AN EDUCATION PROGRAMME TO ENCOURAGE THE EARLY DIAGNOSIS OF CUTANEOUS MALIGNANT MELANOMA

A THESIS SUBMITTED FOR THE DEGREE OF M.D.

by

Valerie Rose Doherty, M.B. M.R.C.P.

Department of Dermatology,
Western Infirmary,
Glasgow.
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ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 – 1346

DECLARATION

I declare that I have personally performed the major part of the work relating to this thesis. The involvement of other individuals is detailed in the following page relating to collaborative work. Sections of the thesis have been published and these references are listed separately. I confirm that the entire thesis has not been previously published or submitted for any other higher degree.

Valerie Rose Doherty

COLLABORATIVE WORK

The production and dissemination of the individual parts of the education programme were undertaken in collaboration with Professor R M MacKie. I was involved in writing the texts and selecting clinical material for most of the components of the programme.

I took an active role in the distribution of the professional and public education programmes. This mainly involved addressing meetings and taking part in associated radio publicity.

I collected all the data from the study myself and was likewise solely responsible for its subsequent evaluation.

Valerie Rose Doherty

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PUBLICATIONS RELATED TO THE THESIS

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CONTENTS

Page

Declaration ... ii
Collaborative Work ... iii
Acknowledgements ... iv
Publications ... v
Contents ... vi
Summary ... ix
Abbreviations ... xiii
List of Figures ... xiv
List of Tables ... xv

Chapter 1 Introduction ... 1

1.1 General Comments ... 1
1.2 Epidemiology ... 4
1.3 Aetiology ... 11
1.4 Types of MM ... 16
1.5 Site of melanoma ... 18
1.6 Prognostic features ... 18
1.7 MM Management ... 23

Chapter 2. Current problems in Melanoma Research ... 27

2.1 Changes in incidence ... 27
2.1.1 Worldwide ... 27
2.1.2 Scotland ... 30
2.1.3 Reasons for Changing Incidence ... 30

2.2 Prognosis in Melanoma ... 34
2.2.1 General Comments ... 34
2.2.2 Scotland ... 34

2.3 Delay in Diagnosis ... 37
2.3.1 General ... 37
2.3.2 Delay in West of Scotland Melanoma patients ... 39

Chapter 3 Education and Screening ... 43

3.1 Medical Education ... 43
3.1.1 General Introduction ... 43
3.1.2 Methods ... 43
3.1.3 Planning ... 44
3.1.4 Evaluation ... 45

3.2 Cancer Education ... 47
3.2.1 Breast cancer ... 48
3.2.2 Other cancers ... 48
3.2.3 Skin cancers ... 49

3.3 Cancer Screening **52**
3.3.1 Breast Cancer 52
3.3.2 Cervical Cancer 53
3.3.3 Other Cancers 54
3.3.4 Melanoma 54

Chapter 4. Materials and Methods **57**

4.1 Introduction **57**

4.2 Materials **57**
4.2.1 Booklets 57
4.2.2 Problem solving exercises 58
4.2.3 Clinical video 59
4.2.4 The 7 point checklist 59
4.2.5 Public Education Campaign 60

4.5 Evaluation **62**
4.5.1 Patient Behaviour 62
4.5.2 Pigmented Lesion Clinic 63
4.5.3 Effects of Publicity 63
4.5.4 Surgeons and Pathologists Workloads 64
4.5.5 Patient Outcome 65
4.5.6 Finance 66

Chapter 5. Results **67**

5.1 Uptake of Materials **67**
5.1.1 General practitioner questionnaire 67
5.1.1.1 Requests for further information 71
5.1.2 Professional Update 71
5.1.2.1 Local Meetings 71
5.1.2.2 Nursing Staff Update 71
5.1.3 Public Education 72
5.1.3.1 Press release 72
5.1.3.2 Television and radio publicity 72
5.1.3.3 Requests for further information 72

5.2 Monitoring **73**
5.2.1 Pigmented Lesion Referral Patterns 73
5.2.2 Effects of Publicity 78
5.2.3 Histological Data 82
5.2.4 Melanoma Data 88

5.3 Evaluation of melanoma data **94**
5.3.1 Breslow Thickness 95
5.3.2 Histogenic Types 96

Chapter 6. Discussion **97**

References **119**

Appendix A Pre-campaign GP Questionnaire **132**

Appendix B Publicity Questionnaire **135**

SUMMARY

Cutaneous malignant melanoma is the third most common variety of skin cancer. Basal cell carcinoma and squamous cell carcinoma take first and second places respectively. Like the other two types of tumour, malignant melanoma occurs more commonly in sunny areas and the highest incidence rates are reported in countries near the equator. Basal and squamous carcinomas show a clear-cut relationship with chronic sun exposure occurring mainly in older age groups and on habitually exposed sites. Malignant melanomas, however, present in individuals with a mean age of only 48 years and may occur in both exposed and unexposed sites.

From the patient's point of view the most important difference between malignant melanoma and the other two skin cancers is their potential for metastatic spread. Malignant melanomas may spread to local lymph nodes and also to other body sites especially the lungs, liver and bones. Although primary melanoma and some local nodes are accessible to surgery, once internal nodes and organs are involved further surgery is usually impossible. Melanomas occurring in these latter sites are also comparatively resistant to radiotherapy and currently available chemotherapy. In contrast, the behaviour of basal and squamous carcinomas is usually less aggressive. Squamous carcinomas tend to spread relatively slowly to local lymph nodes and systemic involvement is rare. Basal cell carcinomas spread locally causing tissue destruction but rarely metastasize. Thus malignant melanoma is relatively unique among skin malignancies in being associated with a considerable mortality rate.

Recently considerable attention has been drawn to malignant melanoma by the marked changes being observed in its incidence rate. In the last decade doubling of incidence has been noted within Scandinavia and parts of America. The incidence in Scotland, a country of low melanoma incidence, has almost doubled since 1979. The change is felt to be due to increased sun exposure in recent years. The greater exposure could reflect alterations in environmental factors such as thinning of the protective ozone layer of the atmosphere with increased transmission of ultra violet light to earth or could be due to altered. behaviour patterns with more participation in outdoor sports and leisure activities.

In the absence of a correctable aetiological factor for melanoma and its rising rate there is presently no possibility of mounting a primary melanoma preventative campaign. The most appropriate endeavour would be to encourage its earlier diagnosis. It is recognized that melanomas with high thickness measurements are more likely to metastasize and thus contribute to mortality rates than ones with low "thin" measurements. If one assumes that "thin" melanomas are diagnosed earlier than thick ones, the encouragement of earlier diagnoses and treatment of melanoma should improve its overall prognosis.

Public education on melanoma diagnosis has been underway for some twenty years in Queensland, Australia, the centre with the highest world-wide incidence. The running of this educational venture has coincided with a rise in the proportion of thin lesions being seen and an improvement in overall melanoma prognosis. The situation in Australia contrasted markedly with that in Scotland where a high proportion of melanomas were thick and the overall prognosis was poor. Closer study of the West of Scotland patients (about half of the total for

Scotland) revealed that the vast majority of patients had delayed in seeking advice about their melanomas due to lack of knowledge on the subject.

This observation confirmed a view that public education on melanoma would be useful in Scotland and led to the running of the Glasgow Melanoma Campaign in 1985. This involved production and design of educational materials on the subject and dissemination of information using all available types of media. This public education venture was preceded, at the request of local general practitioners, by an active professional update programme for those involved in primary care.

The unique aspect of the Glasgow Campaign was the great effort made to evaluate the effects of education. This was done by careful monitoring of referral patterns of pigmented lesions, numbers and types of melanomas and numbers of pigmented lesions submitted for histological evaluation. These figures thus reflected the workload resulting from the campaign as well as its effect on melanoma rates. All this data was collected for the campaign year itself and for a full year before and after it.

The education campaign resulted in considerable publicity. There was a marked rise in the numbers of patients referred to hospital with pigmented lesions and a much smaller rise in the numbers of excised pigmented lesions. The most gratifying result was the marked increase in the proportion of melanoma patients presenting with thin, good prognosis lesions during the campaign. The majority of patients attending dermatology clinics during the campaign year had heard of the work, usually by television publicity.

The Glasgow venture formed a model for a 7 centre melanoma education campaign run by the Cancer Research Campaign in 1987. The early results of melanoma education have been encouraging and further thought may be given to repeating this type of exercise in the future.

ABBREVIATIONS USED IN THESIS

MM	-	Malignant melanoma
SMG	-	Scottish Melanoma Group
BCC	-	Basal cell carcinoma
SCC	-	Squamous cell carcinoma
SSM	-	Superficial spreading melanoma
LM	-	Lentigo maligna
LMM	-	Lentigo maligna melanoma
ALM	-	Acral lentiginous melanoma
FAMM	-	Familial multiple mole melanoma
DNS	-	Dysplastic naevus syndrome
PLC	-	Pigmented lesion clinic
WHO	-	World Health Organisation
CME	-	Continuing Medical Education
BSE	-	Breast Self Examination

LIST OF FIGURES

Page

Figure 1: Clark Levels 20

Figure 2: 7 Point Checklist 61

Figure 3: Education Campaign Calendar 62

LIST OF TABLES

Page

Table 1: Numbers of melanomas in Scotland....36
Table 5.1: MM Topics- Value to GPs....69
Table 5.2: Non-Melanoma Pigmented Lesions....73
Table 5.3: PLC Clinic Data - Age & Sex....74
Table 5.4: PLC Data - Biopsies....75
Table 5.5: PLC Data: Clinical Diagnoses - Biopsies....75
Table 5.6: PLC Data - Clinical Diagnoses - Proportions....76
Table 5.7: Publicity Questionnaires: Age & Sex. No. of patients aware of Glasgow publicity....79
Table 5.8: Publicity Questionnaires. Most useful medium....80
Table 5.9: Pigmented Lesions - Histological Data - Royal....83
Table 5.10: Histological Data - Southern....84
Table 5.11: Histological Data - Victoria....84
Table 5.12: Histological Data - Stobhill....85
Table 5.13: Histological Data - Western....85
Table 5.14: Histological Data - Dermatopathology....86
Table 5.15: Histological Evaluation....86
Table 5.16: West of Scotland Melanoma Data....89
Table 5.17: West of Scotland Melanoma Data....90
Table 5.18: West of Scotland Melanoma Data 1979-1983....91
Table 5.19: West of Scotland Melanoma Data....92
Table 5.20: West of Scotland Melanoma Data....93

CHAPTER ONE

INTRODUCTION

1.1 General Comments

Cutaneous malignant melanoma (MM) is the third most common variety of skin cancer after basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). There are many similarities between BCCs and SCCs in terms of the type of individual affected, the most commonly involved site(s) and the geographical variations in their incidences. Both BCC and SCC occur most frequently but not exclusively in people and parts of the body with above average chronic sun exposure.(1) In Britain, they most frequently present on the face, dorsum of hands and neck of those aged more than 60 years who have had predominantly outdoor occupations. A recent Australian study has shown that individuals whose skin has poor natural sun tolerance ie the fair skinned and blue eyed tend to have a higher incidence of both tumours than dark-skinned and brown-eyed people.(2) World-wide the incidence of all three types of these tumours is highest at the equator and the rate is inversely proportional to latitude.(3)

The most frequent presentation of BCC is as a non-healing usually asymptomatic nodule which has been present for months or even years on the face. These nodules may show superficial ulceration and can contain variable amounts of pigment. Less commonly BCCs may be of the superficial variety presenting as hyperkeratotic, reddish patches often on

the trunk. A variety of possible aetiological factors other than chronic ultraviolet light exposure have been linked to the occurrence of BCC. These include prior treatment of the involved skin with radiotherapy (4), chronic venous stasis (4) and occupational, industrial or medicinal exposure to arsenic (5)

SCCs are also usually asymptomatic but tend to have a more aggressive, rapidly growing history. They occur much less frequently than BCC but share several aetiological associations. These include ultraviolet light exposure (6), occupational radiation (6), arsenic exposure (7) and previous scarring. (8) There are recognisable pre-invasive (in-situ) forms of SCC like Bowen's disease and actinic keratoses. Work from Australia has suggested that only a small proportion of actinic keratoses progress to invasive squamous cancer. (9) In this study 1040 patients with at least one actinic keratosis were followed up. More than a third of patients experienced remission of at least one lesion. The authors concluded that it was probable that less than 1% of actinic keratoses progressed to squamous cancers.

Both BCC and SCC are curable by simple surgery if diagnosed early although more complex techniques like grafting may be necessary for larger, more long-standing lesions. In patients in whom surgery is considered to be inappropriate, radiotherapy may be a useful alternative for either type of tumour. It is rare for BCCs to metastasise and local invasion with subsequent tissue damage is the most frequently encountered serious consequence. Only in the rare cases where this causes damage to vital structures do BCCs result in death. In contrast, squamous cancers do metastasise, most often to the regional lymph

nodes. The frequency of metastases in association with SCCs varies from 0-50% depending on the series quoted. In a series reported by Katz of mainly ultra-violet exposure related SCCs a metastatic rate of 2.6% was observed. (10) This rate is much lower than that seen in series of SCCs arising for reasons other than ultra violet exposure eg those related to scars or to prior irradiation. (11) Both BCCs and SCCs have morbidity rates according to their site, size and extent of treatment required.

Cutaneous malignant melanoma (MM) differs in many ways from the other two types of skin cancer. It can occur, albeit very rarely, in childhood (12) and incidence tends to increase with increasing age. World-wide the average age at presentation is much younger than for BCC or SCC. One overview of the subject quotes a mean age of only 48 worldwide (13) while the mean age of a group of Scottish patients was 54. (18) Although more frequent in sunny countries MM incidence does not show the same clear-cut relationship to latitude.(v.i.). It can occur anywhere on the body including areas like the perineum which have no direct sun exposure. There are, however, favoured sites where MM occurs most frequently, namely the lower leg in women and the trunk in men.

From the patient's point of view, the most important difference between MM and the other two types of skin cancer is that MM not infrequently metastasises. This process can involve not only the regional lymph nodes but also major organs like the liver, lungs and brain. Once this has occurred MM is largely resistant to currently available treatment modalities like radiotherapy and chemotherapy. Thus MM carries a significant mortality as well as morbidity rate.

1.2 Epidemiology

Today the area with the highest World-wide MM incidence is Queensland, Australia (13) with a rate of 35 per 100,000 population per annum. A marked variation in MM mortality with latitude has been reported within Australia itself.(14) Queensland (latitude 11-29 S) had the highest rate, New South Wales (latitude 28-37 S) an intermediate rate and Victoria (latitude 34-39 S) a low rate. These variations in mortality rates presumably reflect a latitude related incidence variation. High incidence rates have also been reported from parts of the USA notably from Arizona (15), New Mexico (17) and Hawaii. (16) Scotland and indeed Britain as a whole has a low incidence currently 7.1% for men and 10.4% for women per 100,000 population per year. ((18), Scottish Melanoma Group data) However, comparison of incidence data from reported series can be difficult for two main reasons. Firstly, in some series in-situ as well as true invasive MMs are included while other centres, such as Scotland, only register invasive lesions. As the histological distinction between *dysplastic* naevus and in-situ MM can be difficult, variations in reporting habits may result in apparently greater numbers of in-situ MMs in some laboratories. If these lesions are then registered as MMs an artificially high incidence rate may be reported.

Secondly, there may be considerable variation in the sizes and types of the population bases on which MM incidence rates are calculated. The Scottish Melanoma Group (SMG) data is almost unique in being based on the whole population of Scotland. Registrations are received from all private and National Health Hospitals in the country. Due to the present health care system this means that virtually all Scottish MMs are

registered whereas in countries like the USA a significant proportion of lesions are removed by private practitioners outside the hospital setting. In the latter case there may thus be under- registration. Some published incidence rates may be calculated on selected populations e.g. those attending specific hospitals or specific dermatologists within an American state. (15) The most useful data is that from unselected populations.

Variations in incidence related to latitude have been sought in areas of both high and low incidence. An inverse relationship between latitude and incidence has been demonstrated within England and Wales (19) and within Norway. (20) These patterns seem to be best observed within similar types of population i.e. within one country. The latitude effect may be much less clear across more diverse populations e.g. although Scandinavia and England are at the same latitude the former previously reported a much higher MM incidence. (21)

There is a marked racial variation in MM incidence. It is a rare tumour in Negro races and uncommon in Mediterranean and Oriental peoples. (1) Data from the south east USA showed that only 3% of melanomas occurred in black patients while 26% of the local population were black. (22) Likewise in a survey of melanomas in the USA, 98% of patients were white, 1% black and 1% "other" eg Hispanic or oriental. (23) Interestingly this study also noted that the melanomas seen in the black patients tended to favour the less pigmented sites. A total of 49% of melanomas in black individuals were located on the sole an unusual site for white patients with melanomas. A country's overall MM risk is thus partly related to the skin pigmentation of its indigenous population.

An apparently MM- susceptible phenotype has been distinguished in various studies of MM patients. The Western Canada Melanoma Study involved interviewing 665 melanoma patients and control individuals matched for age, sex and province of residence. The final evaluation was based on 595 case-control pairs. During the interview note was made of hair and eye colour, freckling tendency and sun-sensitivity in both adult and childhood years. Skin types were defined in terms of tanning ability and liability to burning. (24) The study found that individuals with blonde hair, light skin colour and blue eyes had relative MM risks of 9.7, 3.4,and 1.6 respectively compared with those with dark hair, dark skin and brown eyes. Likewise people whose skin tended to burn rather than tan in the sun had a risk of 2.3 compared to those who tanned and didn't burn. In a similar type of case-control study, Beral noted that light hair colour was the strongest risk factor followed by light skin colour. (25)

It is recognised that MM may be familial in that 10% of cases have MM occurring in a first degree relative. (26) In some families this increased risk was noted to be associated with the presence of large, clinically atypical naevi, a combination initially termed the B-K mole syndrome after the two original families described. (27) A second group described this association and coined the term familial atypical multiple mole melanoma (FAMM) syndrome.(28) The most recently suggested term, is the familial dysplastic naevus syndrome (DNS). Further observations found that the combination of atypical naevi and MM may also occur sporadically i.e. in the absence of a family history of melanoma. A tendency to the same pattern of atypical naevi has also been observed within families with no history of MM. (29)

Since it was first described DNS has been a subject of controversy. The initially described clinical features of these naevi were that they were larger than ordinary acquired moles, irregular in outline and pigmentation, occurred in unusual sites like the scalp and breast and were present in very large numbers. (29) Early work by Kelly and Sagebiel also suggested that this clinical appearance correlated with atypical histological features. (30) These workers looked at 165 naevi excised from individuals who had previously had histologically atypical naevi removed. The lesions were classified on pathological grounds as showing mild, moderate or severe dysplasia. They found that in 75% of cases in whom atypia had been suspected on clinical grounds histological confirmation of dysplasia was obtained. Enlarged clinical photographs of the naevi were then reviewed and the features which correlated best with histological dysplasia were noted. These were an ill-defined border, irregular pigmentation, diameter > 0.5cm, erythema and accentuated skin markings. They concluded that "clinical examination constitutes a practical and sufficiently reliable method for the assessment of melanocytic naevi in patients with dysplastic naevus syndrome". However, more recent work has shown that histological atypia may be observed in clinically banal naevi while clinically abnormal naevi may be histologically benign. (31)

It has also been found that some people have small numbers of clinically atypical naevi. Crutcher and Sagebiel performed skin examinations on 881 patients in California excluding individuals with personal or family histories of melanoma or those who had been referred with a specific pigmented lesion. They noted clinically and histologically confirmed dysplastic naevi in 43 (4.9%) of those examined. (32) In another study it

was noted that 1% of 280 non-melanoma control patients had at least three clinically atyical naevi. (33) Population based studies suggest that sporadic dysplastic naevi occur in 2-5% of the American population. (34) A population based study from New Zealand (35) found that 90% of 388 people in the age groups 30 - 39 and 50 - 59 years had one or more dysplastic naevi. The risk of having three or more dysplastic naevi was increased 40 fold in individuals with 50 or more banal naevi.

