

A second multiple screening clinic in rural general practice

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THE basic principle of multiple screening is to detect certain diseases in an early stage when they are readily treatable thus reducing their mortality. Additionally, screening should aim at detecting those patients with incipient degenerative diseases so that their sequelae can be minimized and their morbidity reduced.

Since our previous paper (Cope and Smith, 1967) describing *A health week in rural general practice*, several investigators have described various aspects of multiple screening surveys. Taylor (1970) examined 498 patients invited to a clinic by a circular letter and Camalt *et al.* (1970) described the examination of 296 people using multiple biochemical and haematological tests. This paper is based on a repeat screening of a static population in rural Lincolnshire, three and a half years after the initial screening programme. Our objects were to see:

- (a) If the incidence of detected morbidity differed from the previous screening;
- (b) To assess the value of repeated tests after this short interval of time;
- (c) If patients would accept repeated screening examinations.

Method

All patients attending the clinic were offered the same tests as in 1966. These were: tests to detect chest diseases, anaemia, glaucoma, cervical carcinoma, carcinoma of the breast, hypertension, glycosuria and albuminuria, together with a simple test to detect significant degrees of loss of visual acuity. In addition, on this occasion we used a Wright peak flow meter, and 'Technicon' auto-analysers so we were able to perform a wide range of blood tests instead of the simple haemoglobin estimation which was performed at the previous clinic.

Our practice population is rural, largely agricultural, and of our 4,100 patients in October 1966, 78.5 per cent were still patients in April 1970.

The clinic was run on the same lines as our previous health week and again we enlisted the support of the local Medical Officer of Health. For ethical reasons, he was responsible for all publicity and advertising, and he acted as liaison officer between us and neighbouring practitioners. The clinic was held in a local youth club for six consecutive nights, in April 1970, from 17.00 until 21.00 hours. During part of this time one of us attended our routine evening surgery. The only administrative change from the previous clinic was that we re-designed the record card in order to make the recording and extraction of results easier.

Results

Attendance

The total attendance at this screening clinic was 1,838. There were 818 (44.5 per cent) of our patients who attended the clinic. There were 1,020 (55.5 per cent) who did not attend.

cent) males and 1,020 (55.5 per cent) females. This compares with 1,711 attenders in 1966 when there were 773 (45.2 per cent) males and 938 (54.8 per cent) females. Of this total of 1,838 people, 962 (52.5 per cent) had attended the earlier clinic. An age-sex analysis of the 1,204 patients belonging to our practice who attended the 1970 clinic is given in table I, and an analysis of the social class breakdown for all attenders is shown in table II.

TABLE I
AGE AND SEX OF THE PATIENTS

Age of patient (years)	Male		Female	
	Number	Percentage of practice	Number	Percentage of practice
15-20	23	17.0	29	23.4
21-30	73	29.8	110	43.5
31-40	115	42.8	163	61.0
41-50	114	41.6	142	50.5
51-60	111	41.4	112	41.6
61-70	70	27.9	77	33.3
>70	33	22.8	32	17.1
	539		565	

Glaucoma

We used a Schwarzer electronometer instead of the Schiötz tonometer as used at the previous health week. One ophthalmic technician easily managed to perform 631 tests during the six evenings. The test was restricted to people over 45 years of age unless there was a family history of blindness or glaucoma. All those with an intra-ocular

TABLE II
SOCIAL CLASS

Social class	I	II	III	IV	V
Number	9	21	561	1016	231

TABLE III
GLAUCOMA

	1970	1966
Number of tests	631	390
Referred for further investigation	53	67
Glaucoma requiring iridectomy	2	5
Glaucoma requiring medical treatment	1	2
Persistent ocular hypertension	0	25

pressure in either eye, greater than 20 mm Hg, were referred to the local glaucoma clinic, (table III). A total of 53 people needed further investigation, of whom 25 attended in 1966, and three new cases of glaucoma were diagnosed. The incidence of undiscovered glaucoma revealed by this survey was 0.5 per cent compared with a figure of 1.8 per cent for our 1966 clinic.

Urine tests

These tests were performed by lay women using 'bililabstix' and 'urobilistix' and 1,478 tests were performed compared with 1,342 in 1966. This time, our number of presumptive cases of glycosuria was much lower and we found the random blood sugars a great help in excluding false positive results. We diagnosed four new cases of late onset diabetes (0.3 per cent) and this was the same percentage as at our previous screening clinic. We did not make any other new diagnosis from urine testing.

Hypertension

A team of district nurse-midwives and health visitors performed this test and one of us checked all abnormal readings. A diastolic pressure greater than 100 mm Hg or a systolic pressure over 150 mm Hg was regarded as elevated in both sexes. Of the 1,702 tests we found 18 women and nine men with abnormal readings. Of these 27 people (1.5 per cent) all but two women and one man were considerably more than ten per cent above their ideal weight (tables issued by the Institute of Actuaries, London) and were put on strict low calorie diets. In addition, six women and three men needed hypotensive therapy. Only one of the women with raised blood pressure was taken an oral contraceptive and her blood pressure did not return to normal on stopping this. In 1966, 1,565 people took the test when we found 43 patients (2.8 per cent) with hypertension using the above criteria.

