Periodic Health Screening in a Rural Private Practice

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Critical analysis has recently shown that the annual complete physical examination (including laboratory and x-ray studies) is not effective in changing the outcome of many diseases and is a wasteful use of medical resources.[1,2] Selective screening for specific diseases which meet rational screening criteria has been proposed as a better alternative.[2,3] Selective screening implies that a longitudinal or lifetime screening plan has been developed and that the plan is individualized to particular patients according to their age, sex, risk factors, and ongoing medical problems. Tests or examinations are included only if they meet stated criteria and will be done at rational rather than arbitrary annual intervals. Frame and Carlson used the six criteria in Table 1 to develop the longitudinal screening flow sheet for asymptomatic adults shown in Figure 1.[2]

The screening criteria used by different authors have been remarkably similar in their general outline, having, of course, some differences of wording and emphasis.[1-3] Significant differences, however, occur in the specific recommendations concerning what diseases to screen for, how often, and by what method. This fact is understandably a source of great confusion to the family physician trying to decide what screening to do. It reflects the fact that published selective screening programs are only hypotheses which must be tested by controlled trials and implementation before their worth can be definitely established. In just this manner the hypothesis that "the annual complete physical examination is worthwhile" was tested and found to be false.

The purpose of this paper is fourfold: (1) to illustrate the controversial nature of many screening recommendations by discussing the rationale behind screening for cervical cancer and colon cancer; (2) to define the general barriers to more widespread implementation of rational periodic health screening; (3) to describe the implementation of a periodic health screening program in a rural family practice; and (4) to identify certain principles and pitfalls which may affect physicians implementing screening in their own practices.

Screening For Cervical Cancer

In a recent paper on screening for cervical cancer, Boyes states, "the worth of screening for cervical cancer by Pap smear has been established."[4] In another paper published at about the same time, Gardner concludes "a causal relationship between cytologic screening and the decreasing incidence of invasive cervical cancer cannot be established."[5] Thus, even the Pap smear, that most accepted of screening tests, is controversial. Factors contributing to the controversy include: the decline in the incidence of invasive cervical cancer prior to cytologic screening, the unknown natural history of in situ carcinoma of the cervix, and the effect of increased hysterectomy rates on the incidence of cervical cancer.

Cervical cancer is relatively common. The incidence of in situ cervical carcinoma is 40 per 100,000 women. The incidence of invasive cancer is 15.6 per 100,000 women. It causes a significant mortality of 5.2 per 100,000 women. The disease has a long asymptomatic period and survival is much better if treatment is started in Stage 0 or Stage 1 disease.[2] The Pap smear will detect cervical cancer in the asymptomatic period although there are some false positive and false negative results. The cost of a Pap smear ranges between $10 and $25.

Thus, Pap smear screening for cervical cancer meets all the criteria outlined in Table 1 and at least in theory should be worthwhile. The controversial question is how often should Pap smears be done?

Table 2 shows the frequency of doing Pap smears as recommended by several authors. The British and Canadian recommendations[6] are much less frequent than those of the American College of Obstetricians and Gynecologists.[7] The two issues central to answering the question "How often should Pap smears be done?" are: (1) what is the

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Figure 1. Screening Flow Sheet

Table 1. Screening Criteria

1. The disease must have a significant effect on the quality or quantity of life

2. Acceptable methods of treatment must be available

3. The disease must have an asymptomatic period during which detection and treatment significantly reduces morbidity and/or mortality

4. Treatment in the asymptomatic phase must yield a therapeutic result superior to that obtained by delaying treatment until symptoms appear

5. Tests must by available that are acceptable to patients, at reasonable cost, and that detect the condition in the asymptomatic period

6. The incidence of the condition must be sufficient to justify the cost of screening

sensitivity (true negative rate) of the Pap smear; and (2) what is the detection interval between the onset of cervical dysplasia and the development of invasive, potentially incurable cancer.

Reports of Pap smear sensitivity range from 70 to 95 percent.[8,9] Recent studies retrospectively analyzing false negative results have tended to indicate a lower sensitivity. Rylander looked at 56 cervical smears reported as normal from women who subsequently developed invasive cervical cancer within four to five years of screening. Of these, 62 percent had been incorrectly read by the cytologist, 25 percent had no columnar cells indicating possible inadequate sampling, and 13 percent were normal satisfactory smears. Thus, the majority of false negative Pap smears result from incorrect reading or sampling. The frequency of cervical cytologic screening must take into consideration the fact that there will be a significant number of false negative Pap smears. Eighty percent is probably a reasonable estimate of Pap smear sensitivity.

