information service, with a photocopier
- Tea-making and food-preparation areas and dining room, with adequate space for food teaching purposes
- Toilet facilities
- Storage areas for equipment.

* With sufficient lines. Much work is accomplished by telephone, saving both patient and staff time.
Supplies and Equipment:

Area Health boards need assistance with such matters as tendering for insulin syringes, blood glucose monitoring sticks, urine glucose monitoring sticks, and the range of insulins and oral hypoglycaemic drugs. This includes advice on the validity of saving money by purchasing cheaper generic drugs. Advice on the provision and maintenance of devices such as blood glucose meters and insulin pumps is also required.

Equipment required will include teaching aids such as films, projectors, charts, tape recorders and such material as food models, brochures and information sheets, books and pamphlets on various aspects of diabetes. It may be important to translate this material into languages other than English, and this is particularly important in areas such as Auckland.

Every national referral centre and every diabetes service team should have a computer able to provide an adequate patient database capable of analysis and retrieval of long-term data, word-processing facilities, statistical and graphic software to assist evaluation of care. As mentioned in Section 2, the minimal requirements for such database should be developed in consultation with the New Zealand Society for the Study of Diabetes and the Royal New Zealand College of General Practitioners. Where possible, computer linkage with laboratory services and Health Department services should occur. Stand-alone computers may be suitable for interactive teaching programmes but, within a major unit, multi-user capability is essential.

Inpatient Beds:

3% of all hospital beds are required for the management of diabetes or its complications (currently 5% are used). It is strongly recommended that of these, half should be under the direct control of a specialist diabetes physician.

STAFF TRAINING

Basic Professional Training:

Increased emphasis needs to be placed upon training specialist medical staff (diabetologists, paediatricians with diabetes interests, ophthalmologists), to meet the minimum suggested levels in the next five years.

It is appreciated that the Guidelines call for a substantial increase in the number of dietitians in particular. This will require an increase in the number of dietitians in training and specific plans should be made by the training schools to increase the numbers of Maori and Pacific Islanders entering the profession. Consideration could be given to providing a special admission scheme for Maori and Pacific Island students to the Department of Consumer and Applied Science of the University of Otago.
Specialist Diabetes Training (nurses and dietitians):

Initial Training

Each year an intensive 2-3-week course is currently available at the Wellington Polytechnical College. Other courses are likely to be developed in other polytechnics in the future. This is open to registered nurses or dietitians. Certificates of competence are awarded on completion of the course.

In Australia, well-established short courses are also available to diabetes nurses and dietitians at:

- Royal North Shore Hospital, Sydney
- Prince Alfred Hospital, Sydney
- Newcastle Diabetes Centre, Newcastle
- Parramatta Hospital, Sydney
- Royal Southern Memorial Hospital, Melbourne

Most of these have been running for 10 years and accept New Zealand entrants by arrangement. It is strongly recommended for diabetes nurses and dietitians to attend one of these courses, either before or shortly after commencing their positions. Similar courses should be attended at least every three years for continued educational purposes.

Continuing Education

In a rapidly changing and developing field, adequate regular conference leave must be a vital part of all job descriptions for all professional staff. There must also be adequate time available each week for training and discussion within each diabetes service team.

Other Health Professionals:

The importance of providing education for other health professionals outside the team must be emphasised. Hospital nurses and doctors, health inspectors, district nurses, general practitioners and practice nurses, medical students, etc., must all be considered and their needs met.

Allied Health Workers: (Voluntary and lay paid workers)

Currently there are no training programmes for such people but it is envisaged that training will be variable depending on the circumstances of individual areas and people, and it is anticipated that more formal training programmes will be developed at polytechnics and community colleges for some cultural groups.