Aside from arguments surrounding the diagnostic features of atypical / dysplastic naevi most DNS research has been directed towards clarifying their potential for development of MM. Much of the work on MM risk in DNS patients has been the result of studies of patients with the familial syndrome such as that of Greene and colleagues (29). During this study 401 members of 14 MM prone families were examined. Over a maximum of eight years of follow-up 39 MMs occurred in 22 individuals. Melanomas were only seen in family members who themselves had clinically dysplastic/ atypical naevi and the probability of MM developing in such individuals was calculated as 56% from age 20-59. Such high risk individuals are usually recommended to have regular follow-up with full skin examination and photography of naevi if possible. Patients usually have either total body or selected area photographs at the time of initial assessment. These are available at the time of review appointments when new or changing naevi can be noted. Using this type of follow-up a group from New York has observed MM developing on patients with clinically dysplastic naevi. (36) This group followed 452 people with various types of dysplastic naevus syndrome for up to seven years. Of the study group, 261 had neither family or personal history of MM, 66 had personal histories of MM and 105 were from MM prone

families. During the period of follow-up eighteen MMs were excised, 12 in-situ and 6 invasive. Of the latter, half (3 MMs) occurred in those with family histories of MM. All types of DNS patients developed more MMs than would be predicted from the observed incidence data for that part of USA. Histological evaluation showed that these tumours occurred in contiguity with dysplastic naevi and thus have been interpreted as arising from previously photographed dysplastic naevi. An alternative explanation, however, could be that these lesions were MM from the beginning and that the dysplastic lesions are a marker of increased MM risk rather than true precursors. It is well recognised that not all MMs seen in DNS patients arise in the dysplastic naevi and that a proportion develop on apparently normal skin.

The risk of MM arising in DNS patients with no MM family history is not yet clear. Patients with dysplastic naevi and a history of previous MM are at an increased risk of a second primary lesion. (37) Whether this risk is appreciably higher than the risk of a second primary lesion developing in any MM patient remains to be seen. The MM risk for individuals with clinically and/ or histologically dysplastic lesions but no personal or family MM history is probably fairly small but longer follow up may be required to clarify this point.

In addition to the relationship with the dysplastic naevus syndrome, MM is found in two family cancer syndromes.(38) These are the Lynch Type II syndrome and the Li Fraumeni syndrome. In these autosomal dominant syndromes MM occurs in addition to a wide variety of other tumours. In addition MM accounts for 7% of second malignancies in familial retinoblastoma.

In Britain there is a marked difference in the sex incidence of MM in that women develop MMs more frequently than men. (18) Data collected by the Scottish Melanoma Group found that in the period 1979-85 MMs were twice as frequent in females . In more recent data the female to male ratio has fallen to 1.5:1. In high incidence areas like Australia there is no difference in the rates between the sexes. The British disparity between the sexes led to a search for possible hormonal influences in the development of MM. Excised MMs were examined to see if they possessed receptors to hormones and in particular to oestrogen. It was noted that only some MMs expressed oestrogen receptors and that this occurred in both male and female patients. (39) A proportion of MMs also expressed receptors for androgens, progesterone and glucocorticoids. From a therapeutic point of view, there was no relationship between the presence of oestrogen receptors and the response of secondary MM to anti-oestrogen hormone based therapies.

Several groups have tried to assess whether women who have taken the oral contraceptive pill have a higher MM rate than those who have never taken it. The results of the two largest studies suggested that any increased risk demonstrated has been small and non-significant. (40,41) In both studies there were problems in distinguishing the possible effects of oral contraceptive use from other possible aetiological factors such as sun-exposure.Another study showed that oral contraceptive users tended to have thinner lesions than non-users (42) This did not confer any improved mortality perhaps due to different site distributions for the two groups of women.

It has been calculated from follow-up data that MM patients have a nine-fold increased risk of developing a second lesion relative to those with no such previous history. (26) This seems to be most likely in the first year after initial presentation (43) and in patients aged less than 45 years. Thus regular monitoring with full skin examination is mandatory for all patients after excision of a cutaneous MM.

Sociological studies have shown that MM occurs preferentially in the upper social classes. i.e. professional and "white-collar" workers. (44) Data on patients with MM in England and Wales and Washington State, USA was assessed. Patients were allocated to social class groupings as defined by the Registrar General. Social class I is professional, II intermediate including commercial and teachers, III skilled workers, IV semi-skilled and V unskilled workers. Both incidence and mortality rates for MM were higher in class I and II compared with III, IV and V. Female patients had social class assigned on the basis of their spouse's occupation. In contrast, the other skin cancers, BCC and SCC are most often seen in habitual outdoor workers i.e. mainly class IV and V. (45) It is likely that this disparity reflects differences in life-styles among the different classes rather than any influence of the occupation itself.

1.3 Aetiology

The wide variation in incidence of MM world wide is perhaps the strongest support for its being, like BCC and SCC, related to chronic sun exposure. Areas of high MM incidence like Queensland also have a high incidence of BCC and SCC. (1)

The relationship between chronic UV exposure and MM is not as clear-cut as that between UV and BCC or SCC. The skin adjacent to the latter tumours almost always shows histological evidence of actinic (solar) damage. In contrast, however, the skin adjacent to MMs is usually histologically normal, showing no evidence of such damage. The exception to this is the lentigo maligna melanoma type which arises on histologically actinically damaged skin.

Several retrospective studies on MM patients have assessed lifetime sun-exposure and tried to correlate this with MM risk. This has principally been done by comparing the cumulative amounts of sun exposure for MM patients with values for non-MM controls. In England and Wales a positive correlation was demonstrated between hours of sunshine and MM incidence rates in different parts of the country. (19) This study looked at mean daily hours of sunshine in 14 districts in England and Wales. Hours of sunshine and MM incidence rates were gathered over similar periods in each district. A correlation was sought between mean daily sun and incidence. This study showed that mean incidence and rate of secular increase correlated negatively with latitude and positively with hours of sunshine. An increasing incidence of MM with no significant change in hours of sunshine was also observed during the study years. In female MM patients the observed correlation suggested an association between hours of sunshine in the two year period prior to the calculation of the incidence rate.

It has also been suggested that MM development may be related to greater than average recreational sun exposure (46) rather than total cumulative figures. Holman and colleagues studied outdoor recreational and

sunbathing habits in a group of Australian MM patients and showed that incidence rates for superficial spreading melanomas were directly related to frequency of sun-bathing in young adult life (47) and frequent participation in high sun-exposure activities like fishing and boating. Such patients had, however, low cumulative outdoor exposure levels. In female patients the amount of skin covered during sun-bathing also seemed important. Patients who wore bikinis or who sunbathed naked had higher incidences of trunk MMs than those who wore a swimming costume.

The timing of sun-exposure in an individual's lifetime may be as important as the amount of that exposure. Evidence from several works suggests that sun-exposure in childhood or young adult life may be more important than that occurring in later life. Work from Australia has shown that individuals who move there in childhood acquire that country's high MM risk whereas those immigrating as adults keep the lower risk of their country of birth. (48) It has been suggested that this childhood ultra violet damage may precede a long lag phase prior to the development of a melanoma.

Retrospective case control studies suggest that MM patients are more likely than controls to offer a history of having experienced painful sunburns in childhood. English and colleagues interviewed 180 MM patients and age and sex matched controls. (49) Histories of painful sunburn episodes in childhood years were sought. Positive replies were significantly more common in the MM group than in the control population. MacKie and Freudenberger (33) interviewed and examined 280 MM patients and age and sex matched controls. They found that

while 54 (19%) of the MM group gave histories of three or more severe sunburns this was the case for only 7 controls. The age at which the sunburns occurred did not appear to be significant.

Malignant melanomas can arise in normal skin or in pre-existing melanocytic naevi. The frequency of the latter occurrence varies from 30-70% in different series. (50) These rates are calculated from histological studies of excised MMs (51) or from MM patient's histories of pre-existing lesions. Given the ubiquitous nature of the common, acquired melanocytic naevus and the rarity of MM it is obvious that a very small proportion of these naevi develop into MM. The recently published UK mole study (52) found that the prevalence of benign naevi increased between the ages 4 and 11. Moles were more frequent in boys and in white children than in non-white children. They were also more frequent in poor tanners, individuals with freckles, individuals with a history of sunburn and those individuals with a history of a number of foreign holidays.

Some studies have suggested that people with large numbers of clinically benign naevi are at higher risk of MM. (53) These workers performed naevus counts on 180 MM patients and 197 non-MM controls. Naevi were diagnosed solely on clinical grounds and all sites except the scalp and genitalia were counted. Only naevi more than two millimetres in diameter were included and these were clinically designated as " benign" or "atypical". This study demonstrated a twelve-fold increased MM risk in individuals with more than 50 benign naevi compared to individuals with fewer benign naevi. Another work with a similar design from Australia counted only palpable naevi on the arms of MM and control

patients. (48) These workers also showed that MM patients tended to have greater numbers of naevi than the control group.

Two other types of pigmented naevi have been noted to be related to a higher risk of MM than the common acquired type. These are the dysplastic naevus (v.s.) and the giant congenital naevus. This latter rare type of naevus occurs in less than 0.1% of Caucasian neonates (54) and may be associated with diffuse meningeal melanosis. In general the size and site of these naevi preclude their prophylactic excision. Thus clinical monitoring of the lesion with or without photography is the usual method of follow-up employed. Clinically, due to their characteristically irregular pigmentation and texture, development of MM may be detectable only at a comparatively late stage. It has been reported that such giant congenital naevi have an estimated lifetime risk of MM of 6%. (54) In half of another series of cases of MM arising in childhood there was a predisposing cause such as a giant congenital naevus. (55) It has also been suggested that small and medium sized congenital lesions may evolve into MM. A study of MMs by Rhodes and colleagues noted the histological evidence of small congenital naevi contiguous with the tumours far more frequently than would be expected by chance. They felt that this observation supported the role of the small congenital naevus as a true precursor of melanoma. (56) In a retrospective study of patients aged < 30 at presentation Mackie found that 44% of MM arose on small early onset naevi (57)i.e. those present before the age of two years.

1.4 Types of MM

There are four main histological types of MM and these can usually also be distinguished on clinical grounds from each other. The most common variety is the superficial, spreading MM (SSM) which constitutes 50-60% of British series of MMs.(58) It consists of a brown-black lesion usually more than 7mm in diameter. Characteristically it has an irregular, scalloped border and a variable amount of pigmentation throughout. Initially SSMs are flat and may remain so for a period of months or years increasing in area but not in depth. Histologically at this stage ,tumour cells are confined to the dermo-epidermal junction. This interval is termed the radial growth phase during which it is has been argued that lesions have no potential for metastasis.(59) This phase may be followed by a vertical growth phase which is characterised clinically by the appearance of a palpable nodule. Histologically, this macroscopic change in the lesion is associated with invasion of tumour cells into the dermis sometimes including its lymphatic and blood vessels. At this stage the MM is regarded as having at least a potential metastatic capacity. The duration, according to the patient's history, of each of these intervals may be variable. The radial phase may be of a few months to several years in duration while patients usually present within several months of the nodule's appearance (vertical growth phase).

The second most common variety is the nodular MM constituting 15-20% of most British series. In this variety there is no clinically recognisable radial growth phase. These lesions usually grow over a period of a few months rather than years and not infrequently their surface is ulcerated. Thus this type of MM may present with bleeding.

These lesions may be quite deeply pigmented when they may closely resemble vascular tumours or they may be amelanotic.

Lentigo maligna melanomas (LMMs) comprise 10-15% of MMs. This variety has most in common with BCCs and SCCs in that it occurs on chronically sun-exposed sites usually in patients aged over 60. The history is usually of an extremely prolonged radial growth phase of many years duration during which the lesion is termed a lentigo maligna (in-situ melanoma). As is the case in the superficial spreading variety the invasive, vertical growth phase is heralded by the appearance of a nodule.

The least common variety of MM encountered in British series is the acral-lentiginous melanoma (ALM). This occurs on the palms, soles, sub-ungual areas and on mucosal surfaces. Perhaps due to the relative invisibility of such sites this variety not infrequently presents at a more advanced stage than the other types. Acral melanomas constitute about 5% of British series. Interestingly, however, this variety constitutes a significant proportion of the small number of MMs seen in Negro and oriental races.(60) In a study of 187 melanomas in Japan more than 90% of plantar and sub-ungual lesions were of the ALM variety. The site distribution of MMs in this group was totally different to that observed among white populations. In the Japanese study 32.1% of lesions occurred on the sole and 6.4% were sub-ungual in location. The reason for these differences is not clear and certainly would not be explicable in terms of sun-exposure. In contrast, the Scottish Melanoma Group data (18) noted a subungual location in 3.7% of male melanoma patients and 2.5% of female patients. 5.6% of male MMs and 5.4% of female MMs occurred on the feet.

1.5 Site of melanoma

MM can occur on any part of the body including areas never exposed to UV light eg the perineum. (61) While MMs in general do not show the clear cut relationship to chronic sun-exposure demonstrated by studies of squamous and basal cell carcinomas, one study from Canada has shown that if their incidence is expressed per unit area of skin MMs do occur more frequently on exposed sites like the face rather than on habitually covered sites.(62)

There is a difference in site distribution of MM between the sexes. The most common site for women is the lower leg (41.8%) and the trunk (37.4%) for men (18),(SMG data). Workers in Denmark have observed a change in sex-specific sites of MM in recent decades.(63) There has been a marked increase in MM of the trunk in women aged less than 40 years of age. The authors felt that this change might reflect the comparatively recent tendency to expose more of the trunk during sun-bathing. This observation confirms that of Holman who noted a relationship between types of swimwear worn by female MM patients. Those who wore bikinis or no swimwear at all had a higher incidence of truncal MM. (47)

1.6 Prognostic features

The main factor which helps predict the prognosis of a MM is its depth of invasion into the dermis. This is termed the Breslow thickness and is defined as the distance in millimetres from the granular layer of the skin to the deepest invasive MM cell.(64) In the original description thickness was shown to correlate directly with poor prognosis. Breslow measurements are made with a micrometer and whilst both inter and

intra-observer variation in values has been observed the error seems small. In one study, (65), sections of 50 "thin" MMs were reviewed by three independent pathologists. For Breslow measurements intra-observer variation of 74-88% was seen and inter- observer was 82-88% if two measurements were taken by each observer.

In Scottish Melanoma Group data, MMs are grouped into three thickness categories; "thin" < 1.5 mm, "intermediate " 1.5 -3.49 mm and "thick" ≥ 3.5 mm. In agreement with Breslow's initial observation, (v.s.) thickness relates directly to poor prognosis for Scottish patients. The thicker the melanoma the more likely it is to recur and /or metastasise. Thus, thicker lesions contribute to MM mortality as well as morbidity. A recent study from Scotland reported 5 year survival rates for thin, intermediate and thick lesions as 92.5%, 72.6% and 48% respectively.(18)

In addition to the above objective measure of thickness, the level to which the MM has invaded into the dermis is also important prognostically. This depth is termed the Clark level and is categorised into 5 groupings.(Figure 1). In many pathology laboratories, both Breslow and Clark readings are made and are interpreted in conjunction with each other. Perhaps due to the more subjective nature of the Clark assessment, the observed variation between Clark levels was 60% in Holloby's study.(65)

Figure 1: Clark Levels

Level 1;	Melanoma cells within the epidermis only.
Level 2;	Melanoma cells encroaching on the papillary dermis.
Level 3;	Melanoma cells filling the papillary dermis.
Level 4;	Melanoma cells entering the reticular dermis.
Level 5;	Melanoma cells invading the subcutaneous fat.

It has been suggested based on the results of several studies that various other clinical and pathological features of MM confer prognostic significance. These studies have all been performed by retrospectively assessing clinical and histological features of MMs and relating these to prognostic measures such as survival rates and /or disease free intervals. The clinical features assessed include site, area, ulceration, sex and history of previous naevus. From a histological point of view, the effect of cell type, mitotic rate, presence of a naevus or an inflammatory response and evidence of lesion regression have been assessed. Most series agree that low Breslow thickness and female sex confer a better prognosis. In a series published by Blois and colleagues the association between survival and tumour depth, histological type, sex, age and site was assessed in 1123 MM patients.(66) In addition to beneficial effects of low Breslow measurements and female sex on prognosis this group observed poorer survival rates for lesions arising on the head and neck compared to all other sites. This site effect was still significant after correcting for thickness. In a similar study of 262 patients, however, Johnson failed to demonstrate any influence of site on prognosis that was independent of

the Breslow thickness.(67) In this work prognosis was assessed in terms of survival time, recurrence free time and 5 year recurrence free rate. Once again female sex was associated with improved prognosis after correction for Breslow thickness. Other than thickness and sex no variable had a significant effect on survival time. However, Clark level was significant for 5 year survival rate, number of mitoses, regression and vascular invasion for recurrence free time and vascular invasion and mitotic rate for recurrence free time. The most recently published study of this type looked at twenty three factors in 264 patients with melanoma. (68) Prognosis was based on survival over an eight year period of follow-up. Multi variate analysis identified six factors which had prognostic significance independent of each other. These were mitotic rate, tumour infiltrating lymphocytes, thickness, site, sex and histologic regression. When a logistic regression model correcting for thickness was used the other five variables were still found to be independent predictors of 8 year survival.