Cervical cytology

The Ayres cervical smear technique was used in this test which was restricted to women aged between 25 and 60 years. Two district nurses prepared the patients and one of us took all the smears. Over the week the number of smears taken was 516 compared with 402 on the previous occasion. All the smears were read by a cytological technician at the local hospital where they were transported at the end of each evening. This time we did not find any carcinoma of the cervix compared with two cases in 1966 (0.5 per cent).

At the present clinic one slide was suggestive of carcinoma *in situ* but subsequent cone biopsy was normal. This woman had an inflammatory smear at the 1966 clinic but repeat smears taken three months and one year later were reported normal. Again we restricted this test to the taking of smears and did not attempt a full pelvic examination as this was not possible in the time available. The details of other findings and a comparison with 1966 results are given in table IV.

TABLE IV
CERVICAL CYTOLOGY

	1970	1966
Cervical carcinoma	0	2
Atypical cells (for repeat) ..	1	1
Monilia	2	1
Trichomonas vaginalis	12	8
Senile vaginitis	3	1
TOTAL NUMBER OF TESTS ..	516	402

TABLE V
CHEST X-RAYS

	1970	1966
Total number x-rayed ..	1711	1684
Active tuberculosis	0	2
Carcinoma of bronchus	1	0
Hiatus hernia	0	3
Cardiac hypertrophy	46	31
Emphysema	1	9
Bronchiectasis	0	2
Eventration of diaphragm ..	1	2

Breast examination

We examined the breasts of 592 women (456 in 1966) over the age of 25 years by inspection and palpation. One case of cystic hyperplasia was referred for biopsy and no other abnormalities were detected. This compared exactly with our previous clinic when again the only finding was a single case of cystic hyperplasia. On this occasion each woman was given a leaflet explaining the technique of self-examination of the breast.

Visual acuity

A trained lay woman operated this test using a Keystone vision testing apparatus. The test was open to all patients providing that they were not already under the care of an optician. Anyone with a visual acuity of less than 6/9 in either eye for distant vision or less than J4 in either eye for near vision was deemed to have failed the test and advised

to see an optician in the near future. Out of 769 people taking the test 313 (40.7 per cent) failed to achieve this standard.

Height and weight

This test was open to all attenders. In all 1,475 were weighed and measured in their indoor clothing and wearing shoes. Of the males, 442 (54 per cent) and of the females, 622 (61 per cent) were greater than ten per cent overweight compared with tables supplied by the Institute of Actuaries, London.

Chest radiography

The Lincolnshire mass radiography unit performed this test. 1,782 people were x-rayed and the results are given in table V.

Wright peak flow meter

A lay woman was in charge of this investigation. Of the 486 men taking this test, 18 had a peak expiratory flow (PEF) of less than 300 litres per minute. 569 women took the test and of these 50 had a PEF of less than 250 litres per minute. Eight of the men and eight of the women were previously known to have asthma or chronic bronchitis, and this test did not lead to any new diagnosis.

Blood analysis

In 1966, the only blood estimation performed was a haemoglobin level measured by the cyanmethaemoglobin colorimetric technique. In the present survey 20 ml of blood was taken from each patient and after the serum had been separated, it was transported to London the same evening for analysis on the following morning. Samples were analysed on a 'Technicon' SMA 12/60, 'Technicon' 7A haematology analyser, a single channel 'Technicon' analyser and a 'Technicon' protein bound iodine (PBI) analyser. In addition, an ESR was done manually on each specimen.

The analysis and interpretation of the biochemical results is outside the scope of this paper and is the subject of a separate report at present in preparation. As general practitioners we divided the results into the following groups:

- (1) Results leading to a new diagnosis.
- (2) Results expected from a previously established diagnosis.
- (3) Results signifying that the patient was in a high risk group, e.g. high serum cholesterol in ischaemic heart disease.
- (4) Results that could be explained by current medication, e.g. a raised protein bound iodine in women on oral contraceptives.
- (5) Unexplained findings.

It was not possible to classify all the results as some of the patients came from outside our area and were not available for follow-up. The results are given in table VI.

The only area in which comparison with 1966 is possible is that of iron deficiency anaemia. Taking levels below 12.5 g/100 ml for men and 10.9 g/100 ml for women as being abnormal, of the 1,427 people taking the test in 1966, 110 patients (7.7 per cent) were found to be anaemic. At the 1970 clinic, out of 1,388 haemoglobin estimations we found that 34 people (2.4 per cent), consisting of 28 women and six men, had iron deficiency anaemia. An analysis of the 1970 anaemic patients shows that seven of the women and one of the men (a high grade mental defective) were also anaemic in 1966.