Workers in Isolated Areas:

A close functional linkage will need to be organised between individual diabetes workers in small or isolated areas by way of association with the main diabetes resource team in the geographic area for regular educational up-dating and half-day conferences.
Minimum Staffing Requirements (full-time equivalents/100,000 population):

<table>
<thead>
<tr>
<th>SERVICE AND RESOURCE TEAM</th>
<th>10-Year Goal</th>
<th>5-Year Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dietitian</strong></td>
<td>2.0</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Diabetes Nurses</strong></td>
<td>2.5</td>
<td>1.8-2.0</td>
</tr>
<tr>
<td><strong>Specialist Medical Staff</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetologist</td>
<td>0.7</td>
<td>0.5</td>
</tr>
<tr>
<td>Paediatrician</td>
<td>0.016</td>
<td>0.016</td>
</tr>
<tr>
<td><strong>Podiatrist</strong></td>
<td>0.5</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Social Worker &amp; Psychologist [1]</strong></td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Clerk-Administrator-Computer Operator-Receptionist</strong></td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Every unit should provide full-time cover, possibly shared with other community health maintenance services (asthma, hypertension, etc) in smaller areas. More than one FTE performing a mix of tasks, is required in larger units.

**Related Services**
- Ophthalmologist (Section 5) | 3.0 | 1.0-1.5 |
- Medical Retinal Photographer | 0.5 | 0.3 |

**Other Workers**
- Health Department Nurse
- Screening Assistant | 0.5 | 0.3 |
- Educators
- Paid Lay Workers

**Nephrology (see Appendix 9)** | 0.1 | 0.05 |

No specific figures are available. Increased resources will be required unless present trends can be reversed.

**Obstetrics **
- Obstetrician | 0.05 | 0.05 |
- Diabetologist | 0.05 | 0.05 |
- Dietitian | Included Above |
- Diabetes Nurse | Included Above |

**Primary Care [2]:**
Each patient will also require 2.5 hours per year from the general practitioner (4 routine half-hour visits and one half-hour review per year. 20 diabetics (3 IDDM, 17 NIDDM) x 2.5 hours = 50 hours per year. In addition, each GP will provide half an hour per week for detection and prevention of diabetes. It is calculated that each general practitioner would therefore devote 0.5 sessions per week to diabetes.

---

* Allows one 15-minute review per patient per year
** These recommendations are calculated for average birth rate and population structure. Areas with high birth rate & high incidence of diabetes require more staff & resources.

AIMS:

- That diabetics and their health-care-providers be aware that thorough and competent regular eye examinations are crucial to blindness prevention.

- That emphasis in eye care be shifted to education, prevention, early detection and early treatment of vision-threatening retinopathy.

- That screening for and monitoring of diabetic retinopathy should be routinely accessible to all diabetics. Specific recommendations for frequency of eye examinations and identification of the ophthalmic facility for this purpose within each community setting, be part of diabetes education.

- That every diagnosed diabetic in New Zealand be in the care of an ophthalmologist (medical eye specialist).

- To reduce the incidence of eye disease with significant established vision loss at the time of detection by 80%, and of legal blindness by 50% within ten years.

BACKGROUND:

Ocular complications of diabetes are the leading cause of new cases of legal blindness in subjects aged 20 to 74 years in the United States. Diabetes-related visual morbidity greatly exceeds blindness prevalence. New Zealand is similar to the United States but Maori and Pacific Island Polynesians have more eye disease. Complications which lead to blindness are:

Diabetic Retinopathy and its sequelae are the single largest cause of this blindness, affecting particularly the economically productive age-group of 20 to 65 years.

In developed countries, about 30% of NIDDMs have retinopathy at diagnosis. 60-80% of IDDMs will have developed retinopathy after about 20 years duration. Onset of retinopathies related to duration of diabetes, age and control of glucose metabolism.
There are two vision-threatening forms of diabetic retinopathy which develop at varying rates following onset of retinal microvascular disease. They are:

- Retinal vascular proliferation (proliferative diabetic retinopathy)
- Fluid (oedema) in the macula associated with abnormalities of the retinal capillaries (maculopathy)

Early identification of the patient at risk and adequate early photocoagulation treatment can prevent blindness in at least 95% of IDDM with proliferative or pre-proliferative disease and about 60% of NIDDM with proliferative retinopathy and/or macula oedema [1,2,3,4]

The proportion of diabetics who will eventually develop vision-threatening retinopathy in New Zealand is estimated to be 15-30%, there being great variation in prevalence in reported studies [5]

Currently, a significant number of long-standing and newly-diagnosed diabetics present to ophthalmologists with advanced eye disease and established irreversible vision loss which reflects inadequate screening and monitoring programmes.