This work by Clark suggested that lesions on the BANS areas ie on the back, posterior arms, posterior neck and scalp have a worse prognosis than other sites even when corrected for Breslow thickness. Other series have also looked at the possible influence of site on prognosis. In a series of three articles Day has looked at prognostic factors in patients with "thin", "intermediate" and "thick " lesions. In this work thin was classified as Breslow of 0.76 -1.69mm, intermediate as 1.51-3.99mm and thick as > 3.65mm. Eleven of the twelve deaths which occurred in the 203 patients with thin lesions occurred in those with lesions in the BANS sites. The only other useful prognostic factor identified for this group was the Clark level.(69) For patients with intermediate and thick lesions Cox's

multivariate analysis of variables was used to identify the combination of variables best able to predict the likelihood of bony or visceral metastases. In the 177 patients in the intermediate group these were more than 6 mitoses per mm2, location other than forearm or leg, ulceration width> 3mm and the presence of microscopic satellite lesions.(70) In the 77 patients with thick tumours the four factors were absent/minimal lymphocytic response at the base of the lesion, histological type other than SSM, location on trunk and presence of involved draining lymph nodes.(71)

There was previously some confusion in MM literature as to the effect of pregnancy on MM behaviour. Some studies suggested that MM arising in pregnancy carried a worse prognosis. (72) This led to further speculation as to a hormonal influence on MM. (v.s.) From a management point of view it used to be suggested that MM patients avoid subsequent pregnancy lest this pre-dispose to recurrent disease. Reintgen and colleagues showed that while intercurrent pregnancy conferred a worse than predicted prognosis, subsequent pregnancy had no effect on recurrence rate or survival.(73) This group looked at 58 women whose melanomas arose during pregnancy and at 43 who became pregnant within 5 years of melanoma development. These individuals were matched for age, sex, site and stage of primary lesion, Clark level, thickness, ulceration and histologic type with patients selected from the melanoma register at the same medical centre. A recent WHO study has looked at a total of 388 women who developed melanoma before, during, between or after pregnancies.(74) The group whose tumours were diagnosed whilst they were pregnant had tumours of greater thickness than the other three groups. After controlling for Breslow thickness,

however, there was no significant difference observed between survival rates for all the groups.

1.7 MM Management

In most instances primary MMs are managed initially by surgical means. The size and site of the tumour dictates the complexity of the surgery required. Large lesions may require the use of skin grafting or other more complex surgical techniques. However, lesions of 1-2cm in diameter can usually be excised with a 0.5-1cm margin of normal skin and primary closure achieved. Older MM literature suggested that wide excision (3-5cm of adjacent normal skin) was required to reduce the chances of subsequent recurrence. (75) More recent evidence from follow-up studies has shown that this type of management did not confer any advantage over narrower (1cm) margins. Breslow and Macht reviewed excision margins of 62 thin melanomas processed in their laboratory.(76) Measurements were taken from pathology reports i.e. from fixed tissue which are likely to be significantly smaller than those from fresh tissue. It was found that although margins varied from 0.1- 5.15cm in this group no patient had developed recurrent disease. In an international study Veronesi looked at two comparable groups of MM patients. 305 patients had narrow excisions with a 1 cm margin around the lesion while the other group of 307 patients had lesions excised with a margin of 3 cms or more. No difference was found between the two groups in the metastatic rate to regional lymph nodes or to distant organs. Disease-free survival rates were similar for both groups. (77)

If MM spreads to regional lymph nodes the initial treatment is surgical, where feasible. In most centres clearance of the regional nodes is performed rather than biopsy of macroscopically involved ones. For limb lesions the place of prophylactic excision of draining lymph nodes has been the subject of much argument. In a WHO multi- centre study Veronesi prospectively randomised 267 melanoma patients to elective lymph node dissection while 286 patients had dissection performed only when there was clinical evidence that the nodes were involved. After a follow-up period of up to seven years there was no evidence of any difference in out-come between the two groups. (78)

It is recognised that MM may have a somewhat unpredictable course with secondary lesions being reported more than 10 apparently disease free years after excision of the primary lesion.(79) Another group looked at 13 patients with thick MMs (> 5.5 mm) who survived longer than 10 years and compared them with 13 age, sex and treatment matched patients also with thick (> 5.5 mm) MMs who died within 5 years. There was no difference in Clark level, ulceration, mitotic rate or inflammatory response between the two groups. (80) In contrast, Shaw's group (81) followed 846 patients with MM < 0.76 mm for 2 to 31 years. 61 patients (7.2%) had recurrence, mainly to regional lymph nodes. This was more likely with axial, especially scalp, primaries than with limb primaries. Metastatic spread was also associated with ulceration, high mitotic rate and deeper Clark level (III and IV compared with II). In general most MMs metastasise within the first two years of follow-up. (43) A measure called the hazard rate analysis has been employed to predict the probability of death from MM in a group of 719 MM patients. (82) It was found that the peak hazard rate was at the 48th month of follow-up for

the group as a whole. If, however, the group was divided into thickness categories thicker lesions peaked at month 40 and thinner ones not until the 72nd. Many clinicians feel that lifelong follow-up may be necessary for MM patients in order to detect recurrent disease, metastatic disease or further primary lesions.

Once major organs like liver, lung and bone are involved chemotherapy may be used. Large numbers of chemotherapy regimens have been used and many more are under current evaluation. The use of various regimens in patients with disseminated melanoma has been reviewed by Bellet. (83) The single most effective chemotherapeutic agent was DTIC (dacarbazine) which produced a combined response rate of 23.4%. Combined response was classified as complete response or at least 50% reduction of measurable tumour bulk. In addition to single drugs, various combinations of chemotherapy regimens have been used. These give combined response rates of 0-48% with generally very low complete response rates. In some series, response rates include patients with sub-cutaneous metastatic disease only. If this latter, generally responsive group are removed the responses for true visceral disease are very low indeed. The combination of DTIC and Tamoxifen has been used in the light of a possible endocrine influence on MM (v.s.). This was found to be more effective than DTIC alone in women while male patients showed no such benefit. (84)

Patients with metastatic disease confined to one limb may also be offered isolated limb perfusion. This allows the use of higher concentrations of chemotherapeutic agents within the affected limb only and avoids systemic toxicity. The most effective drug to be used in this way is the

alkylating agent melphelan. In all reported series this technique produces marked reduction of localised recurrent disease including 'in-transit' metastases. (85) Unfortunately it is difficult to assess the value of this treatment more fully as the results are usually expressed as 5 year survival figures without figures for a matched, untreated control group.

Many textbooks say that melanoma is a radio-resistant tumour. There is, however, evidence from several studies that it can be useful in treatment and palliation of disease. Radiotherapy has been employed as the primary therapy in lentigo malignas and lentigo maligna melanomas. Harwood described his experience of this using four or five fractions over four to five weeks, a protocol similar to that used for treating other skin cancers. In his series 28 patients with lentigo maligna melanoma were treated and followed up for periods of 6 months to 8 years. Twenty two patients were disease free, 1 patient was alive with metastatic disease, 2 had residual / recurrent local disease and information was not available on the remaining three patients. (86) Responses have also been described for tumours treated concomitantly with surgery and radiotherapy. Obviously in these instances it is impossible to separate the effects of the two treatment modalities. Perhaps the most frequent use of radiotherapy is in palliation of metastatic lesions especially cerebral ones. In a review article of published series Young noted response rates of 50% for bony lesions and 67% for cerebral ones. (87)

CHAPTER TWO

CURRENT PROBLEMS IN MELANOMA RESEARCH

2.1 Changes in incidence

2.1.1 Worldwide

The most striking feature of melanoma epidemiology in recent years has been the rapidity with which its incidence has risen world wide. In the USA, rates for male and female MM incidences rose by 296% and 189% respectively in the period 1950- 1985. (88) This study examined incidence and mortality rates for a wide variety of cancers within USA. Workers observed significant rises in incidence and mortality rates of four cancers during these years: lung cancer, melanoma, multiple myeloma and non-Hodgkins lymphoma. The observed rise in male lung cancer was less than that of male MM while that for female MM was surpassed by female lung cancer and multiple myeloma. Although other forms of cancer showed increases in incidence, albeit smaller than these four, the mortality rates for the other types were either static or falling. Another American study of a population contributing to a single health plan showed a 3.5 fold and 4.6 fold increase in MM incidence for men and women respectively between 1960 and 1986.(89) Data from the national SEER (Surveillance, Epidemiology and End-Result) program for the period 1973-87 reports 4.8% per annum and 3.6% per annum increases in MM incidence for American men and women respectively. Mortality

rates were not rising so sharply with increases of only 2.5% and 1.3% respectively being noted.(90)

It has been estimated that were this currently observed trend towards increasing MM incidence to continue, by the year 2000 1% of all Americans would develop MM during their lifetime. (91)

In Scandinavia there has been a doubling of MM incidence in the past decade. (21) Rauh et al (92) reported a 5 fold rise in incidence of MM in Germany between 1970 and 1984. Danish workers have also demonstrated a rise in trunk MMs especially in women during the period 1943-82. (63) The study reported by Glass also demonstrated a specific increase in trunk MMs in both sexes (89) while rates for head and neck tumours were largely unchanged.

An apparent rise in the incidence of any disease may result from changes in diagnostic criteria or from improved collection of data. It is recognised in the interpretation of all MM data that there may be inter-centre variability in reporting methods and that these methods may alter through time. A group of workers from Bristol took part in a study to investigate the latter possibility further. (93) A selection of benign and malignant pigmented lesions were identified from files for three separate time periods, 1945-49, 1954-57 and 1980. New slides were cut from the stored paraffin blocks and then re-examined "blind" by two pathologists. The lesions were first categorised as benign or malignant then a more detailed diagnosis was reached. The original and reviewed diagnoses were compared. Of a total of 210 lesions examined only twenty-two were reclassified and the changes in interpretation of the slides was defined as

minor in eighteen. One case on review was interpreted as malignant instead of benign while three cases originally categorised as malignant were re-assigned to the benign group. Half of the changed diagnoses related to the oldest group of specimens (1945-9). Assuming that this extremely low rate of major disagreement with the original diagnosis would occur in most pathology departments it was concluded that the observed changes in MM incidence were unlikely to be explained solely by changing reporting habits. In another study from Australia, 761 MMs, both in-situ and invasive, were reviewed by a panel of six pathologists. Various parameters including Breslow thickness, Clark level, regression and mitotic activity were scored. High levels of agreement were found for Breslow measurement and ulceration and intermediate levels for Clark level, histological type, presence of pre-existing naevus, solar elastosis and determination of cross sectional profile of the lesion. All other parameters showed poor agreement. (94) There was, however, no disagreement with the diagnosis of MM. Thus, on the basis of these two studies and perhaps more importantly given the sheer size of the present changes in MM data it seems that differences in diagnostic categorisation played only a small role in explaining the recent incidence rates. No series reports any change in the proportions of the different histological types of MM or in the observed frequency of any specific pathological features.

In many series of MMs data is collected through national cancer registries. Little information exists on the accuracy of such systems although one American study found that reported cases of all cancers were within 5% of actual cases. (95) Actual cases were calculated from histological

diagnoses obtained from pathology departments. In the state of Massachusetts, a comparison was made between the national figures and independently collected data for MM (96) in the period 1982-1986. It was estimated that during this time at least 12% of histologically confirmed MMs were not registered in the national figures. It is possible therefore, that recent rises in MM incidence based on national cancer data may well be an under-estimate of the true extent of the problem.

2.1.2 Scotland

Data collected by the Scottish Melanoma Group (SMG) showed a 7.4% annual increase in MM incidence (18) over the 11 year period 1979-1989. The figures for 1979-83 are given in Table 1 and more recent data from this group for the years 1984-1990 appears in Tables 5:16 - 5:20.

The Scottish Melanoma Group estimate that they register 95% of all MMs treated in private and NHS hospitals within Scotland. This high level of accuracy is partly due to the small number of individuals involved in the collection of data ie pathologists, dermatologists and plastic surgeons in Scotland. (SMG data) Hopefully this means that the Scottish figures are as accurate as possible.

2.1.3 Reasons for Changing Incidence

If it is accepted that the observed rise in MM occurrence is real it is appropriate to consider the possible causes of this at an early stage. Assessment of current information on MM aetiology suggests that the most consistent association is with ultraviolet exposure. The wide variation of incidence with latitude and the relationship to susceptible

skin types lends support to this. Melanoma does not, however, share the direct relationship with chronic sun exposure exhibited by basal and squamous cell carcinomas. It is suggested that intermittent bursts of sun-exposure may be more important for melanoma. This theory would support the observed link between high incidence MM and indoor occupations.(44) Attention has also been directed to the question of when this intermittent sun exposure took place. A case-control study from Australia (47) looked at both recreational and occupational sun exposure in early life and in the 10 years before diagnosis. Information was also collected on the frequency of sunbathing between the ages of 15 and 24, an interval when sunbathing is most common. The authors noted that individuals with low total outdoor exposure in early life had an increased incidence of SSMs. The rate of SSMs of the trunk was related to frequency of sunbathing in both sexes and indeed in women was greater for those wearing bikinis compared to swim-suits. A change in the pattern of site involvement in melanoma has also been reported from Denmark where the observed rise in female trunk lesion has being linked to the fashion for two piece swimwear. (63) Glass (89) has also noted a rise in trunk MMs in recent years.

For Caucasian patients the part of the world where pre-teenage years are spent seems to determine that individual's lifetime MM risk. People emigrating to Australia after childhood do not appear to acquire that country's high MM risk.(48) Native born Australians have higher MM mortality rates than immigrants. For the latter, however, mortality increases with length of residence in Australia.(97) Likewise, immigrants to Israel keep the risk of their country of origin. Those from Europe and

America have higher and those from Asia and Africa lower risks compared to native Israelis.(98)

Two explanations have been proffered for possible recent changes in sun-exposure, namely a behavioural one reflecting the fashion for high exposure sports and sun-tans and an environmental one in which the amount of energy from the sun reaching earth has risen.

The link between MM incidence and changing recreational habits could be the explanation for the "cohort effect" noted in melanoma literature. If MM patients are studied grouped according to year of birth, higher rates of MM emerge as successive generations reach the same age group. This trend has been observed in several countries of both high and low incidence.(99) A study of birth cohorts in Australia showed an increasing incidence starting with those born in 1865 and stabilizing around the 1935 cohort. (14) The cohort effect has been interpreted as being a reflection of the fashion for exposing more skin to the sun and increased availability of sunny holidays in successive generations. Cohort analysis can also be applied to mortality data. There has been a trend to increasing mortality with successive birth cohorts but the rate of increase appears to be slowing in recent years. (100)

An alternative explanation for changing MM trends is that more harmful ultra violet light is now able to reach earth due to environmental changes. Ultra violet light is divided into UVA, UVB and UVC with wavelengths of 320-400nm, 290-320 and 200-290 respectively. The most widely publicised recent environmental change affecting ultra-violet light is the thinning of the protective ozone layer of the stratosphere.

Ozone is formed by the action of ultraviolet light on oxygen atoms. This process occurs very slowly and thus damage to the ozone layer may take many years to be reversed. The ozone layer protects the earth's surface from ultraviolet light, virtually blocking the very harmful UVC rays. UVC is maximally absorbed by DNA while this occurs to a very much lesser degree with UVB and hardly at all with UVA. Thus the potential for damage with UVC is considerable. Theoretically, a damaged ozone layer would allow more ultraviolet light to reach more people and eventuate in more MMs.

Scientists first reported a "hole" in the ozone layer over Antarctica in 1984 and thinning of the layer has been noted in other parts of the world subsequently. This thinning is maximal in the northern hemisphere between latitudes 50-60.(101) The chemicals which cause most damage to the ozone layer are chlorofluorocarbons produced by aerosols and refrigerants. The widespread use of these products has increased in the last few decades.

On a related theme, it had previously been noted that peaks of increase in MM incidence mirrored the cycle of "sunspot" activity.(102) Sunspots occur in peaks approximately every ten years and can catalyse the destruction of ozone. Peaks in MM incidence followed 2 - 3 years after sunspot peaks while no similar cyclic pattern was noted for other types of tumour. The recent observation of reduced ground level ultraviolet measurements associated with sunspots must cast doubts on the direct relationship to MM.

It is likely that the increase in MM incidence is a reflection of the combination of behavioural change and environmental differences and

thus both would need to be addressed in any attempt to reverse this trend.

2.2 Prognosis in Melanoma

2.2.1 General Comments

As mentioned previously the most important prognostic factor for MM is the Breslow thickness. Thick primary tumours are more likely to metastasise than thinner lesions. Thus the proportion of a country's MMs in the thick, poor prognosis category is reflected in that country's overall MM mortality rate. If the overall incidence of MM rises and the proportion of poor prognosis lesions remains the same, in time the mortality rate from MM will increase in parallel.

Data from Australia, (13) has shown that mortality rates are not increasing in line with incidence. This would seem to be explained by the fact that the proportion of thin, good prognosis lesions has increased to the extent that the vast majority of primary lesions are now in this category. It has been suggested that this change is a result of a long running public education campaign to encourage earlier diagnosis and treatment. (103, 104)

2.2.2 Scotland

In the period 1978-83 Scottish patients with newly diagnosed primary MM had a poor overall prognosis with a 62% 5 year survival rate. (105) This compared unfavourably with data from other countries notably Australia. (13) In Australia 62% of MM patients presented with thin tumours and their overall 5 year survival rate was 80%. This difference

could relate either to different biological behaviour of the tumour in different parts of the world or could reflect presentation of MM at a later stage in Scotland.

The Scottish Melanoma Group arbitrarily divides reported melanomas into three thickness categories according to the Breslow measurement of the primary lesions. These are "thin" 0-1.49mm, "intermediate" 1.5-3.49 mm and "thick" $\geq$ 3.5mm. The 5 year survival figures for patients presenting up to 1983 were 93%, 67% and 37% respectively.(105) The poor overall survival rate of only 62% reflects the high proportion of individuals in the thick and intermediate categories.

During the years examined in the above study the percentages of Scottish patients presenting with thick lesions was 31, with intermediate 30 and with thin lesions only 39. In an attempt to explain the disparity in numbers of thick lesions in Scottish patients compared to Australian ones a search for possible delay in diagnosis in the Scottish cases was undertaken.

Table 1: Numbers of melanomas in Scotland

	Tumour thickness				
Year	**Thin**	**Intermediate**	**Thick**	**Missing**	**Total**
1979	92	78	81	0	251
1980	105	62	69	16	252
1981	81	66	79	13	239
1982	99	71	82	16	268
1983	117	96	81	14	308
Total	**494**	**373**	**392**	**59**	**1318**

2.3 Delay in Diagnosis

2.3.1 General

It seems logical to assume that the earlier a correct diagnosis is made and appropriate treatment instituted for any malignant condition, the better the outlook for the patient. Thus "delay" in diagnosis is generally thought to be disadvantageous although very little work correlating delay to outcome has been carried out.(v.i.)

There is no clear definition of delay as, other than in those patients whose tumours present as incidental findings all patients have some interval between noting the abnormality and seeking advice about it. The early work of Pack and Gallo (106) defined "delay" as a period of greater than three months between noting a new symptom or sign and seeking medical advice about it. This time interval has become widely accepted as a reasonable definition of delay.

The word "delay" unfortunately implies some fault on behalf of the doctor or the patient. One group has advised that the term "delay" be avoided and "lagtime" substituted. (107) These workers interviewed 125 individuals with recently diagnosed malignancies including MM and enquired about lagtime to diagnosis. Patients were then subjected to extensive psychological testing. Individuals with longer lagtimes tended to deny their disease, to believe it was not serious and to have more marital and family problems than those with shorter lagtimes. However, only in those with breast cancer did the duration of lagtime correlate with

the stage of the tumour at the time of presentation. A previous study, having shown that 62% of cancer patients waited more than 3 months to seek medical advice interviewed 314 patients about their reasons for delay. (108) These patients had breast, cervical, mouth or skin cancer (MM or SCC). The authors found that while most breast cancer patients suspected they had cancer before seeing their doctor, patients with the other types of tumour were largely ignorant of the significance of their symptoms. Over half of all the patients interviewed delayed seeking medical advice for at least three months. Delays were longer among those who suspected they might have cancer.