Discussion

Any assessment of screening must include an analysis of the cost effectiveness of such a programme and this is best measured by calculating the cost per patient screened. The alternative method of costing a screening programme by calculating the cost of each new diagnosis ignores the many other advantages of screening. These include the value of normal results when used as baselines in the subsequent assessment of a patient. In

TABLE VI
RESULTS OF BLOOD ANALYSIS

Assay	Limits of normal range used	Number of estimations	Number of abnormals found	Judged clinically useful	Judged not clinically useful	New diagnoses	Unexplained findings
Cholesterol ..	mg/100ml 130-300	1,263	207	207	0	5	0
ESR	mm/hr <15mm	1,368	248	67	101	1	80
Uric acid ..	mg/100ml 2.5-8	1,236	32	26	0	14	6
Haemoglobin ..	g/100ml Females 10.9-17 Males 12.5-18	1,388	34	34	0	18	0
Alkaline phosphatase ..	m u/ml 35-100	1,368	24	9	7	1	8
Albumin ..	g/100ml 3.3-5.2	1,396	12	8	2	0	2
Sugar	mg/100ml 65-200	1,457	13	8	3	2	2
Total protein ..	g/100ml 5.5-8.5	1,391	14	5	7	0	2
WBC	c mm 4,000- 15,000	1,392	16	4	6	0	6
Urea	mg/100ml 25-40	1,457	8	4	3	0	1
Aspartate amino transferase ..	m u/ml 10-70	1,281	41	4	23	0	14
Creatinine ..	mg/100ml 0.3-1.8	1,386	6	3	2	0	1
PCV	Percent Females 30-55 Males 35-60	1,388	6	3	2	0	1
PBI	u g/100ml 3.8-8.5	1,378	23	2	16	1	5
Red cells ..	c mm Females 3.5-6.0 Males 4.0-6.5	1,293	3	2	0	0	1
Bilirubin ..	mg/100ml 0-1.5	1,364	8	1	3	0	4
Calcium ..	mg/100ml 8.5-11.0	1,401	2	1	1	0	0
Phosphorus ..	mg/100ml 2.0-5.0	1,398	3	0	2	0	1
TOTAL		24,615	700	388	178	42	134

our 1966 survey the cost was approximately 25p per patient, but in the present survey it rose to £3.30 and this was almost entirely due to the additional cost of the blood and biochemical tests. In view of the large additional cost of more biochemical tests, it seems desirable to select these carefully.

Random blood sugar, haemoglobin, uric acid and cholesterol estimations led to the greatest number of new diagnoses. Serum cholesterol has an added value in that it

influences the treatment given to patients with hypertension, cardiomegaly and obesity discovered either alone or in combination in the other tests.

The results obtained at the two clinics show that there is a considerable reduction in morbidity discovered at the second clinic. The number of patients with anaemia, hypertension, glaucoma or cervical carcinoma were all significantly lower on the second occasion. It is tempting to attribute this decrease in the incidence of illness to the holding of the first health week, however, a proportion of this improvement must be due to the follow-up of those identified three and a half years before.

Although this decrease in morbidity is pleasing, it is economically important to be realistic about the timing of screening clinics. It would seem that the time lapse of three and a half years was too short and, with the exception of cervical smears, an interval of ten years would perhaps be more appropriate. Alternatively, a case could be made out for holding an initial screening clinic and dividing the results into actual morbidity disclosed and patients at risk. These at risk patients would include people with, for example, cholesterol levels, hypertension or obesity approaching the upper limits of normal. These patients could then be screened by invitation at much shorter intervals than ten years.

The Wright peak flow meter is of much greater use in the surgery in assessing the need for or the effectiveness of treatment rather than as a screening test. Breast examination by palpation and inspection is not truly a screening procedure, and it is likely that a much more productive avenue to early diagnosis is to impress on women the importance of regular self-examination of the breasts. It has proved a waste of time and effort to test urine other than for glycosuria, but a simple dipstick method of screening urine for glucose should be a feature of any screening project.

Finally it must be stressed that patients who are found to be normal in every test derive a benefit which it is impossible to measure quantitatively. The public response to health weeks in our practice leads to the conclusion that the provision of such clinics encourages healthy self-interest without producing hypochondriasis.

Summary

This paper describes a repetition of a multiple screening programme in a static rural general practice, three and a half years after the initial screening clinic. 1,838 people attended (of whom 52.6 per cent had attended the previous clinic) and were offered nine tests and a full haematological survey. In all, four cases of diabetes, three cases of glaucoma, 27 hypertensives, and 34 cases of iron deficiency anaemia were diagnosed. The full haematological and biochemical results are given. A comparison between the two clinics has been made and the value of individual tests discussed.

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