Controlled clinical trials indicate that photocoagulation treatment of early proliferative or pre-proliferative retinal vascular disease and macular oedema (maculopathy) when vision is threatened rather than lost, achieves the best long-term visual results.

Cataract (lens opacity):

The prevalence of cataract is currently greater in the diabetic population and onset is earlier. Intra-ocular surgery is higher risk. Management of combined cataract and vision-threatening diabetic retinopathy is difficult, time-consuming and the visual results are often poor.

Occlusive Disease of Retinal Veins (clotting of the blood in small veins) occurs more frequently in diabetics.

Advanced Diabetic Eye Disease:

Uncontrolled small blood vessel disease of the retina can lead to:

i Chronic macular fluid (accumulated fluid near the nerve head)
ii Intractable glaucoma (raised pressure in the eye) and
iii Traction retinal detachment (scarring of the retina), all of which are blinding and require time-consuming advanced, complex surgical management if some vision is to be preserved [6,7,8].

The feasibility of undertaking vitreoretinal surgery which may be necessary to control advanced vascular proliferation and retinal detachment, and to prevent intractable glaucoma, is severely compromised in New Zealand in comparison with Australia, the USA and Europe because an argon laser which can deliver intraoperative photocoagulation is vital to success and is not available in any centre in New Zealand.
Management of the ocular complications of diabetes is complex, costly and time-consuming. Skilled ophthalmic surgeons with adequate advanced specialised training and sophisticated, expensive surgical equipment are essential to treatment success [6,7,8].

Requirements for improved detection & management of diabetic retinopathy

Screening and Monitoring:

That screening and monitoring is not effectively achieved by general practitioners and physicians in general is evidenced by the large number of patients who present initially with established vision loss from diabetic retinopathy [9].

It is proposed that effective screening and monitoring programmes for diabetic retinopathy will only be achieved if the ophthalmic service crosses the boundary from hospital eye department to the proposed diabetes service team/diabetes centre/hospital diabetes clinic. Such ophthalmic involvement has many advantages for the patient and the team.

Community screening for diabetic retinopathy is effective [10].

In its early stage, retinopathy is occult and does not affect vision. Early diabetic retinal disease can only be detected reliably by skilled examination of the retina (ophthalmoscopy) or by retinal photography, both through the dilated pupil. Testing of visual acuity alone is inadequate.

It is therefore recommended that:

1. Ophthalmic retinal screening and monitoring facilities be integrated with other diabetes services, in particular the proposed diabetes service team / diabetes centre / hospital diabetes clinic.
2. Adequately equipped satellite ophthalmic facilities should be provided by boards within the diabetes service location where this is distant from the hospital eye department.

There are obvious advantages to ophthalmic participation in a team effort and it is recommended that a good low-cost ophthalmic facility which can provide practical service for common disorders associated with diabetes, such as refractive errors, cataract development, glaucoma and diabetic retinopathy, should consist of:

1. Vision alley and vision chart
2. Darkened examination room large enough for patient, nurse and ophthalmologist
3. Slit lamp biomicroscope with tonometer
4. Trial lens set and frames
5. 90 dioptre lens (the 90 dioptre lens and slit lamp provide wide field views of the retina. The instrument most likely to be used in isolation in the community for detection is the direct ophthalmoscope).
Within these services, delegation of screening to other medical observers by the ophthalmologists (for example, selected general practitioners, ophthalmic nurse/technician) trained by them in techniques of detecting retinopathy, may occur. However, supervision, structuring and quality control must be defined and these are the direct responsibility of the ophthalmologist.

Retinal photography may be the ophthalmologist's chosen method of screening where this is already established (for example, Dunedin). Retinal photographs must be read by an ophthalmologist.

Advantages of routine integrated ophthalmic screening and monitoring are early detection of eye disease, education, enhanced specialist communication in recognition and management of patients at risk, improved efficiency and patient compliance.

**FREQUENCY OF ROUTINE OPHTHALMIC EXAMINATION OF DIABETICS**

**At diagnosis,** it is recommended that all diabetics (IDDM and NIDDM) be referred to the ophthalmologists. **Thereafter, two-yearly (minimum three-yearly) reviews are recommended until retinopathy or other ocular disease is detected.** When eye disease has become established, review should be scheduled according to the ophthalmologist's recommendation.