A study of delay in cancer patients in New Mexico looked at 800 individuals with all types of cancer. The most frequently encountered tumours were those of the colon/rectum, prostate and breast. The investigators assessed several medical and sociological factors including the site, ethnic group, social class, and knowledge of cancer. They found that 20% of the patients delayed for at least 3 months. Delays were greatest for cancer of the prostate and least for breast cancer. Hispanic patients delayed more than non-Hispanics and patients who did not attend a physician for regular check-ups were also more likely to delay. (109)

Adam and colleagues also looked at possible delay in a group of 162 women with newly diagnosed breast cancer.(110) They considered delay to be composed of three intervals between four events; (i) patient noting the abnormality, (ii) consulting their general practitioner, (iii) referral to a specialist and (iv) definitive treatment. Any interval of greater than two weeks was considered as a delay. In their study they found that 80% of the patients had at least one "delay" interval. Patient- attributable delay was

due to failure to appreciate the potential significance of their symptoms in 44% of cases and to rationalisation of symptoms or domestic problems in a further 30%. Another study of delay in breast cancer patients (111) involved interviewing 145 patients. Those presenting with a breast lump alone or accompanied by other signs or symptoms had significantly shorter patient- attributable delays than those with other, less well-recognised presenting features.

The presence and influence of delay in diagnosis of testicular tumours has also been studied. Patient-attributable delay of more than three months was associated with a later stage at diagnosis. (114) Another group found that 93% of patients presenting within 1 month of noting symptoms had Stage 1 disease only while 50% of those delaying more than 6 months had clinically detectable metastatic disease.(115) A further study of Irish patients with testicular tumours showed that delay correlated with presentation with metastases, decreased prospects of cure and increased mortality. (116)

2.3.2 Delay in West of Scotland Melanoma patients (117)

A group of 125 patients presenting with primary melanoma was studied to establish the presence or absence of delay. Possible delay was recognised at these time points; (i) the patient could delay in seeking the advice of their general practitioner about a suspicious pigmented lesion, (ii) the general practitioner could delay in referring the patient for specialist opinion and (iii) there could be a hospital delay either in seeing the patient on receipt of the general practitioner's letter or in instituting therapy. These intervals were termed patient, general practitioner and

hospital delay respectively. They were added together to establish the duration of total delay. Combined durations of three months or more were classified as "delays" in this study. The dates used to calculate the delays were obtained from a questionnaire completed by the patients and confirmed using the hospital records and referral letters. The patient questionnaire covered many different points in the patient's past medical, occupational and social histories and was not confined to possible delay alone. Full details of the the patient's age and sex together with the site, histological type, Breslow thickness and other pathological features of the melanomas were available from the SMG proformae.

The study patients consisted of 88 women and 37 men (f:m:2.4:1) of ages ranging from 19-82 years. Of the 125 evaluable patients only twenty (16%) had total delays of less than three months. Sixty patients (50%) had delays of three to twelve months and forty two (34%) of more than a year. When the individual components of the delays were examined it was found that there were no hospital delays of more than three weeks. In three cases (2%) the general practitioner had delayed referring their patients to hospital for six, eight and sixteen weeks respectively. In all these instances, however, the patient had delayed for more than three months before seeking their general practitioner's advice. Thus in 102 of the 125 cases where the total delay had been over three months delay was entirely attributable to the patient. No significant delays were due solely to the general practitioner or the hospital service.

Ninety nine of the 105 delay patients (94%) said that they had not sought advice earlier as they had been totally unaware of the potential seriousness of their suspicious pigmented lesion. Four patients (4%) cited

other seemingly more important family reasons for the delay while two patients (2%) admitted that they feared the surgery that might ensue if they sought medical advice.

There was no significant difference in the mean age at presentation in those with and without delays. The mean age of those waiting less than 3 months was 47 years (range 19-71), for those waiting 3-12 months 48 years (22-79) and for those waiting more than 12 months 52 years (29-82)

The site of the primary lesion was designated "socially visible" or "usually covered". Socially visible sites were the face, neck, hands and female lower leg. Sites were examined in this way to see if ease of observation of the melanoma by the patient and others lead to earlier presentation. No significant differences were demonstrated in the mean delays for covered and socially visible sites. Likewise there was no significant difference in the mean delays for men and women patients nor any variation according to the histological type.

The Scottish study thus demonstrated three findings; (i) there was a delay in diagnosis in the majority of patients, (ii) almost all delays were attributable to the patient and not the general practitioner or the hospital service and (iii) patient delay was almost always due to lack of knowledge.

Relatively few studies have specifically addressed the problem of delayed diagnosis of melanoma. Temoshok and colleagues (118) studied patient-attributable delay in 106 patients looking at behavioural factors as well as tumour characteristics and prognostic features. They found that the longest mean delay (6 months) occurred in patients whose MMs were on the back and in those with little or no previous knowledge of MM or its

treatment. This group also demonstrated a correlation between the Breslow thickness of superficial spreading MMs and length of delay. This relationship only held if tumours diagnosed by coincidence during physical examinations for other purposes were excluded i.e. those with no delay at all. In contrast, however, a previous study of 245 MM patients had however failed to show any correlation between Breslow measurements and length of patient attributable delay. (119) This group found a mean delay of 8 months in their patients and no correlation between certain sites including the back and length of delay. They found that nodular MMs were associated with longer delays than the superficial spreading variety.

A more recent study from Australia (120) looked at delay data for 435 patients with melanomas. No significant differences were found between time to diagnosis (delay) and Breslow thickness. The median duration to diagnosis from noting a change in the lesion was 5 months.

The results of the Scottish delay study suggested a general lack of knowledge of MM which might be at least partly corrected by a public education campaign on the subject. There was no indication from the results that any specific age group or sex of patient should be selectively targeted.

CHAPTER THREE

3.1 Medical Education

3.1.1 General Introduction

Continuing medical education (CME) has been defined as postgraduate education designed to maintain a consistently high standard of preventative and curative care. (121) In general it excludes education taken to gain specific qualifications or diplomas.

This concept of CME assumes that anything other than perfect care reflects a lack of knowledge on the part of the doctor involved. It also assumes that the correction of this gap in knowledge will improve care. Neither assumption has been proven in the literature.

3.1.2 Methods

A variety of educational methods may be used. The choice is dictated by a number of factors such as the number of learners, the subject matter and the situation in which learning is taking place.

The most commonly used method for large numbers of learners is the formal lecture. The lecturer can disseminate knowledge from many sources and offer their own opinion on the subject. Visual aids e.g. 35mm slides and videotapes can be incorporated into the lecture to emphasise or more fully explain certain points. Some time is usually available for learners to ask questions.

Smaller numbers of learners allow education to take place in the less formal tutorial setting. Students are encouraged to ask questions requiring more detailed answers and also to demonstrate their own learning and experience of the subject. Tutorials allow the use of the same visual aids as the formal lecture.

Individual learners can use self-learning programmes to improve their knowledge. The pace and timing of the learning can be completely dictated by the learner themself. Such learning programmes can use sophisticated education methods like computer and videotape or simple ones like tape slide presentations or written questions and answers.

3.1.3 Planning

The greater part of CME is arranged by professional organizations, hospitals and medical schools. Success in learning usually requires the presence of some form of stimulus. In some parts of the United States evidence of a certain amount of participation in recognised CME programmes is essential for re-licensing purposes. Previously, in Britain, a financial incentive was offered to general practitioners for their attendance at designated courses and meetings. This practice has now been discontinued. For hospital doctors, attendance at recognised courses and meetings is allowed with pay and expenses granted by the employing Health Authority.

In designing a specific education programme several factors have to be taken into account. These include the perceived goals of the programme, the target audience, the type of information to be disseminated and the most useful media for education.

In medical education the so-called classical planning model is based on the belief that appropriate instruction will result in a change in doctor behaviour. Surprisingly little information exists in the literature to confirm this point. Some education programmes have therefore as their perceived goal the correction of a recognised deficiency in health care. They aim to achieve this by improving doctors knowledge and then altering their behaviour accordingly. In some programmes there may be more than one perceived goal or learning objective.

An appropriate target audience has to be selected for the programme. This is often dictated by specialist interest, geographical situation and resources of those organizing the programme. For programmes directed at doctors the choice is usually easily reached as to whether it should be aimed at general practitioners or at hospital doctors. Because the British health care system involves general practitioners as the primary health providers they are the ideal target for population based screening and for education programmes which include a public education component.

Hospital based programmes can use more sophisticated screening programmes on a selected population and may be more appropriate for some treatment- orientated programmes. Depending on the subject matter the target audience can be widened to include other health care personnel e.g. hospital and community based nurses and health visitors.

3.1.4 Evaluation

If an educational programme has well defined learning objectives, assessment of its success can be made by establishing whether these have been met. It is relatively straightforward to measure the level of

knowledge in the target audience before and after the education programme. Whether an increase in information results in altered behaviour and thus improved patient care is much more difficult to measure. Only a few studies have tried to assess knowledge before and after education and very few have addressed its subsequent effects on patient care. Likewise the resulting behavioural and attitudinal change produced in the practitioner has not been studied.

A physician's performance in a defined clinical situation is dependant on his knowledge and also on the application of that knowledge. This latter factor is almost impossible to assess directly but will be a strong influence on more readily measured patient outcome figures like mortality data. Some aspects of physician behaviour can be measured before and after education to give an indirect indication of its efficacy. These include referrals to specialists, biopsy or operation rates and requests for investigations like X-rays. A study of the effects of CME in Kansas (122) showed that there was no relationship between good perinatal and neonatal mortality outcome figures and the amount of obstetric CME undertaken by the physicians studied. Likewise in the same study there was no link between tonsillectomy rates and the amount of CME in otolaryngology.

In most education programmes no attempt at assessment of subsequent behaviour has been made. One study (123) showed that surgeons' approaches to the ordering of blood for elective operations was altered after the issue of advisory guidelines by the transfusion staff. The written advice was augmented by talks to groups of surgeons and discussion of individual transfusion requests by laboratory and clinical staff.

Education evaluation is even more difficult when the target audience has been the general public. Some idea of knowledge can be obtained by questioning a randomly selected group of the target audience before and after education. This was done before the establishment of the Breast Cancer Screening Programme in Edinburgh. (124) These workers showed that the knowledge within the target population was increased after an education campaign and that no similar change occurred in a an "uneducated" control population. However, this study also showed that the increase in knowledge did not result in an increase in patients consulting their GPs about breast problems as had been anticipated.

Patient outcome figures can also be studied to give an indirect method of the effect of education on the public. The Queensland Melanoma Project has reported an increasing proportion of thin, early MMs in recent years and consider that this is due to the tendency for their now well educated and MM- aware population to seek medical advice at an earlier stage than before.(103,104)

3.2 Cancer Education.

Public education in the field of cancer recognition and prevention is not a new concept. In general the most common types of cancer eg breast, lung and uterine cervix have been the subject of public campaigns. In several of the sunnier parts of the world the problem of skin cancer has also been addressed.

3.2.1 Breast cancer

A major education campaign was carried out in Edinburgh to coincide with the launch of a population- based breast cancer screening programme.(125) The authors tried to establish the level of knowledge of breast cancer among the female population of Edinburgh by a questionnaire, to then offer appropriate education and finally to re-evaluate the level of knowledge on the subject. This latter value was then compared with that of women in Aberdeen where no educational campaign had taken place. As a result of earlier pilot studies the Edinburgh workers chose to use the small group discussion format to spread the information.

The aims of the campaign were to increase knowledge amongst the susceptible population, to promote a positive attitude to the disease and to teach women to use self- examination to encourage diagnosis at an earlier stage. Evaluation of the campaign showed an increase in the level of knowledge in Edinburgh compared with Aberdeen. There was no behavioural change produced in that self-examination did not become more widely practiced. The authors acknowledged that increasing the level of knowledge might not necessarily result in earlier diagnosis. Other factors such as age and social class could affect the attitude to self-examination or attendance at screening clinics despite greater knowledge.(126)

3.2.2 Other cancers

An evaluation of knowledge of testicular cancer was carried out by postal questionnaire in a group of young men. The recipients were selected to be

of higher than average education. The authors found that knowledge was extremely poor and awareness of the value of self-examination almost non-existent.(127) These findings have led to a public education programme on testicular cancer.

3.2.3 Skin cancers

Most education campaigns have concentrated on malignant melanoma rather than squamous or basal cell carcinomas. Two different approaches have been used; (a) secondary prevention - early detection of MM at a thin, curable stage and (b) primary prevention - education on sensible sun exposure to reduce risk of developing MM.

The high incidence of MM has resulted in several major campaigns in Australia most notably the Queensland Melanoma Project.(104) This has been running since 1963 utilising all available types of media. The campaign was produced in response to the recognition of the high incidence of MM, at that time 16.5 per 100,000 population. The first publicity used a colour leaflet on diagnosing pigmented lesions which was distributed to local doctors. The interest produced by this led to its being more widely distributed in Australia and also to other countries. The original leaflet was expanded to a more comprehensive one.

The interest generated by the leaflet was capitalised on by the use of multiple local and national talks and lectures. These were targeted both at the medical profession and at para-medical individuals like nurses and physiotherapists. This section of the educational venture was associated with an increase in the proportion of thin MMs being seen. This result led to similar campaigns in other parts of Australia.

After the professional part of the programme was established, a public education venture was introduced. The initial publicity used posters to demonstrate the appearance of doubtful pigmented lesions and then progressed to public meetings, press and radio publicity. The campaign was conducted with very limited funding and thus television publicity could only be used when it was free e.g. when a doctor was asked to contribute to a planned programme. In the later years of the campaign television advertising has been purchased to pass the campaign advice to maximum numbers of people.

Specific efforts have been made to educate schoolchildren and to identify high risk groups e.g. those with familial MM with or without multiple atypical naevi.

As the campaign has run on it has been updated and altered to maintain public interest and to include more preventative advice on sensible sun exposure. Those involved in the project noted that the public memory was fairly brief and that regular reminder campaigns were necessary to maintain the projects high public profile.

The main measure of success of the campaign has been the fact that in the face of a continuously rising MM incidence the Queensland MM mortality rate has been stable whereas that of other Australian states has risen. There has also been a continuing increase in the proportion of thin MMs seen.(103,104) Similar projects are also running in Victoria, Australia and in New Zealand.

In Hawaii, where a seven -fold increase in MM had been noted in recent years, an education campaign has been taking place. This has been aimed

at four separate target groups: (i) physicians and surgeons, (ii) other health professionals like nurses and physiotherapists, (iii) non-health professionals like hairdressers and beauticians and (iv) the general public. The amount and nature of the information was tailored to the target audience. Tape-slide preparations were used for the professional audiences and a comic book, television and radio announcements for the general public. (128) Subsequent evaluation showed that public knowledge was increased by these efforts by pre and post campaign testing of randomly sampled members of the public. The most widely cited method of learning was by television broadcasts.

An education program was conducted in the low incidence area of Trento, Italy in 1977 and 1979.This consisted of the distribution of pamphlets designed to encourage the early recognition of MM. The pamphlets were distributed to schools, pharmacies and hospitals.The advice included a 5 point checklist for lay use. The leaflets were discussed in local press and radio programmes. Patients were encouraged to attend the local dermatology department for a free skin examination in the leaflet.

Their results were evaluated using aggregated annual data 1972-76 (pre-publicity) and 1977-81 (post-publicity). The post-publicity years showed a fall in the proportion of thick (>3mm) lesions to 40.3% compared to 59.8%. Thin lesions (<1.5mm) had increased in proportion from 10.2% to 32.6%.The authors attributed this change to their publicity.(129)

3.3 Cancer Screening

Screening of the whole or "at-risk" members of the population for the more common varieties of cancer has taken place in various parts of the world. Most workers agree that screening is most effective in a well-informed population and thus most programmes follow a professional and public education campaign. Screening is best applied to diseases in which the following criteria can be met: the disease is common and has a significant morbidity/mortality, early treatment is helpful and a simple, patient-acceptable test is available.

3.3.1 Breast Cancer

More data is available for the assessment of screening for breast cancer than any other cancer. Most of the major screening efforts have been aimed at the 45-64 year old age group.

There are two main screening methods available - mammography +/- physical examination and education in breast self examination (BSE). A comparative trial of the methods was set up in 8 centres throughout Britain. (130) In 2 centres annual examination and biennial mammography was offered while 2 others offered education and encouragement in monthly BSE. In the 4 other centres available for comparison no additional services were offered, breast cancers continuing to be managed in the established way(s). Evidence was emerging from other parts of the world that breast screening could have beneficial effects. The long running Health Insurance Policy study from New York showed a decrease in deaths from breast cancer in the screened compared to unscreened women. Those cancers detected at screening were also more

likely to be node negative than those presenting conventionally. (131) These findings have been confirmed by workers in other countries including Sweden.(132)

In the light of the above findings the Forrest report recommended screening all British women in the 50-64 age group by single view mammography. Repeat examinations were to occur every three years. Screening was to be available throughout the country at ninety designated centres some of which were to be mobile. They were to be staffed by appropriately trained nurses, radiographers and radiologists. Evaluation of the service including a cost per cancer diagnosed is underway.(133)

3.3.2 Cervical Cancer

Although Papanicolaou made a cytological diagnosis of cancer of the female genital tract by his "smear " technique in 1928 it was not until 1943 that its use as a diagnostic test came to be recognized. By the 1960s the smear test was such an established technique that it was felt that it should be used as a screening test for all at-risk individuals. After pilot studies in Aberdeen (134) smear tests became available nationwide. Although initially a hospital based service most tests are now carried out by general practitioners, by the family planning service or at "well women" clinics.

Evaluation of cervical screening programmes has shown a fall in incidence and mortality of invasive disease coincident with large-scale screening exercises.(135) A Canadian study has further shown that the reduction in mortality correlated with the intensity of screening. (136) In addition, the trend to an increase in mortality noted prior to the start of

screening in 1964 appears to have been halted. (137) In Britain cervical screening is currently available to all women over thirty every three years. There is no evidence that more frequent screening would significantly improve the pick-up rate of invasive tumours (138)

3.3.3 Other Cancers

Several programmes are currently underway for screening for carcinomas in other sites including the lower bowel (139) and ovary. (140) These sites are much less accessible than cervix and breast and generally require a more invasive form of screening test. This has great implications for cost, personnel and facilities required and for patient acceptability of initial screening and follow-up tests.

3.3.4 Melanoma

Skin tumours form an ideal target for a screening campaign if clinical examination is taken to be both sensitive and specific. No specialized equipment is required and the screening test itself is quick and non-invasive.

Several screening ventures have taken place in the United States under the direction of the American Academy of Dermatology (AAD). In late March 1985 the first Melanoma/Skin Cancer Prevention Week took place. The campaign was nationwide and utilized maximal local and national publicity to encourage the public to attend for a free and if possible, full skin examination. Examinations were made by volunteer dermatologists in hospital outpatient departments and in public places including shopping malls. People were examined either by an

appointment system or on a "walk-in" basis according to local arrangements. In 1985, 22,000 people were screened and 42,000 in 1986. The screening involved only clinical assessment and patients with clinically suspicious lesions were advised to see a dermatologist for biopsy. In 1985 91 lesions which were clinically felt to be MMs were detected at screening and 262 in 1986. Many more individuals were found to have non MM skin cancer and precancerous conditions including actinic keratoses. All lesions were diagnosed clinically and subsequent histological confirmation was generally not available.(141)

The AAD publicity for the screening was not aimed at any special groups within the population. In general, more women than men attended (142) and 43% of those screened were aged less than 50 years. No data is available as yet from the AAD project to indicate whether screening has had any effect on melanoma mortality and morbidity. Plans have been made, however, to continue with these annual campaigns. It has been argued that as melanoma is a relatively rare tumour screening should be directed only at high risk individuals rather than the general population.(142).

Similar screening has been done in Queensland (104) when people are offered free skin examinations on mobile units on beaches and in other public places. The rate of "pickup" of MM by this method is not available. The siting of the units on the beaches means that the appropriate high risk sunworshipping population is being targeted.

To date there has been no large scale MM screening programme in Britain and most effort has been directed at public and professional

education. Given the rarity of the disease and the current doubt about the benefits of screening the general population there would be no strong arguments for establishing such a programme here at present. From an educational point of view, there had been no large scale MM programme prior to 1985 though various interested individuals had been active at local levels.

Although screening may seem an attractive proposition for MM certain aspects of the process would require clarification. Firstly the exact nature of the skin examination e.g. total or limited. Secondly, the most useful screener needs to be identified e.g. specialist doctor, general practitioner or trained nurse. Finally evidence would be required to show that any effect on mortality would be sufficiently large to justify the capital and human costs of this type of exercise.

CHAPTER FOUR

MATERIALS AND METHODS

The Glasgow Melanoma Campaign

4.1 Introduction

The professional part of the education programme was designed for a target audience of all 650 general practitioners in the Greater Glasgow Health Board Area. It was decided to offer an amended version of the programme to other members of the primary health care team thereafter. These included hospital and community based nurses and district nurses.

The campaign had three aims; (a) cognitive - to increase knowledge, (b) attitudinal - to emphasise the value of treatment at an early stage and (c) behavioural - to encourage early referral of appropriately screened patients. Much of the information for the campaign was best expressed visually rather than verbally. The preliminary GP questionnaire had indicated that the preferred method of learning was a booklet, followed by talks, video-tapes and tape-slide presentations.

4.2 Materials

4.2.1 Booklets

The two most popular booklet subjects selected by the GP's in the preliminary questionnaire were the recognition of the early MM and the clinical features of other benign pigmented lesions. Two separate

illustrated booklets were produced specifically for the campaign on these topics. Both contained many appropriate clinical photographs selected to help emphasis the points raised in the text. Included in the booklets were blank pages for note taking.

The first booklet dealt with the epidemiology, aetiology, clinical features and current management of MM.(144) This comprehensive booklet gave a detailed description of the wide variety of clinical features observed in different types of melanoma with accompanying clinical photographs. A companion booklet "An illustrated guide to benign pigmented lesions" was also produced.(145) The clinical features of the more commonly encountered pigmented lesions were described together with their incidence, age of onset, malignant potential and appropriate management. Clinical photographs were used to illustrate the text.

4.2.2 Problem solving exercises

A book containing management problems arising in patients with pigmented lesions was produced. This described the patient's history briefly and asked one or more key questions on management on one page. The following page then offered the correct diagnosis and widely accepted views on appropriate treatment. The latter were based on comments supplied by a wide range of experts in the melanoma field. These exercises could be used by the GPs as a means of self-assessment as well as a source of information.

4.2.3 Clinical video

With the help of the Audio-Visual Department at Glasgow University a videotape on MM was produced for the campaign. The 17 minute tape consisted of interviews conducted by Professor MacKie with patients who had primary or secondary MM. Patients in the former category were asked to describe the features that drew their attention to their lesion, its duration and their thoughts on the cause of any observed changes. Treated patients were asked about their primary lesion and their subsequent therapies. Good, close-up views of primary lesions were obtained and their distinctive clinical features stressed. Information on MM similar to that provided in the booklet was used in the video between interviews in the form of information cards and simultaneously in the script. A few patients with benign pigmented lesions were also featured and the factors which could help distinguish MMs from such lesions were emphasised.

4.2.4 The 7 point checklist

The amount of information in the campaign material was large and thus it was felt that a summary of the essential message was desirable. A checklist of factors which could be used by health professionals in the evaluation of pigmented lesions was made. The 7 features which were most useful in distinguishing MMs from benign lesions were listed. This checklist was featured in both booklets and the videotape. The points are listed in Figure 2.

4.2.5 Public Education Campaign

It was felt that public education would be most effective if carried out as a concentrated week of information using as many different types of media as possible. As people are generally more skin conscious at the time of their annual holiday the early summer was chosen as the optimum time for this part of the campaign.

An illustrated poster and companion leaflet were designed for the campaign, the costs of printing and distribution being initially met by the Greater Glasgow Health Board Health Education Department. These showed coloured pictures of typical melanomas and described the "at risk" individual. The 7 point checklist (Figure 2) was the most prominent feature of both productions. Posters and leaflets were distributed to general practitioners' surgeries, hospital outpatient departments, clinics and public libraries.

With the help of the Health Board Education Department a press release was prepared on the campaign for publication in the second week of June. It was initially given to all local and national Scottish newspapers only. The release drew attention to the rising incidence of MM, its potential seriousness, the need for early diagnosis and to the use of the 7 point checklist for self examination. The public were encouraged to seek medical advice on any suspect lesions.

Air-time was requested on local and national radio and television programmes. In some instances MM patients were interviewed and described their experiences of diagnosis and treatment. On other occasions there was a interview with a specialist (Professor R MacKie) who

described the current increasing incidence, the need for early diagnosis and the value of self examination using the 7 point checklist. Media publicity tended to be self perpetuating in that other newspapers and magazines carried their version of the press release days or even weeks after the official campaign one. For this reason the publicity did not remain confined to a Melanoma week in June as intended but was sustained throughout June and July. The time scale of the different components of the programme are shown in Figure 3.

Figure 2: 7 Point Checklist

1	Size > 1cm diameter. (blunt end of pencil)
2	Irregular outline.
3	Irregular pigmentation/colour.
4	History of growth.
5	Itch.
6	Bleeding or discharge.
7	Inflammation.

Figure 3: Education Campaign Calendar

August - October 1984;	GP questionnaires sent out, returned and evaluated.
December 84 - May 85;	Professional education.
June/July 1985;	Intensive publicity for public education.

4.5 Evaluation

It was decided to attempt to evaluate the public campaign in several different ways. Direct questioning of the target audience was felt to be impractical due to the size of the audience and the limited funding available for the campaign. Thus assessment was made on the basis of change in patient behaviour and change in measurable patient outcome figures.

4.5.1 Patient Behaviour

The most predictable alteration in behaviour was thought to be an increase in people seeking advice on their pigmented lesions. In the present health care system this would mean a rise in consultations with GPs, a factor which would be extremely difficult to measure accurately due to the large number of doctors involved. Instead it was decided to measure the number of pigmented lesions referred to all Glasgow dermatology departments which, in the absence of a major change in GPs

referral habits would mirror alterations in the GP consultations. The number of pigmented lesion referrals to the five main Dermatology departments in the two months of maximal public education (June and July 1985) were counted using the disease index system of each department. The figures were compared with those of the same months in 1984. As the vast majority of pigmented lesions in Glasgow are referred to the designated Pigmented Lesion Clinic (PLC) at the Western Infirmary it was decided to count only the referrals to this clinic over a longer period of time to allow for seasonal variations in numbers. Thus the referrals to the PLC were monitored for the three year period starting December 1983. This gave the numbers referred during the professional and the public campaign compared to the years preceding and following them.

4.5.2 Pigmented Lesion Clinic

At the Western Infirmary there was a designated PLC already established. This allowed rapid referral of any suspect pigmented lesions usually within 2 weeks. The clinic initially was conducted by two medical staff though as the campaign progressed additional personnel were required. Lesions suspected of being MMs at the clinic were removed at the time if feasible or within a few days if more complex surgery was required. A clinical photographer was present throughout each clinic.

4.5.3 Effects of Publicity

A questionnaire (see Appendix) concerning the possible influence of publicity on referral was administered to 50 consecutive patients seen at the designated PLC at the Western Infirmary in the summer of 1985. The

same questionnaire was sent to 50 consecutive patients attending non-PLC dermatology clinics in Glasgow and 29 in Dundee during the same period. These individuals were identified from diagnostic indices as having been referred with a pigmented lesion.

A designated PLC was set up in 1985 in the Royal Infirmary in Edinburgh. Publicity related questionnaires were also completed by 118 patients attending there.

Questionnaires were intended to be anonymous though the city of origin was identifiable. Patients were asked their age, sex and whether they had been aware of the current Glasgow Melanoma campaign. Those who had heard of it were offered a choice of the names of national and local newspapers, television and radio programmes which had featured the campaign and asked to select the one(s) they had encountered. Other proffered information sources included leaflets/posters and "other". The latter option gave space for comment. Those who had not heard of the campaign were offered some possible reasons for having consulted their GP about their pigmented lesion. These included advice from friends and relatives, change in or development of symptoms in their pigmented lesion and existing awareness of the potential seriousness of pigmented lesions.

4.5.4 Surgeons' and Pathologists' Workloads

The above referral data gives some indication of the change in referrals to dermatologists throughout the city. In order to assess changes in referrals to other outpatient clinics eg plastic or general surgery and to monitor any change in histopathologists' workloads the numbers of pigmented lesions

excised throughout Glasgow during the designated three year period were measured.

This was done by counting the numbers of histologically diagnosed lesions of the types which are most commonly confused with MMs on clinical grounds. These are melanocytic naevi, seborrhoeic keratoses, dermatofibromas, benign vascular lesions and basal cell carcinomas. At the time that this data was collected none of the contributing pathology laboratories had computerised records. Thus all the data was manually extracted from pathology request forms in all pathology departments in the city. In the Western Infirmary the majority of skin specimens are processed in the dermatopathology laboratory and a smaller number in the main pathology department. Data was collected from both sources. Four of the laboratories involved classified specimens using coding systems which helped in identifying the relevant request forms but in two sites these had to be manually extracted from a general skin file. Note was taken of those instances where the clinical diagnosis was thought to be melanoma.

Material was received in all five hospitals from both dermatologists and general surgeons. The laboratories at the Western and Royal Infirmaries also processed specimens from the Regional Plastic Surgery Unit at Canniesburn Hospital in Glasgow.

4.5.5 Patient Outcome

The most important initial measure of the success of the campaign was the numbers and types of melanoma seen and in particular the proportion of thin, early tumours. With the co-operation of the Scottish

Melanoma Group data was obtained of the numbers, histological types and Breslow thicknesses of all MMs removed in the West of Scotland for the year of the campaign and the years preceding and following it. The final measure of the effect of the campaign will be the mortality data obtained in the future.

4.5.6 Finance

Funding for the campaign was obtained from the Camilla Samuel Fund which paid for a part-time salary for a registrar in 1985 and 1986. The cost of the first printing of the two booklets was met initially by the Department of Dermatology of the University of Glasgow and thereafter by a pharmaceutical company. The costs of production and distribution of the posters and leaflets for public education were met by the Health Education Group of the Greater Glasgow Health Board. Publicity in the press, television and radio was provided free.

CHAPTER FIVE

RESULTS

5.1 Uptake of Materials

5.1.1 General practitioner questionnaire

(The pre campaign general practitioner questionnaire is in Appendix A.)

A total of one hundred questionnaires were distributed to a randomly selected group of Glasgow's 650 general practitioners. Questionnaires were accompanied by a reply paid post card by which further information could be requested. Sixty nine completed questionnaires were received (69%) and all were evaluable.

Replies to individual questions were as follows.

(i) The recognition of early malignant melanoma is a subject about which in general GPs are not confident because of its relative rarity.

Options: Agree/Disagree.

61 of 69 (88%) of GPs agreed that there was a lack of confidence in the early recognition of melanoma.

(ii) If the following forms of material were available to help compensate for this lack of personal experience, which do you consider would be most useful?

Illustrated booklet	46/69 (67%)
Videotape	37/69 (54%)
Local meetings	35/69 (51%)
Tape-slide	16/69 (23%)
Car tape	9/69 (13%)
Phone	0/69 (0%)

(iii) Which of the above would you anticipate being most useful to the majority of GPs?

Booklet	37/69 (54%)
Meetings	20/69 (29%)
Video tape	8/69 (12%)
Car tape	4/69 (6%)
Tape-slide	2/69 (3%)
Phone	0/69 (0%)

(iv) Do you consider that the needs of trainee GPs, as far as this topic is concerned, are different from those of established GPs?

Options:	Yes/No.	58/69 (84%) - Yes

(v) Which of the following possible topics for educational leaflets would you consider most GPs would find helpful in this area of knowledge?

Options: Definitely useful and interesting/ Probably useful/ Not of great interest.

Table 5.1: MM Topics- Value to GPs. *

Topic	Perceived value		
	Definite	**Probable**	**Not**
MM-Early Recognition	92	7	1
Normal moles	63	26	9
MM-Pathology	12	41	47
MM-Surgery	13	56	28
Disseminated MM Management	23	44	23
MM & Pregnancy	47	44	7
MM-Epidemiology	13	43	38
Dangers of excess sun	53	36	9

(vi) Do you have any personal anecdotal case history of practical experience in this field which might be used (anonymously or not) for the educational exercise?

Options: Yes/No.

Yes: 13/69 (19%)

**Figures refer to number of GPs assessing usefulness of each topic.*

(vii) Would you welcome more information on the appropriate procedures to initiate if a patient walks into your surgery with a suspect melanoma?

Options: Yes/No.

Yes: 51/69 (74%)

(viii) Would you welcome information on current appropriate therapeutic procedures for melanoma in order to inform patients of the likely course of events?

Options: Yes/No

62/69 (90%)

(ix) Would you welcome educational material or an educational campaign aimed at your patients to encourage them to attend for examination of "odd moles" and possible early melanoma?

Options: Yes /No/ Only after the GP programme has been distributed.

Yes -25/69 (36%)

Yes but preceded by GP education - 36/69 (52%)

No - 8/69 (12%)

5.1.1.1 Requests for further information

A total of ninety one cards requesting further information were received. Of these, there were ninety one requests for the booklet on benign pigmented naevi, sixty three for the problem solving exercises and seven for the videotape. A further seven practices requested a showing of the videotape at a later date.

5.1.2 Professional Update

5.1.2.1 Local Meetings

During the six month professional update six meetings were held in the West of Scotland and attended by about 350 general practitioners. These sessions usually consisted of a talk on melanoma, a viewing of the videotape and an opportunity to ask questions on the topic. Copies of the melanoma, benign naevi and problem solving exercises booklets were available at all the meetings.

5.1.2.2 Nursing Staff Update

Separate meetings were held during the professional update period for hospital and community nurses in the West of Scotland. Meetings were held in six different venues and audiences included student and qualified hospital nurses, district nurses and health visitors. At these sessions the clinical video was shown and a question and answer period followed. All sessions were attended by at least one of the contributing dermatologists. Copies of the videotape were made available to senior nursing teaching staff who showed the video on further occasions in individual hospitals

to nurses unable to attend the main meetings. Copies of the campaign booklets, posters and leaflets were also available at the nurses meetings.

5.1.3 Public Education

5.1.3.1 Press release

A press release was produced with the advice and co-operation of the Health Education Department of Greater Glasgow Health Board. Publicity was requested for the first week in June 1985. The following newspapers carried the release: the Times, Observer, Guardian, Scotsman, Glasgow Herald, Daily Record, Sunday Mail, Coventry Evening News and the Nursing Times.

5.1.3.2 Television and radio publicity

The education campaign received publicity during the following television programmes: BBC National News, BBC Breakfast Time, BBC Reporting Scotland and Body line. Radio publicity was through the following: BBC Radio 4-"Today", Woman's Hour, Tell Me More (science programme), Radio Clyde (local West of Scotland), Radio Solent and Radio Sheffield.

5.1.3.3 Requests for further information

Following the major publicity there were many requests for further information from the lay public, professional organizations and doctors. Fifty three letters were received from the general public from all parts of Britain. All the letters were answered and copies of the campaign leaflet enclosed. Further information was sent on request to the following

associations: British Association of Cancer United Patients, Association of Sun Tanning Operators, Institute of Electrolysis and the Central Council for British Naturism.

5.2 Monitoring

5.2.1 Pigmented Lesion Referral Patterns

The numbers of pigmented lesions seen at the five major teaching hospitals in Glasgow during the time of maximum publicity (June and July 1985) were obtained from the diagnostic index of each of their Dermatology departments. The numbers were compared with those of June and July 1984. For this assessment, "pigmented lesion" was defined as melanocytic naevus, dermatofibroma, angioma, seborrhoeic wart and basal cell carcinoma. The figures are given in Table 5:2.

Table 5.2: Non-Melanoma Pigmented Lesions

Glasgow - Non-PLC

Hospital	June-July **1984**	June-July **1985**	**% change**
Royal Infirmary	58	63	+8.6
Victoria Infirmary	40	56	+40
Stobhill	36	51	+41
Southern General	24	48	+100
Others*	12	25	+108

Others* = smaller hospitals in West of Scotland outside Glasgow itself.

A proforma was completed for all new patients attending the PLC at the Western Infirmary. Data was collected for the twelve months preceding the professional education (December '83 - November '84), the campaign year (December '84 - November '85) and the post campaign year (December '85 - November '86). Details of the patients age, sex, referring GP, site of lesion, clinical and histological diagnoses and treatment if any were noted.

These figures are shown in Table 5:3 for each of the years studied.

Table 5.3: PLC Clinic Data

Numbers of Patients Seen, Age and Sex Distribution.

	1984	**1985**	**1986**
Numbers	155	573	759
Female	112	392	549
Male	43	181	210
F:M	2.6:1	2.2:1	2.6:1
F: Ages			
Range (Years)	0.1-87	1-90	3-94
Median	36.5	40.7	41.64
M: Ages			
Range (Years)	5-83	1-83	4-79
Median	37	45	36

Table 5.4: PLC Data.

Proportion of New Patients Biopsied

Year	1984	1985	1986
Number of patients seen	155	573	759
Number of biopsies taken	103	285	246
Percentage of PLC patients biopsied	66.7	49.7	32.4

Table 5.5: PLC Data: Clinical Diagnoses.

Number of each type of lesion & percentage biopsied

Type of lesion	1984		1985		1986	
BCC	7	80%	16	93%	15	93%
Seborrhoeic wart	41	65.8%	171	32.7%	188	11.7%
Benign naevus common	37	67.6%	158	44%	253	34%
Benign naevus other	8	37.5%	11	45%	12	33.3%
Congenital naevus	6	50%	50	58%	44	6.8%
Atypical naevus	8	75%	24	37.5%	40	30%
Angiomas	13	69.2%	17	64.7%	19	47.4%
Dermatofibromas	2	100%	17	58.8%	20	65%
Melanomas	23	100%	35	100%	42	100%
Lentigo maligna	2	100%	11	100%	17	94%
Others	8		63		109	
Total	**155**		**573**		**759**	

Comment: benign naevus-other = blue, Spitz, Becker's, naevus spilus and spindle cell naevus of Reed.