As retinopathy is related to duration of diabetes, this schedule may appear excessive. However care levels and patterns established in the first decade govern long-term success in prevention of complications. Hence, early routine ophthalmic participation is essential, even during the first decade of diabetes.

**The purpose of seeing all diabetics at the time of diagnosis is:**

To assess for established retinopathy or other ocular disease
To educate concerning ocular risks and preventative care
To explain the necessity for regular ocular examinations and the recommended frequency.

Subsequent screening is to detect eye disease and to re-inforce education.

When retinopathy or cataract is found, the patient is identified as high risk for visual impairment and other complications. Review of general care strategies is essential and thereafter monitoring of the rate of progress of retinopathy towards vision-threatening disease much be achieved.
TREATMENT OF OCULAR COMPLICATIONS IN DIABETES

DIABETIC RETINOPATHY

Benefits of general preventative management will not become apparent for 1-2 decades. If instituted rapidly, screening programmes will be of benefit within a decade and cost-effective. Early treatment for vision-threatening retinopathy will reduce the number of persons requiring prolonged photocoagulation and vitreoretinal surgery for advanced diabetic eye disease, thereby reducing social and economic costs. The current necessity for this surgery is due to failure of primary care.

Requirements

Evaluation: Clinical and photographic

Treatment: Photocoagulation

Staff: Ophthalmic Surgeon and Registrar; Medical Photographer; Nurse

Time: Photography: outpatient 90-minute session.
Photocoagulation: outpatient 90-minute session

The minimum total time requirement for treatment of early vision-threatening retinopathy is 3-4 hours per patient. Retinopathy tends to affect both eyes and the total time over which treatment may extend could be one to two years. Additional photography may be required during this period. Photocoagulation treatment for severe retinopathy could require between 10 and 20 hours per patient, excluding inpatient surgical intervention. Clinic attendances to assess treatment effectiveness are interspersed. All patients require long-term follow-up, especially for observation of maculopathy (macular oedema) which has a less well-defined treatment end-point.

Apparatus: Retinal Cameras: It is essential that once retinopathy is detected, its rate of progress be adequately established by objective quantification. In addition, microvascular disease in the eye can be readily documented and is therefore of particular relevance in monitoring therapy and new drugs. As preventative aspects become more emphasised, so will the demand for objective longitudinal and quantifiable evaluation of complications become more essential. Currently in New Zealand, retinal photography is mostly used in evaluation, and as a guide during photocoagulation treatment.

It is recommended that both population numbers and distribution be considered in the allocation of cameras. It is estimated that 18 retinal cameras are required throughout New Zealand if patient compliance and effectiveness of monitoring is to be achieved. For example, Auckland justifies three cameras (North, Central, South) whilst Thames, Invercargill and Nelson warrant the facility by reason of isolation rather than population numbers. Skilled medical photographers and ophthalmologists may need to cross area and board boundaries.

Argon Lasers should be confined to ophthalmic departments where there is a specialist trained in laser photocoagulation therapy. Currently, 2-3 more Argon lasers are required to facilitate treatment in some areas. For advanced complications Argon laser for intra-operative use should be available in some departments where there is an ophthalmologist competent to undertake diabetes-related vitreoretinal surgery.
Site: Treatment and photography will normally be sited within the hospital eye department. (In some areas with large populations, diffusely spread, e.g., Auckland, 1-2 satellite photography or laser facilities may eventually be necessary to improve compliance and efficiency).

FTE Staff per Population: If screening and early treatment is to be effective & feasible, there must be an urgent improvement in ophthalmic staff/population ratios. The estimated requirement is: Ophthalmologist = 3 FTE/100,000; Medical Photographer = 0.5 FTE/100,000. Ophthalmic nurses and technicians with knowledge of diabetes and general practitioners are essential supportive staff, their distribution and numbers being dependent on practice patterns which pertain to each area.

The ophthalmic surgeons' practice cannot be confined solely to diabetics. The general ratio is currently about one ophthalmologist per 40,000 to 50,000. It is recommended that the ratio be improved to 1 per 33,000 to cope more adequately with diabetic eye disease.
CATARACT SURGERY

Requirements as for routine cataract surgery. However, the use of intra-ocular lens implants varies relative to the degree, severity and stability of retinopathy, and the higher prevalence of complications of intra-ocular surgery in diabetics. Multiple procedures may be necessary for complications and to eventually achieve best vision.