Table 5.6: PLC Data: Clinical Diagnoses

Types of pigmented lesions as percentage of total number of lesions seen.

Type	1984		1985		1986	
BCC	7	4.5%	16	2. %	15	2%
Seborrhoeic Wart	41	26.5%	171	29.8%	188	24.8%
Benign naevus common	37	23.9%	158	27.6%	253	33.35%
Benign naevus other	8	5.2%	11	1.9%	12	1.6%
Congenital naevus	6	3.9%	50	8.7%	44	5.8%
Atypical naevus	8	5.2%	24	4.2%	40	5.3%
Angiomas	13	8.4%	17	3%	19	2.5%
Dermatofibromas	2	1.3%	17	3%	20	2.6%
Melanomas	23	14.8%	35	6%	42	5.5%
Lentigo maligna	2	1.3%	11	1.9%	17	2.2%
Others	8	5.2%	63	11.0%	109	14.4%
Total	**155**		**573**		**759**	

The campaign year caused a marked rise in referrals of new patients to the pigmented lesion clinic. Attendances increased by 273% in 1985 and by a further 32.5% in 1986. In all three years more female than male patients were seen and the female to male ratio showed no significant change over the three study years.(2.6:1, 2.2:1, 2.6:1 respectively).

The numbers of patients seen with various types of clinically diagnosed pigmented lesion are seen in Table 5:5. This also indicates the proportions

of each type submitted for histological evaluation. During 1985 and 86 the proportion of some of the five designated types of lesion sent for histology fell markedly. The percentage of seborrhoeic warts biopsied fell by almost a half in 1985 and by a further two thirds in 1986. The figures for benign naevi biopsied dropped by a third in 1985 and by a quarter in 1986. Overall the total percentage of PLC patients biopsied varied greatly in the three study years. In 1984, 66.6% of patients had a biopsy performed and the rates for 1985 and 1986 were 49.7% and 32.4% respectively.

In table 5:6 the individual clinical diagnoses are displayed as a percentage of the total number of lesions seen at the clinic for each year. In 1985 despite the marked increase in total numbers of patients seen there was no evidence of this being due to an increase in one specific type of lesion. The significant changes in the 1985 figures were falls in the proportions of vascular lesions, BCCs, melanomas and "other" benign naevi. The categories showing a significant increase after 1984 were congenital naevi increasing from 3.9% to 8.7% and the "other" group which rose from 5% to 11% in 1985. The percentages of the two most common lesions, seborrhoeic warts and common benign naevi both showed small increases only.

In 1986 there was a further significant fall in the percentage of BCCs and of congenital naevi. The proportions of vascular lesions, melanomas and "other" benign naevi showed no further significant change. There was a further small increase in the proportion of seborrhoeic warts and "other" lesions seen.

Thus it appeared that the marked increase in attendees at the clinic caused a relative dilution of the malignant skin tumours including melanoma. The rise in congenital lesions seen may be due to their tendency to have atypical clinical features which would score some points on the 7 point check-list. The percentages of the two types of lesion which constitute the major workload of the clinic ie common benign naevi and seborrhoeic warts both increased in 1985.

5.2.2 Effects of Publicity

A questionnaire concerning the possible influence of publicity on referral was given to 50 consecutive patients seen at the designated PLC at the Western Infirmary, to 50 patients attending non-PLC dermatology clinics in Glasgow and to 29 patients in Dundee during the summer of 1985. These latter two groups of patients were identified from diagnostic indexes as having been referred with a pigmented lesion. The questionnaires were also completed by 118 consecutive patients at the pigmented lesion clinic in the Royal Infirmary, Edinburgh.

The results of the questionnaires are given in Tables 5:7 and 5:8. The full questionnaire is in the Appendix.

Table 5.7: Publicity Questionnaires: Age & Sex.

No. of patients aware of Glasgow publicity

	Glasgow			Edinburgh			Dundee		
Replies	**Y**	**N**	**T**	**Y**	**N**	**T**	**Y**	**N**	**T**
Age (years)									
0-20	5	8	13	6	17	23	1	1	2
20-40	13	10	23	10	25	35	2	3	5
40-60	24	4	28	16	23	39	1	2	3
> 60	11	10	21	6	15	21	2	8	10
Total	**53**	**32**	**85**	**38**	**80**	**118**	**6**	**14**	**20**
Sex: F	41	26	67	32	56	88	4	11	15
M	12	6	18	6	24	30	2	3	5
Female:male		3.7:1			2.9:1			3:1	

Y=yes N=no T=total

Table 5.8: Publicity Questionnaires.

Most useful medium

Medium	Glasgow	Edinburgh	Dundee
TV:National	27	16	2
	50.9%	42%	
TV:Local	26	16	1
	49.1%	42%	
Radio:National	2	4	0
	3.8%	10.5	0
Radio:Local	11	4	0
	20.8%	10.5%	
Press: National	5	8	0
	9.4%	21.1%	
Press:Local	26	14	2
	49.1%	36.8%	
Posters/leaflets	8	3	1
	15.1%	7.9%	
Total	**53**	**38**	**6**

Numbers refer to numbers of patients quoting each type of medium as their information source. Percentages are of total patients replying in each city.

A significantly greater proportion of patients attending the dermatology clinics in Glasgow had been aware of the campaign publicity compared to those in Edinburgh and Dundee (62% compared to 32 and 30% respectively). The numbers of questionnaires from Dundee was small and these have not been further broken down to look at effects of age and/or sex. Perhaps people pay more attention to media items related to their home city and are more likely to remember them. In addition the extra publicity in Glasgow including posters, leaflets, local radio and local press may help explain the disparity.

The overall effect of the publicity may well have been under estimated as a large number of those who were personally unaware of the publicity stated that they had been encouraged by friends and relatives to seek medical advice. It is possible that theses individuals offered the advice because of the publicity. It is of note that there was an increase in referrals of pigmented lesions in both Edinburgh and Dundee at the time of the campaign (personal communications) suggesting that these areas were affected by overspill publicity.

Looking at the results from Glasgow and Edinburgh only, some differences in the groups questioned are seen. The percentage of patients under 40 was higher in Edinburgh (58/118, 49.2%) than in Glasgow (36/85, 42.4%). The female : male ratio in Glasgow was higher than that in Edinburgh, 3.7:1 and 2.9:1 respectively. As the patients who completed the questionnaire were not selected in any way these differences presumably reflect a differing section of the population attending the PLC in the two cities.

In the Glasgow group the percentage of men and women who had heard of the publicity was virtually identical (12/18,67% for men and 41/67,61.2% for women). Among Edinburgh patients, however, a higher percentage, 36.4% (32/88)of women were aware of the publicity compared to 20% (6/30) of men. The most widely cited method of learning of the campaign was by television both local and national. Sixty-two percent of respondees in Glasgow, 27.6% in Edinburgh and 50% in Dundee had been alerted in this way. A short item featured on the BBC national evening news proved to be the single most quoted method in all three centres.

5.2.3 Histological Data.

All lesions excised and histologically diagnosed as one of the five categories of pigmented lesion i.e. melanocytic naevi, basal cell carcinomas, seborrhoeic warts, angiomas and dermatofibromata were counted for the pre- campaign, campaign and post-campaign years.

This data was collected from request forms filed in six histopathology departments in Glasgow. These were sited at the Western, Royal and Victoria Infirmaries and Stobhill and Southern General Hospitals. The Western Infirmary site receives some skin pathology specimens into the main pathology laboratory but the great majority of material is sent to the dermatopathology department there. In four of the departments reports were filed using a coding system which allowed for selection of the different pigmented lesion categories. In the other two the required categories had to be manually extracted from a more general "skin lesion" file for counting.

Material was received in all five hospitals from general surgeons and dermatologists. The laboratories at the Western and Royal Infirmaries processed all the specimens from the West of Scotland Regional Plastic Surgery Unit at Canniesburn Hospital in Glasgow. The results are presented in Tables 5:9-5:14 for each hospital separately and summarised in Table 5:15.

Table 5.9: Pigmented Lesions - Histological Data.

Royal Infirmary	**1984**	**1985**	**1986**
Melanocytic Naevi	436	455	463
BCC	790	700	708
Seborrhoeic warts	190	302	317
Angiomas	71	53	49
Dermatofibromas	46	52	41
Total	**1533**	**1562**	**1578**
% change	-	+1.9	+1

Table 5.10: Histological Data

Southern General Hospital	**1984**	**1985**	**1986**
Melanocytic Naevi	50	108	98
BCC	55	69	67
Seborrhoeic warts	60	88	115
Angiomas	8	22	18
Dermatofibromas	14	18	38
Total	**187**	**305**	**336**
% change	-	+63	+10

Table 5.11: Histological Data

Victoria Infirmary	**1984**	**1985**	**1986**
Melanocytic Naevi	278	256	303
BCC	173	149	136
Seborrhoeic Warts	99	136	92
Angiomas	51	50	36
Dermatofibromas	42	62	65
Total	**643**	**653**	**632**
% change	-	+1.5	-3.2

Table 5.12: Histological Data

Stobhill Hospital	**1984**	**1985**	**1986**
Melanocytic Naevi	88	127	122
BCC	47	55	65
Seborrhoeic Warts	45	69	58
Angiomas	20	21	19
Dermatofibromas	7	28	35
Total	**207**	**300**	**299**
% change	-	+44.9	-.3

Table 5.13: Histological Data

Western Infirmary-General Laboratory

	1984	**1985**	**1986**
Melanocytic Naevi	49	41	44
BCC	14	17	16
Seborrhoeic Warts	30	31	26
Angiomas	14	7	19
Dermatofibromas	22	20	21
Total	**129**	**116**	**126**
% change	-	-10	+8.6

Table 5.14: Histological Data

Western Infirmary- Dermatopathology Laboratory			
	1984	**1985**	**1986**
Melanocytic Naevi	219	354	362
BCC	180	202	237
Seborrhoeic Warts	160	267	192
Angiomas	45	26	40
Dermatofibromas	37	24	40
Total	**641**	**873**	**871**
% change	-	+36.2	-0.2

Table 5.15: Histological Evaluation.

All Glasgow Laboratories	**1984**	**1985**	**1986**
Melanocytic Naevi	1128	1341	1392
BCC	1273	1192	1229
Seborrhoeic Warts	573	893	800
Angiomas	211	173	156
Dermatofibromas	171	204	240
Total no. "lesions"	**3356**	**3803**	**3817**
% change	-	+13	+0.4
Total - all specimens	**50947**	**51123**	**52055**

"lesions" = basal cell carcinomas, seborrhoeic warts, naevi, angiomas and dermatofibromas.

Specimens = total number of all categories of material received by pathology department.

Over the three year study period the variation in numbers of pigmented lesions excised and submitted for histology was fairly small in Glasgow as a whole. In 1985 this increase was 13% of the 1984 value and there was a further rise of only 0.4% between 1985 and '86. During 1985 the main change was an increase in excised seborrhoeic warts (+55.9%) with smaller rises in naevi (+18.9%) and dermatofibromata (+19.3%). There were falls in the numbers of BCCs and angiomas.(-6.4% and -18% respectively)

Figures from the Royal Infirmary (table 5:9), Victoria Infirmary (table 5:11) and general pathology department of the Western Infirmary (table 5:13) show virtually no change over the three years. In the other three departments (tables 5:10, 5:12, 5:14) there were overall rises in total numbers with changes of + 63, +45 and +36% noted in 1985. The diagnostic categories showing the largest rises were naevi and seborrhoeic warts. The numbers of these types and indeed of all excised lesions were virtually unchanged in 1986.

During the study years there were small non-significant changes in the total numbers of all types of surgical specimens processed throughout the city. These were a rise of 0.3% in 1985 and a further 1.8% increase in 1986. This implies that the observed 13% increase in skin specimens seen in 1985 was a reflection of a specific increase in excisions of skin lesions.

The changes in the numbers of excised lesions are similar to those noted for change in referral patterns. The Royal Infirmary had the smallest increase in referred lesions and the least rise of excised ones whilst the Southern General and Western Infirmaries saw the largest increases in

both. The increase at the Western is attributable to the PLC but their is no obvious local explanation for the figures for the Southern General.

5.2.4 Melanoma Data

The numbers of melanomas registered in the West of Scotland during the three study years and till 1990 are shown in table 5:17 and those for preceding years in table 5:18. Figures were obtained from the Scottish Melanoma Group data and refer to calendar years. Numbers of cases are sub-divided into males and females and also into the three Breslow thickness categories previously described. In table 5:17 the melanomas are categorised according to histogenetic types.

Table 5.16: West of Scotland Melanoma Data

Annual numbers of melanomas categorized by sex with number and percentages of Breslow thickness bands.

Year		0-1.49mm		1.5-3.49mm		≥3.5m		Other		Total	
1984	**M**	18	(27.2)	15	(22.7)	27	(40.9)	6	(9.1)	66	(100)
	F	60	(49.6)	31	(25.6)	23	(19.0)	7	(5.8)	121	(100)
	T	78	(41.7)	46	(24.5)	50	(26.7)	13	(6.9)	187	(100)
1985	**M**	30	(43.5)	14	(20.3)	22	(31.9)	3	(4.3)	69	(100)
	F	75	(53.6)	35	(25.0)	25	(17.9)	5	(3.6)	140	(100)
	T	105	(50.2)	49	(23.4)	47	(22.4)	8	(3.8)	209	(100)
1986	**M**	32	(43.8)	20	(27.4)	18	(24.6)	3	(4.1)	73	(100)
	F	80	(48.2)	40	(24.1)	39	(23.5)	7	(4.2)	166	(100)
	T	112	(46.9)	60	(25.1)	57	(23.8)	10	(4.2)	239	(100)
1987	**M**	29	(37.2)	13	(16.7)	29	(37.2)	7	(9.0)	78	(100)
	F	88	(62.4)	22	(15.6)	25	(17.7)	6	(4.2)	141	(100)
	T	117	(53.4)	35	(16.0)	54	(24.7)	13	(5.9)	219	(100)
1988	**M**	46	(54.8)	19	(22.6)	15	(17.9)	4	(4.8)	84	(100)
	F	82	(55.8)	33	(22.4)	30	(20.4)	2	(1.4)	147	(100)
	T	128	(55.4)	52	(22.5)	45	(19.5)	6	(2.6)	231	(100)
1989	**M**	62	(57.4)	24	(22.2)	19	(17.6)	3	(2.8)	108	(100)
	F	69	(54.3)	30	(23.6)	24	(18.9)	4	(3.1)	127	(100)
	T	131	(55.7)	54	(23.0)	43	(18.3)	7	(3.0)	235	(100)
1990	**M**	45	(46.4)	17	(17.5)	28	(28.9)	7	(7.2)	97	(100)
	F	104	(63.4)	35	(21.3)	18	(10.9)	7	(4.3)	164	(100)
	T	149	(57.1)	52	(19.9)	46	(17.6)	14	(5.4)	261	(100)

M = male F = female T = total

* Other = lesions in which Breslow thickness could not be estimated.

Numbers in parenthesis refer to proportions of patients in each thickness category for males, females and all patients.

Table 5.17: West of Scotland Melanoma Data

Annual number of melanomas categorized by sex and numbers and proportions of histogenetic types.

Year		SSM		LMM		NM		ALM		Other		Total	
1984	M	29	(43.9)	6	(9.1)	17	(25.8)	3	(4.5)	11	(16.7)	66	(100)
	F	79	(65.3)	13	(10.7)	23	(19.0)	6	(4.9)	7	(5.8)	121	(100)
	T	108	(57.8)	19	(10.2)	40	(21.4)	9	(4.8)	18	(9.6)	187	(100)
1985	M	27	(47.4)	9	(15.8)	16	(28.1)	2	(3.5)	3	(5.3)	57	(100)
	F	68	(55.7)	13	(10.7)	25	(20.5)	8	(6.6)	8	(6.6)	122	(100)
	T	95	(53.1)	22	(12.3)	41	(23.0)	10	(5.6)	11	(6.1)	179	(100)
1986	M	39	(57.3)	7	(10.3)	15	(22.1)	4	(5.9)	3	(4.4)	68	(100)
	F	86	(55.1)	25	(16.0)	30	(19.2)	4	2.6)	11	(7.1)	156	(100)
	T	125	(55.8)	32	(14.3)	45	(20.1)	8	(3.6)	14	(6.3)	224	(100)
1987	M	36	(43.6)	12	(15.4)	22	(28.2)	3	(3.8)	7	(9.0)	80	(100)
	F	84	(59.2)	18	(12.7)	25	(17.6)	4	(2.8)	11	(7.7)	142	(100)
	T	120	(53.6)	30	(13.6)	47	(21.4)	7	(3.2)	18	(8.2)	222	(100)
1988	M	54	(62.0)	7	(8.0)	15	(17.2)	1	(1.1)	10	(11.5)	87	(100)
	F	90	(61.0)	20	(13.5)	33	(22.3)	4	(2.7)	1	(0.7)	148	(100)
	T	144	(61.3)	27	(11.5)	48	(20.4)	5	(2.1)	11	(4.7)	235	(100)
1989	M	65	(60.2)	9	(8.3)	26	(24.1)	4	(3.7)	4	(3.7)	108	(100)
	F	83	(65.4)	11	(8.7)	24	(18.9)	5	(3.9)	4	(3.1)	127	(100)
	T	148	(63.0)	20	(8.5)	50	(21.3)	9	(3.8)	8	(3.4)	235	(100)
1990	M	55	(55.6)	6	(6.1)	21	(21.2)	6	(6.1)	11	(11.1)	99	(100)
	F	111	(63.1)	22	(12.5)	23	(13.1)	8	(4.5)	12	(6.8)	176	(100)
	T	166	(60.4)	28	(10.2)	44	(16.0)	14	(5.1)	23	(8.4)	275	(100)

M = male F = female T = total

* Other = lesions of other melanoma types or which are unclassified.

Numbers in parenthesis refer to proportions of total numbers with each type of melanoma for males, females and all patients.

Table 5.18: West of Scotland Melanoma Data 1979-1983

Total number of melanomas categorized by sex and histogenetic type

Year		SSM	LMM	NM	ALM	Other	Total
1979	M	16 (41.0)	3 (7.7)	10 (25.6)	5 (12.8)	5 (12.8)	39
	F	57 (58.2)	13 (13.2)	14 (14.3)	7 (7.1)	7 (7.1)	98
	T	73 (53.3)	16 (11.7)	24 (17.5)	12 (8.8)	12 (8.8)	137
1980	M	27 (54.0)	3 (6.0)	9 (18.0)	5 (10.0)	6 (12.0)	50
	F	50 (49.5)	16 (15.8)	18 (17.8)	7 (6.9)	10 (9.9)	101
	T	77 (51)	19 (12.6)	27 (17.9)	12 (7.9)	16 (10.6)	151
1981	M	22 (47.8)	2 (4.3)	11 (23.9)	7 15.2)	4 (8.7)	46
	F	44 (47.3)	14 (15.1)	20 (21.5)	4 (4.3)	11 11.8)	93
	T	66 (47.5)	16 (11.5)	31 (22.3)	11 (7.9)	15 (10.8)	139
1982	M	21 (42.9)	8 (16.3)	8 (16.3)	8 (16.3)	4 (8.2)	49
	F	37 (42.0)	12 13.6)	22 (25.0)	9 (10.2)	8 (9.1)	88
	T	58 (42.3)	20 (14.6)	30 (21.9)	17 (12.4)	12 (8.8)	137
1983	M	22 (40.0)	7 (12.7)	18 (32.7)	4 (7.3)	4 (7.3)	55
	F	65 (57.5)	9 (7.9)	25 (22.1)	5 (4.4)	9 (7.9)	113
	T	87 (51.8)	16 (9.5)	43 (25.6)	9 (5.4)	13 (7.7)	168

M = male F = female T = total

Numbers in parenthesis refer to percentages of each type of melanoma for males, females and all patients per annum.

Table 5.19: West of Scotland Melanoma Data

5 year disease free survival figures for MM patients presenting 1979-1985 categorized by sex and Breslow thickness band

Year		Breslow Measurement 0-1.49		1.5-3.49		≥3.5		Not available		Total	
		F	M	F	M	F	M	F	M	F	M
1979	**T**	38	15	31	6	28	14	1	4	98	39
	D/F	28	12	20	2	7	5	0	1	55	20
	%	73.6	80	64.5	33	25	35.7	-	25	56.1	51.3
1980	**T**	38	18	28	12	30	18	5	2	101	50
	D/F	30	14	18	5	14	4	1	0	62	23
	%	78.9	77.8	64.3	41.7	46.7	22	20	-	62.4	46
1981	**T**	37	10	20	15	29	17	7	4	93	46
	D/F	32	5	9	4	9	2	1	-	51	11
	%	86.5	50	45	26.7	31	11.8	14.3	-	54.8	23.9
1982	**T**	30	16	19	15	32	13	7	5	88	49
	D/F	23	9	12	7	9	1	2	1	46	18
	%	76.7	56.3	63.2	46.7	28.1	7.7	28.6	20	52.3	36.7
1983	**T**	46	12	35	19	29	23	3	1	113	55
	D/F	41	12	18	8	9	5	2	-	70	25
	%	89	100	51.4	42.1	31	21.7	66.7	-	61.9	45.4
1984	**T**	60	18	31	15	23	27	7	6	121	66
	D/F	50	8	20	5	8	4	1	1	79	18
	%	83.3	44.4	64.5	33.3	34.8	14.8	14.3	16.7	65.2	27.2
1985	**T**	75	32	35	14	25	22	5	3	140	71
	D/F	63	23	24	4	12	5	-	1	99	33
	%	84	71.9	68.6	28.6	48	22.7	-	33.3	70.7	46.5

T = total DF = Disease free patients

% = no. of disease free patients as % of total.

Table 5.20: West of Scotland Melanoma Data

5 year disease mortality from melanoma figures for patients presenting 1979-1985 categorized by sex and Breslow thickness band

Year		Breslow Measurement 0-1.49		1.5-3.49		≥3.5		Not available		Total	
		F	M	F	M	F	M	F	M	F	M
1979	T	38	15	31	6	28	14	1	4	98	39
	D	4	1	8	3	17	9	1	3	30	16
	%	10.5	6.7	25.8	50	60.7	64.3	100	75	30.6	41
1980	T	38	18	28	12	30	18	5	2	101	50
	D	4	1	5	3	12	11	3	2	24	17
	%	10.5	5.6	17.9	25	40	61.1	60	100	23.8	34
1981	T	37	10	20	15	29	17	7	4	93	46
	D	2	4	6	7	15	11	5	3	28	25
	%	5.4	40	30	46.7	51.7	64.7	71.4	75	30.1	54.3
1982	T	30	16	19	15	32	13	7	5	88	49
	D	0	4	4	4	13	8	5	4	22	20
	%	-	25	21.1	26.7	40.6	61.5	71.4	80	25	40.8
1983	T	46	12	35	19	29	23	3	1	113	55
	D	0	0	11	7	13	12	1	1	25	20
	%	-	-	31.4	36.8	44.8	52.2	33.3	100	22.1	36.4
1984	T	60	18	31	15	23	27	7	6	121	66
	D	4	6	5	7	11	16	3	5	23	34
	%	6.7	33.3	16.1	46.7	47.8	59.3	42.9	83.3	19	51.5
1985	T	75	32	35	14	25	22	5	3	140	71
	D	3	1	3	6	8	14	4	2	18	23
	%	4	3.1	8.6	42.9	32	63.6	80	66.6	12.9	32.4

T = Total D = Dead of melanoma % = % dead of total

There was an increase in the numbers of MMs registered each year in the three years of the study and this continued at a similar rate in subsequent years. Overall in the 7 year period from 1984 there was a 47% increase in melanomas in the West of Scotland. The 1985 figure shows an higher than expected annual increase of 11.8% from '84 with a further 14.4% rise to the 1986 level. The female to male ratio has altered over the years to 1.5:1 compared to 2:1 in the prepublicity figures. The percentages of "thin" lesions in '84,'85 and '86 were 41.2, 50.2 and 46.9 respectively. The difference between '84 and '85 was significant. The percentages of women MM patients presenting with thin lesions rose to 53.6% in 1985 while the male percentage rose by more than a half to 43.5% The percentages of thin lesions has improved significantly for both sexes over the years studied and the difference between the sexes is overall less marked. "Thick" lesions constituted 25.7,22.5 and 23.8% of the annual totals in the study years. The greatest change related to sex was a dramatic fall in the percentage of men with thick lesions from 37.9 in 1984 to 24.7 in 1986.

5.3. Evaluation of melanoma data

The melanoma data for 1979-1990 was assessed to evaluate changes in total numbers, sex distribution,Breslow thickness distribution and histogenetic type over time.

A computer package, EPI INFO (WHO) was used to calculate chi squared and probability values

Taking the whole of 1985 as the intervention year the data was aggregated to examine pre-intervention (1979-1984) figures and post-intervention

* p = probability; df = degrees of freedom.

(1986-1990) ones. In addition comparisons were made across the aggregated years i.e. 1979 vs 1984, 1984 vs 1986 and 1986 vs 1990. The tests excluded all missing or unspecified variables e.g. unclassifiable histogenetic types.

5.3.1. Breslow Thickness

Aggregated data for males, females and both sexes were compared for distribution across the 3 Breslow thickness categories in pre- and post-intervention years.

Results:

Both sexes : Chi sq = 55.6 ; p=0 (approx); df=2*

Male only : Chi sq = 29.8 ; p=0 (approx); df=2*

Female only : Chi sq = 30.0 ; p=0 (approx); df=2*

For all three groups there is a highly significant relationship between Breslow distribution and time for the two aggregated periods.

For all the groups the dominant number of people had moved to the thin Breslow category in the post-1985 period at the expense of the other two thickness groups. Pre-1985 the dominant number of people were in the thicker categories.

Breslow thickness distribution was examined for the years 1979 vs 1984, 1984 vs 1986 and 1986 vs 1990. No significant change was apparent before 1985. A significant shift from thick to thin lesions was demonstrated for 1984 vs 1987 and for 1986 vs 1990 for both sexes.

5.3.2. Histogenetic types:

Aggregated data for males, females and both sexes were compared to look for a relationship between pre- and post-intervention years and the distribution among 5 types of MM i.e. SSM, NM, ALM, LMM and "other".

5.3.2. Results:

Both sexes : Chi sq = 28.7; p=0 (approx); df= 4

Male only : Chi sq = 12.95 ; p=0.012; df= 4

Female only : Chi sq = 18.9 ; p=0.001; df= 4

Thus there are highly significant differences in the distribution of types between the two time periods. Post-intervention years see a shift in distribution towards more SSMs with decreases in NMs, ALMs and "others".

No significant difference for types was found by comparing the data for 1979 vs 1984, 1984 vs 1986 or 1986 vs 1990.

5.3.4. 5 year follow up data:

A relationship was sought between number of patients alive (disease free) and those dead in each thickness category, for the 5 histogenetic types, for males and females separately and between different years of presentations.

Results: Thickness categories. Both sexes

1979: Chi sq = 26.9; p=0 (approx); df= 2
1982: Chi sq = 19.3; p=0.0001; df= 2
1985: Chi sq = 19.2; p=0.0001; df= 2

For all years those with thick tumours formed the greatest proportion of those dead and the smallest of those alive. The same pattern was seen for males and females separately with very similar Chi squared values.

There were no significant differences between the sexes, histogenetic types or between different years of presentation.

CHAPTER SIX

DISCUSSION

Thus far, most educational work in the field of melanoma has been directed at secondary preventive measures, mainly towards the early diagnosis of lesions. The possible beneficial effects of education and earlier diagnosis can only be accepted if a correlation exists between delay in diagnosis and poor prognosis MMs. The assessment of delay data is difficult as it relies largely on the patient's recall which may be faulty. It is likely, however, that this inaccuracy is present to similar degrees in most delay studies and thus their results can be usefully compared. Most of the small number of studies of delay in melanoma patients have tried to correlate delay with the current gold-standard prognostic indicator, Breslow thickness. Data of 125 Glasgow MM patients studied before the education campaign showed that the great majority delayed more than three months before seeking advice and the commonest explanation offered for this behaviour was lack of knowledge of the possible significance of their changing pigmented lesion. (117) In a more recent study post-dating educational ventures in America, Cassileth and colleagues (146) found evidence of both physician and patient delay in a group of 275 patients with invasive MM. Physicians who rated themselves as having "substantial" or "expert" knowledge of MM were more likely to correctly identify the lesion. Patients studied were, irrespective of general education status, unable to distinguish between benign pigmented lesions and MM. Women had longer mean delays (3.3 months) than men (1.9 months) a factor also noted in the Glasgow study.

Before the start of the West of Scotland campaign, the demonstration of lack of knowledge of MM among MM patients was taken as an indication of poor MM knowledge amongst the Glasgow population as a whole. Newman and colleagues evaluated public knowledge of skin cancers in several other British towns before the Cancer Research Council sponsored 7 centre campaign. (147) Their assessment was made by postal questionnaire to 250 individuals selected from the electoral rolls of each of five towns. Response rates varied among the towns from 56 to 72% with an overall figure of 63%. Sex and age distribution of the respondents was similar to that of the general population, 47% of respondents being male and 48% aged $\geq$ 45 years. Only 26% of people had heard of the term "melanoma" though 28% remembered some type of publicity about moles and/or MM. Half of the latter group had received the information from television. Nearly all the respondents said that skin cancers could be cured by early treatment but curiously the most commonly cited method of treatment was laser. The questionnaires were assessed to give an overall knowledge score. Scores were higher for women, those educated beyond the age of 17 years and for non-manual social classes. There were no significant differences in scores for the different towns or among different age groups. This work thus demonstrated a generally poor level of MM knowledge in the towns studied and a comparison with the West of Scotland population would have been interesting.

Efforts have been made to reduce delay in the presentation of tumours other than MM. A study from Southampton looked at delay in presentation with symptomatic breast disease in the years during, before and after a public education campaign. Whilst there was a trend to less

delay after publicity this was not very marked. On closer evaluation it was shown that those women who presented in less than 3 months pre-education presented even more quickly after it. The proportion of women with long delays was unchanged throughout the 3 year study period. On the positive side the greatest decrease in delay after education was seen in those aged over 65, the age group at highest risk of malignant disease. (148)

Public education seems to be a logical approach towards the correction of a recognised deficiency in knowledge. In the current British health care system referrals to hospital specialists occur through GPs. Any public health venture which is to be evaluated through hospital acquired data is best carried out with the co-operation of the GPs in the target area. A pre-campaign questionnaire distributed to Glasgow GPs showed a desire for the public education programme preferably preceded by professional update. This initial enthusiasm was confirmed by the large attendances at subsequent meetings and by requests for campaign materials. Professionals other than doctors are very important in MM education and thus nurses, who frequently see the less socially visible areas of patients bodies, were also targeted in the Glasgow MM campaign and information was received by them with great enthusiasm.

During the professional campaign much of the education was possible on a small group basis in surgeries and health centres. Evidence from breast cancer education work suggests that individual or small group teaching is the most effective method of education. (126) The main materials used as teaching aids during this phase of the Glasgow campaign were booklets and a clinically orientated video tape presentation. The presence of one of

the campaign dermatologists on these occasions allowed for informal questioning and clarification of the points raised in the teaching material. Fairly detailed information could be provided to supplement the comprehensive booklets. Whilst it is likely that those GPs attending these sessions improved their level of knowledge of MM it is impossible to assess whether this altered their management of patients with pigmented lesions. There was a small rise in referrals to the PLC during the update suggesting either increased awareness of the possible seriousness of pigmented lesions or of the availability of the PLCs facility for rapid referral.

A few studies have attempted to assess behavioural change among small professional education target audiences and some have shown that whilst there may be a demonstrable improvement in knowledge this does not necessarily produce a better patient outcome. In one study (149) it was noted that medical staff failed to follow up 90% of major laboratory abnormalities detected on their patients. After education, there was no improvement noted in this rate. Another American study showed that there was no direct relationship between level of knowledge and percentage of correct diagnoses reached in two groups of physicians assessing the same 133 patients with urinary tract problems. (150)

The professional update formed only a section of the Glasgow MM campaign. Patient outcome measures like the proportion of MM patients presenting with thin lesions were interpreted as being due to the whole campaign and the effects of individual components were not evaluated. When a target audience is large and not uniform a variety of messages and types of media are required to reach the maximum number of

people. Thus for the public education component of the campaign different educational methods were employed than had been used in the professional update. The two components were linked, however, by the use of the 7 point check-list. This compact list was felt to be an appropriate method of getting the key message to the maximum number of people. Similar messages have been derived for the public campaigns in Queensland (Slip, slap, slop) and in USA (ABCDE). The former advocates the slipping on of a T shirt, slapping on a hat and slopping on sunscreen. The American mnemonic is similar to the 7 point list in giving features to check during self-examination of pigmented lesions (A - asymmetry, B - border, C - colour, D - diameter,E - elevation).

Although it is widely accepted that public education is probably "a good thing" there is very little evidence to support this assumption. Very few public education programmes have been evaluated in terms of their effects on public knowledge, and their success or failure is usually judged by assessment of patient outcomes e.g. mortality data. The middle step in this system i.e. whether improved knowledge results in altered behaviour has not been questioned and indeed it would be difficult to imagine a good method of doing this. In the Canadian Breast Cancer Study participants were divided into those who had a single examination and those who were eligible for rescreening on an annual basis. Those who were reviewed annually were assessed as to their competence in breast self examination (BSE). It was shown that individuals who complied with the re-screening requests improved their competence and frequency of BSE. (151) It seems reasonable to assume that this behavioural change was at least in part due to increased knowledge. Robinson has looked at behavioural change produced by education in a

group of 1042 patients who had had surgery for non-melanoma skin cancer. (152) Patients were given verbal and written advice on sun protection. This included altering behaviour by limiting sun exposure, changing time of day of that exposure and use of sunscreens both of a chemical and clothing type. One year after surgery patients were sent a questionnaire to assess their compliance. It was found that 38% of those who replied were not complying with the offered advice. Patients aged over 65 years tended to be less compliant. In addition a health risk taking group was identified among the non-compliers. These tended to be women who did not perceive a significant benefit from the proffered advice to counteract the perceived cosmetic disadvantages of lack of tan and stickiness of sunscreens. Such women tended to be smokers who had not attended for available screening measures like cervical smears or mammography. While the level of compliance achieved in this study may seem quite good initially it must be remembered that certain factors in the work were unusual and thus similar results could not be expected with true public education. Firstly, the population involved was highly selected in that all had had sun-related skin tumours requiring surgery. Secondly, education was given verbally on two separate occasions on a one-to-one basis which is recognised as the best method of transmitting information. (126)

The benefits of less individualised methods of health education are difficult to measure and thus little data is available from other educational work to compare the effect of publicity of the Glasgow education campaign. A few other health campaigns have measured patient outcomes like mortality or factors like stage at the time of diagnosis to give some indication of their effectiveness. The Edinburgh

Breast Cancer Study assessed women's knowledge of various facts about breast cancer especially breast self examination before (124) and after education.(125) A year after the campaign there had been a small but significant increase in knowledge.

The North Karelia Project directed major publicity on cardiovascular health specifically to one county in Finland. Subjects covered included possible preventative strategies like advice on low fat diet and information to raise public awareness on cardiovascular health. Subsequent data showed that the trend towards a reduction in cardiovascular diseases noted for Finland as a whole were much more marked in North Karelia than in the other counties where no such education had taken place. (153) The assumption was that the five year education project had been responsible for this good outcome. Critics of the project comment that although an improved level of knowledge on cardiovascular matters was demonstrated in the target population after education no attempt was made to establish whether this had resulted in a behavioural change. (154) Thus a direct connection between education and improved patient outcome could not be proven.

Experience in other fields of cancer education has shown that public education will result in increased referral of patients. Even if the general practitioner is trained prior to the public education it is likely that they will feel the need to refer some of the patients presenting post-publicity for a specialist opinion. Following the Glasgow melanoma campaign there was a significant rise in pigmented lesions seen at virtually all dermatology clinics in the city. At the Western Infirmary PLC the increase was mainly due to seborrhoeic keratoses and benign naevi. The

proportion of MMs seen at the clinic fell in 1985 compared to 1984 although the actual number of MMs increased in both 1985 and 1986.Thus the increased numbers of referrals actually diluted the proportions of MM seen at the PLC.

Although no formal change in management of pigmented lesions at the clinic was made, the marked increase in new patient numbers was associated with an alteration in the proportion of patients biopsied. In 1985 when the numbers first increased almost half of the new lesions seen were biopsied. In 1986, however, this proportion fell markedly despite a further rise in numbers of patients being seen. Biopsy results in a considerable increase in workload compared to simple clinical examination. Each biopsy requires further medical and nursing time and also time for processing in the pathology laboratory.

In the assessment of the workload of the PLC data was not gathered on reasons for proceeding to biopsy. The possible reasons are 1) to make a diagnosis, 2) to reassure the patient and 3) for cosmetic reasons.

In both 1985 and 1986 no patients had a lesion excised urgently on cosmetic grounds. It is likely that fewer lesions were biopsied in 1986 as increase in confidence in clinical diagnosis made it unnecessary. By 1986 the medical staff regularly doing the PLC had considerable experience in the diagnosis of pigmented lesions and had had the opportunity to correlate the clinical and pathological features during 1985. There would be no obvious reason for a reduction in the proportion of patients requiring biopsy for reasons of reassurance in 1986.

The increase in clinical confidence would be a useful skill to pass on to other health care professionals. Many GPs freely admit that they are uncertain about the nature of some pigmented lesions. This may reflect the relative infrequency with which they see such lesions in the surgery. Even after publicity in Nottingham (155) the GPs canvassed were only seeing an average of 3 pigmented lesions a week. It could be worth developing the experience of one or two GPs in each health centre by offering them the chance to attend a PLC regularly to maintain their confidence. This would perhaps prevent individuals with common lesions like seborrhoeic warts and benign naevi being referred to hospital.