VITREORETINAL SURGERY

Vitreoretinal surgery is an integral part of management of the patient with advanced proliferative retinopathy and its sequelae (see above) [7,8]. It has a definite role in dealing with fibrovascular membranes and retinal traction and is now being used earlier [11].

Requirements:

Staff:  
- Trained vitreoretinal surgeon
- Trained theatre nurses
- Special surgical equipment: Outcome, instrumentation, argon laser

Time:  
3-6 hours/operative session; Inpatient: 5-7 days.

Savings:  
In the recent report to the American Congress (Citizens' Committee Budget for Fiscal Year 1987) by the Research of Prevention of Blindness Organisation, it was reported that estimated savings in economic terms achieved by laser photocoagulation for proliferative retinopathy is $US454,000,000 per annum and that early treatment which halts or reverses macular oedema is calculated to save $US100,000,000 per annum.

The New Zealand National Health Statistics Centre Blindness Register, 1970 to June 1984, indicates that blindness registration due to diabetic retinopathy (visual acuity not exceeding 6/60 and visual field not greater than 20° diameter in better eye) range from 24-45 per annum. Since instrumentation and techniques became fully developed in about 1976, and ophthalmic surgeons achieved greater experience in photocoagulation treatment, there appears to have been only a very slight reduction in the number of people registered, reflecting late presentation to the ophthalmologist for treatment, increased diabetes and unresponsive maculopathy.

The statistics take no account of visual morbidity which occurs during prolonged photocoagulation treatment, wait-listing for cataract surgery and surgical treatment of advanced disease; nor do these statistics record the much larger number of diabetics with impaired rather than registerable visual impairment. The United States estimates indicate the possible magnitude of economic and social savings which, if translated, could be achieved in New Zealand.

Costs:  
Indications are given of treatment duration for retinopathy, staff levels and equipment (see Section 4 and above) from which precise costings can be derived. There is the potential within the next decade to confine treatment of diabetic retinopathy almost exclusively to outpatient services and reduce treatment duration and associated clinic visits.

Provision for cataract vitreoretinal and glaucoma surgery in diabetics is less predictable. Costs of cataract surgery in the diabetic should be based on a 2-3 day inpatient stay and specific surgical requirements.
TRAINING:

The number of ophthalmic registrar training positions must be both maintained and increased as already recommended to the Department of Health by the Education and Qualification Committee of the Ophthalmological Society of New Zealand. Any restructuring of the health services must ensure continuance of such training programmes.

Grants should be provided to young ophthalmic surgeons which will enable them to undertake higher training in the United Kingdom or United States in advanced management of diabetic eye disease.

Special consideration should be given to training of ancillary staff, particularly medical retinal photographers currently in short supply.

DATA AND REGISTERS:

Data: Statistical and epidemiological data on the prevalence of ocular complications of diabetes and related hospital care in New Zealand is deficient.

Requirements:
- Provision for adequate collection and analysis of data
- Registration and identification of patients at high risk
- Improved communication systems
- Monitor effectiveness of screening programmes and service delivery
- Identify racial/population differences

DURATION OF DIABETES

AGE-SEX STRUCTURE
A SELECTED BIBLIOGRAPHY

AUSTRALIA: Diabetes in Australia. Published by Diabetes Australia (Formerly the Australian Diabetes Foundation), GPO Box 428, Canberra ACT, Australia.


REGIONAL DIABETES CONTROL PROGRAMME: GILBERT P, ZIMMET PZ. The Region 8 (Victoria) Diabetes Education and Control Program. Interim Report. August 1986. Published by the Lions-International Diabetes Institute, Royal Southern Memorial Hospital, Caulfield South, Victoria, Australia.
AVERAGE DAILY INSULIN REQUIREMENTS

20% sample of all Insulin Recieving Patients in Ch Ch (191)
A real doctor first finds the reason for the illness, and when he has found it, he tries to cure it with a change in diet. If this does not work, he tries medicines.

Lin Yutang, 15th Century Chinese Author