In the periods following publicity the observation that many of the referrals to PLCs throughout the country were of benign non-melanoma lesions led to a review of the 7 point check-list. It had been recognised at the outset that some benign lesions could score several points and thus that its use by GPs might not prevent referral of these lesions to hospital. Professor Mackie herself recognised the possible flaws in the original list and after further extensive review of melanomas produced a revised version in 1989. (156)

Other groups have tried to formally assess both the original and the revised version. Higgins and colleagues evaluated both versions in consecutive patients attending their PLC with histologically confirmed benign pigmented lesions.(157) Lesions were scored by both doctor and patient and the scores compared. Doctors categorised 30% of histologically proven benign lesions as "suspicious" using the 1985 list and 70% using the 1989 one. The patients' own score was very similar with both versions of the list. The doctors also gave each lesion a clinical

diagnosis independent of the score and 99 of 100 lesions were correctly diagnosed as being benign. One lesion was clinically suspected of being a melanoma and proved on histology to be a dysplastic naevus. This work was performed by a number of clinicians and the degree of inter-observer variation was not assessed. The case mix for the London PLC in the study was quite different from the Glasgow one. In Glasgow 60% of lesions were seborrhoeic warts or benign naevi while those constituted 86% of lesions assessed in the London study. Perhaps the latter difference may be of relevance as it means that lesions like atypical naevi,dermatofibromas and angiomas were under-represented..

The same group of workers evaluated the original 7 point check-list by looking at clinical photographs of 100 proven malignant melanomas. They found that half of the lesions seen scored less than 3 on the check-list. As they were all biopsied there must have been some suspicious features which led the doctors to proceed to biopsy despite the low score. (158)

Finally Keefe and colleagues evaluated the original check-list in a series of 195 patients with a variety of pigmented lesions. They noted predictive values of 64% and 99% respectively using doctors'scores but only 7% and 99% for patient ones. The single feature which best distinguished MMs from benign lesions was the doctor's recognition of an irregular margin (159). None of the patients recognised the irregularity of the margin and also found it difficult to recognise variation in pigmentation throughout their lesions.

As yet no alternative to the check-list has been suggested. The features largely agree with those used by the American Cancer Society and those

used in melanoma publicity in Australia, New Zealand an New Mexico. It may be that they will continue to prove the most useful form of advice to publicise.

All the educational material including check-lists relates mainly to the superficial spreading variety of melanoma though it would also apply to most lentigo maligna and acral lentiginous varieties too. The type of MM least likely to be diagnosed or suspected from the check-list would be the nodular one which often lacks the irregular edge and variable pigmentation. The lack of a clear radial growth phase may mean that even those presenting promptly on noting any change may already be quite thick in terms of Breslow measurement.

The next phase to consider may be a modified educational message to encourage early diagnosis. For adults the check-list could probably be summed up into a one word message - "change". This would cover six of the original seven points and would apply whether the change was noted by the patient, relative or friend or health care professional. Perhaps an enquiry as to changing pigmented lesions could be included as part of all general medical examinations, e.g. those conducted by GPs on their older patients. Younger people could be questioned when attending the surgery for other problems or when attending Well Women, family planning clinics or sports medicine clinics. Any lesion which had altered could then be evaluated using the 7 point check-list (or a future alternative) and further referral made if indicated. If the public education message was made more vague it is possible that many more people would seek advice and thus further professional education would be required to improve GPs and non-specialist doctors confidence in assessing pigmented lesions.

The factor which is not included in either of the versions of the Glasgow checklist is the doctor's clinical diagnosis of the lesion.Irrespective of actual scores, an experienced doctor would be able to recognise most seborrhoeic warts by their characteristic warty, "stuck on" appearance. Likewise, many doctors will appreciate the differing appearance of a patient's MM from that of their other pigmented lesions even if it has a low score.

In the Glasgow campaign the marked rise in pigmented lesions referred was taken as an indication that the publicity had been effective. Evaluation of the benefits of the campaign and thus its true success is much more difficult. At first sight the marked increase in melanomas and in particular in thin ones in 1985 seemed to imply that the publicity had encouraged people to present with thinner lesions reflecting their increased knowledge of melanomas.

The best method of assessing the effect of any intervention like public education is to measure outcomes and knowledge before and after a limited time of intervention. A study population should be compared with a similar control population who have not been exposed to the intervention.

This had been the original plan with the Glasgow melanoma campaign. In practice, the plan proved impossible to follow. The public education intervention, intended to concentrate on June and July 1985, continued to appear throughout the whole of 1985 and to a more limited extent in 1986. Due to the extremely limited funding of the venture very little publicity was actively sought after June 1985. The campaign was widely reported as information spread by a "snowball" effect to a variety of

media. As the publicity also went national rather than remaining local, it was impossible to monitor the planned control population.

The fact that 1987 saw the multicentre version of the Glasgow campaign launched meant that there was never an opportunity to sample knowledge (delay in diagnosis) in the Glasgow MM patients in the absence of active publicity and to separate the effects of local and national ventures. Further publicity has been given to melanomas and their diagnosis ever since 1985. During the planning of the 1985 campaign it was felt that annual reminder campaigns might be required and this now effectively occurs.

The most useful outcome measure for cancer education ventures is the mortality data. Reduction in mortality can be interpreted as a successful campaign result but the reduction must be of a certain size to offset the cost of the campaign in order to be regarded as being cost effective. In breast cancer work, long term follow up has allowed calculations to be made to estimate cost of diagnosing cancers by screening and some doubt exists as to whether any improvement in mortality and morbidity has been worthwhile. Mortality data gathered by the SMG has shown a fall in melanoma mortality from 1988 onwards for women but not for men. (18) This would be in keeping with improved proportions of thin lesions especially in women. Longer follow up would be required to assess whether this trend was to continue and be seen in males too.

The main intermediate measure of the MM education venture is the proportion of thin, good prognosis lesions seen. The proportion of thin lesions was significantly higher in 1986-90 compared with the pre-campaign years. There was a concomitant fall in the proportion of thick

lesions. It is impossible to prove that the public education was the cause of the change. The annual melanoma figures for the West of Scotland only were too small to determine definite trends but there was no evidence of any emerging trend towards thinner lesions in 1979-84 before any publicity.

If education was the cause of the change in the proportions of different thickness categories of MM the apparently better uptake of educational material by women could partially explain the larger increase in thin lesions in women after 1985. The rapidity with which the CRC 7 centre campaign followed the Glasgow one makes it difficult to distinguish a point where the effect of one stopped and the other started. Data from Nottingham and Glasgow showed that more women than men attended PLCs in 1985. This was regarded as possibly being a good thing as twice as many women had MMs.

Further work from Scotland (160) for 1979-89 has shown that the greatest increase in MM incidence was in older men who also had the greatest proportion of thick lesions. A study from New South Wales found that thick MMs were more common in older men.(120) In both studies the highest proportion of thick lesion were on the head and neck.

A recent study from USA (161) found that MM mortality increased to 50% for men between 1973 and 1988 compared to only 21% for women. The greatest rise occurred in those over 50 with a peak in the 80-84 age group. Other workers had shown improved 5 year survival figures for MM patients as a whole from 41% in 1983 to 83% in 1985.(162) These authors attributed this change to their public education ventures.

The above data suggests that future educational ventures should make special efforts to reach older men. This section of the population lacksthe easily identifiable information sources like women's magazines and sports facilities which reach women and younger people respectively. It is possible that the recent introduction of regular health checks by GPs for their older patients may allow this group to be informed and screened.

For education to be successful there must be some increase in the level of knowledge within the target group although there is no proof that improved knowledge alters behaviour.The level of knowledge on MM in the West of Scotland was not assessed before or after the campaign. This was largely due to constraints of finance and personnel before the campaign and to the continuous publicity in the years after it.(v.s.). Indirect estimates of knowledge were taken from patients attending the PLC, 66% of whom were aware of the campaign.

Recent British work by Newman et al (147) and Whitehead et al (155) measured knowledge of melanoma in a multi-town postal survey and a PLC respectively. In the former only 26% of those surveyed had heard of MM and only very few knew that skin cancers could be life threatening.

In Nottingham (155) over 70% of patients were aware not only of MM but of the 7 point check-list. This study was carried out before the 1987 CRC campaign. The high level of knowledge may be partly explained by the fact that the population was a selected one. As the only publicity at that time on the 7 point checklist was from the Glasgow campaign the high level of awareness in Nottingham must reflect spill-over publicity.

Countries with high MM incidence like Australia have longer experience of public education and there 90% of people surveyed had heard of MM and were aware that skin cancers could be dangerous. (163) Perhaps this level of knowledge in the population only appears after repeated educational ventures.

One possible detrimental effect of public education is an increased workload for GPs and hospital services with the implications this could hold for health service budgets. The results of the Glasgow and Nottingham campaigns suggest that the increase in workload is not too great.In Scotland where hospital waiting lists are short there has been no suggestion that the increase in pigmented lesion referrals caused undue delays for other patients. In the West of Scotland this possibility was largely avoided by channelling pigmented lesion referrals to a designated PLC. In parts of the country without this facility continuing educational ventures may be causing increases in waiting lists.

The Glasgow and Nottingham experience was that at least ten benign lesions are seen for each MM at their PLCs. Obviously many more patients will have consulted their GPs and not been referred on. As yet no figure is available for a cost per MM diagnosed.

The other potentially adverse effect of education observed in the cancer field has been an increase in patient anxiety. Particular attention has been given to the anxiety generated by population based screening eg for breast and cervical cancers and general health assessments. (164). It is recognised that even inviting people for screening may cause anxiety which may not be totally corrected by a normal result. (165). Other workers have shown that such anxiety can be reduced by providing more

information with the screening information, at the time of attendance for the screening test and with the result. (166) If the screening test result produces referral to hospital for further investigation, this invitation may further increase anxiety. A study of women referred to a hospital cytology clinic after an abnormal smear result found that the group who were sent an explanatory leaflet with the appointment card were significantly less anxious than those who were not. (167)

During the Glasgow campaign no attempt was made to formally measure anxiety related to attending the clinic. It was common, however, for individuals to express relief when told that their lesion was benign. This aspect of work would be a useful study for the future as would levels of anxiety in patients attending their general practitioner for a preliminary (screening) examination.

The alternative means of encouraging earlier diagnosis of MM is to consider screening either of the whole population or of identified high risk groups. The nature of MM makes it an attractive target for a screening programme. It is increasing in incidence and mortality making it a public health problem, the screening test (clinical examination) is rapid and patient acceptable and there is evidence that early diagnosis improves prognosis.

Screening for melanoma has been carried out in a series of Skin Fairs in USA. One or two day fairs are held in shopping malls and other public places, staffed by dermatologists who offer their services free. The screening is preceded by considerable publicity including the ABCDE checklist. Those individuals suspected of having a melanoma or other skin cancer are advised to have the lesion excised promptly. As this

means that the histological diagnosis is not easily available to the screening organisers, it has proved difficult to accurately assess the numbers of melanomas found. Koh and colleagues have followed one group of screened patients and calculated a predictive value of 35-40% for visual screening examination for melanoma (142)

More recently visual screening was conducted in a beach location in the Netherlands (168) A total of 3,069 people were examined, 65 (2.1%) were found to have suspicious lesions and these individuals were referred back to their GPs. Subsequent histology showed that this group included 6 melanomas, 2 squamous cancers, 23 basal cell cancers and 5 dysplastic naevi. This gives an approximate rate of 1 MM per 500 individuals examined. Only 80% of those referred back to their GPs complied and histology was available for 19 of the suspicious lesions.

At present no plans exist to extend MM screening to the general population in Europe.

Some attention has been given to the possibility of screening high risk groups. Greene and colleagues (37) followed up families with dysplastic naevus syndrome. All the melanomas identified at these screening examinations were very thin and thus there has been no mortality in this group. Data has recently been published from the Glasgow PLC on 116 patients with different types of atypical naevi. The median thickness of the melanomas detected at follow up was only 0.75 mm.(169).The highest risk of MM was in those with atypical naevi and family histories of MM. (Relative risk-444) Lesser risks were identified in those with atypical naevi and personal histories of MM (Relative risk-91) and those with atypical naevi only (Relative risk-92).

Thus is may be appropriate to suggest limited screening for MM of high risk individuals and perhaps this should be done through specialist clinics initially. In view of its comparative rarity it may not be appropriate to suggest large scale screening programmes in Britain until there was good evidence of its value from pilot studies. Large scale screening would require specific training for either medical or nursing personnel as numbers of dermatologists in Britain could not take up this workload. Until then it is probable that screening will rely on general practitioners and other primary care health workers. It is essential that regular update programmes are planned for these individuals.

The situation in high incidence countries like Australia is somewhat different. There, State Cancer Councils suggest regular self screening and annual doctor screening for all. A recent study for New South Wales examined the prevalence of screening in a group of 1344 people. Only 48% regularly examined their own skin or had it examined by their partner. A further 2% had had an examination by a doctor within the last year. The value of this type of screening is not yet proven. The study showed that male gender, lower social class, unemployment, physical inability to work and lack of secondary education characterised those who had not been screened. (170)

In contrast this group in Australia found that those with real or perceived increased risk of melanoma and those aware of the benefits of its early diagnosis were most likely to be screened.

At the Glasgow PLC those with a possible increased risk of melanoma were instructed in self screening. In addition those with atypical naevi

were followed at variable intervals at the clinic. This has allowed for early diagnosis of new MMs and assessment of risk (169)

At present, therefore, most melanoma work is likely to remain in the field of early diagnosis and education until a clearer picture of the value of screening emerges. Attention should be given to improvements and alterations to the education programme. As mentioned previously, the publicity seems to be virtually self-generating and to attract public interest, it is important that the best type of message is selected to reach those most in need. In Glasgow, the 7 point check-list has been modified (171) and the publicity leaflet updated to give a more "user-friendly" layout.

The situation regarding preventative measures in melanoma is not yet clear. Global issues like ozone depletion need to be addressed urgently and steps taken to at least decelerate current rates of damage to the environment. In 1987 the Montreal Protocol on substances recognised to deplete the ozone layer was signed by 35 countries. This aims to fix levels of chlorofluorocarbons production initially then gradually reduce them. While such endeavours will perhaps slow the rate of ozone thinning, more restrictive legislation would be required to arrest it completely. Thus if ozone thinning is even partly responsible for increasing MM incidence the rise would continue for several more decades even if such legislation was undertaken at once. (172)

On a smaller scale, in view of the undeniable relationship between MM and UV exposure, it seems reasonable for health care professionals to advocate sensible sunning for all. This requires a behavioural change among both the general population and particularly those at high risk.

The most appropriately aged targets for this type of information may well be children and teenagers given that it appears that sun exposure at this age confers a lifelong MM risk. In addition, it is at this age that people become aware of fashions and body image. A school based skin cancer prevention project is underway in the high incidence area of Arizona (173) and in London (174). If tomorrow's adults were convinced of the damage potential of excess sun exposure perhaps the rising incidence of MM could be halted.

Adults too should be educated to assess their natural tolerance and use an appropriate sunscreen either chemical or physical (clothing). In recent years both the cosmetic acceptability and efficacy of the chemical types have greatly improved. Hopefully, this, together with appropriate publicity, should encourage more widespread use of these agents.

The hoped for result of good sun screening would ultimately be a halt in the increase in MM incidence. Monitoring of the level of sunscreen use within communities would be helpful in evaluating their possible benefits.

The National Institutes of Health Concensus Development Conference on the diagnosis and treatment of early MM has recently published its findings.(175) Amongst their conclusions it was stated that education and screening programmes have "the potential to decrease the morbidity and mortality from melanoma". This document adds weight to the continuing development of education programmes.

For the future, the search for aetiological factors in MM must continue and further effort must be directed towards finding an explanation for the

rising incidence and mortality rates. In the meantime, improved general knowledge of MM and more widespread recognition must remain a goal for those working in this field.

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APPENDIX A

General Practitioner Questionnaire.

1. The recognition of early malignant melanoma is a subject about which in general GPs are not confident because of its relative rarity.

   Agree. ☐ Disagree ☐

2. If the following forms of material were available to help compensate for this lack of personal experience, which would you consider would be most useful?

   (i) Video tape presentation of representative cases for practice or home use. ☐

   (ii) Tape slide presentations. ☐

   (iii) A short illustrated booklet for instant reference in the surgery. ☐

   (iv) Small local meetings with an "expert" lecturer, followed by discussion. ☐

   (v) A tape to play in your car or at home. ☐

   (vi) A recorded telephone message. ☐

3. Which of the above would you anticipate being most useful to the majority of GPs?

   _____

4. Do you consider that the needs of trainee GPs, as far as this topic is concerned, are different from those of established GPs?

   Yes. ☐ No ☐

   If yes, could you say how?

   _____

5. Which of the following possible topics for educational leaflets would you consider most GPs would find helpful in this area of knowledge?

Value to GP

	Definitely useful and interesting	Probably useful	Not of great interest
Early recognition of malignant melanoma and its differential diagnosis	☐	☐	☐
Normal benign melanocytic naevi (moles) from birth to death	☐	☐	☐
Pathology of melanoma	☐	☐	☐
Current approaches to surgery of primary melanoma	☐	☐	☐
The management of advanced melanoma	☐	☐	☐
Melanoma and pregnancy-what advice is appropriate for young female patients	☐	☐	☐
The epidemiology of melanoma around the world	☐	☐	☐
Dermatological dangers of excessive sun exposure	☐	☐	☐

6. Do you have any personal anecdotal case history of practical experience in this field which might be used (anonymously or not, as you wish) for the educational exercise?

Yes. ☐ No ☐

if yes , we will contact you in the near future.

7. Would you welcome more information on the appropriate procedures to initiate if a patient walks into your surgery with a suspect melanoma?

   Yes. ☐ No ☐

8. Would you welcome information on current appropriate therapeutic procedures for melanoma in order to inform patients of the likely course of events?

   Yes. ☐ No. ☐

9. Would you welcome educational material or an educational campaign aimed at your patients to encourage them to attend for examination of "odd moles" and possible early melanoma?

   Yes. ☐ No. ☐

   Only after the GP programmehas been distributed. ☐

This questionnaire is a genuine attempt to determine what GPs themselves feel are the educational deficiencies in this area and how to correct them.

Please return this questionnaire in the enclosed reply paid envelope and distribute copies to your partner and trainees.

APPENDIX B

Pigmented Lesion Clinic Questionnaire.

(please tick appropriate box)

1. Age range.
   0-20yrs ☐ 20-40yrs ☐ 40-60yrs ☐ Over 60 ☐
2. Sex.
   Male ☐ Female ☐
3. Before your recent hospital attendance had you heard anything about the Skin Cancer Campaign?
   Yes ☐ No ☐
   If yes please answer question 4.
4. Can you put a tick(s) beside the way you heard about the campaign.

Newspapers		TV/radio	
Glasgow Herald		BBC News (TV)	
Daily Record		Breakfast Time	
Sunday Mail		Woman's Hour	
Scotsman		BBC Radio 4-"Today"	
The Times		Reporting Scotland	
The Guardian		Bodyline	
The Observer		Radio Clyde	
Other		Jimmy Mack	
Posters/Leaflets		What's Your Problem	

5. If you answered no to question 3 can you say why you went to see your GP about the mark on your skin eg was it following advice from a relative or friend?

Please return the completed form in the enclosed envelope.

Many thanks for your time and co-operation.