The detection interval between the onset of cervical dysplasia and the development of invasive cancer is not precisely known and undoubtedly is highly variable from case to case. Prospective studies and epidemiologic data suggest it is fairly

Table 2. Recommended Frequencies for Asymptomatic Women to Have a Pap Smear	
1. British National Health Service[6]:	Initial smear age 25; repeat in 1 year, then every 5 years to age 70
2. Walton Report[6]:	Initial smear at age 18 if sexually active. Repeat in 1 year, then every 3 years to age 35 and every 5 years to age 60.
3. Frame & Carlson[2]:	Initial smear when sexually active or age 21. Repeat in 1 year then every 2 years.
4. American College of Obstetricians and Gynecologists[7]:	Initial smear when sexually active or age 18. Repeat in 6 months, then every year.

long, averaging at least five, and possibly 10 to 15, years.

Richart and Peterson did prospective studies of precancerous cervical lesions. Richart found an average progression time from dysplasia to carcinoma in situ of 44 months.[10] Peterson followed in situ lesions and found 11 percent became invasive within three years, 22 percent within five years, and 39 percent within nine years.[11]

Epidemiologic data show the mean age of diagnosis of in situ carcinoma is 34 years, while the mean age of diagnosis of occult invasive cancer is 48.6 years, and the mean age of diagnosis of clinically apparent carcinoma is 52 years.[6] If one assumes invasive cancer starts as carcinoma in situ, then these data suggest an average 14.6 year progression time from in situ to invasive disease.

In contrast to evidence supporting a long detection interval for cervical cancer, large screening programs have shown a few cases develop in a much shorter time. Rylander reported seven cases of invasive cancer developing within four to five years after a truly normal Pap smear.[8] Fidler reported 15 cases of invasive cervical cancer which developed in less than three years.[12] It is important to know the denominator (how many women were screened) in each of these studies. Fidler's cases were from a population of 980,000 women in British Columbia screened at least once between 1960 and 1967 in which 3,284 cases of in situ carcinoma and 383 cases of invasive cancer were found. The exact denominator in Rylander's study is not stated.

Knox has shown schematically how to correlate data about Pap smear sensitivity and detection interval to determine how many cancers will be

Figure 2. Percent detection for different screening frequencies (1/s) and different detectability intervals assuming 80 percent sensitivity of test.
From Knox EG: *British Journal of Cancer* (34) 446 1976
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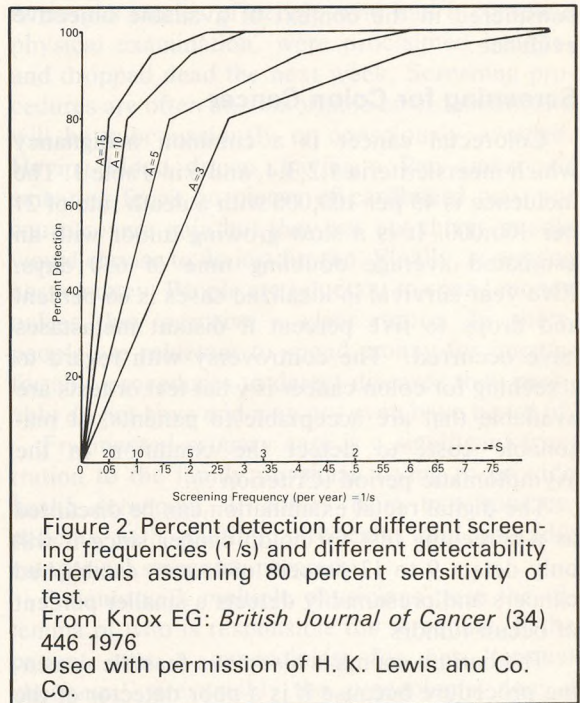
missed with given frequencies of screening.[13] Figure 2 shows that if the detection interval "A" is three years (a rapid "worst case" detection interval) and the Pap smear is 80 percent sensitive, screening every three years will detect 80 percent of cancers in a curable stage. Biannual screening will detect about 90 percent, and screening every year will detect essentially 100 percent. If, as available evidence suggests, the detection interval

is 5, 10, or even 15 years, there is no advantage to screening every year compared to every two years and, indeed, less frequent screening is justified. Therefore, unless the detection interval is three years or less or Pap smear sensitivity is considerably less than 80 percent, there is little gain from doing yearly Pap smears compared to every two years. Screening every three to five years is more cost effective, but if the detection interval is short, a significant number of cases will be missed.

My recommendation to screen for cervical cancer every other year is a compromise. It involves one half of the physician time and expense of what is currently advocated and practiced in the United States, yet is perhaps excessive when considered in the context of available objective evidence.

Screening for Colon Cancer

Colorectal cancer is a common malignancy which meets criteria 1,2,3,4, and 6 in Table 1. The incidence is 45 per 100,000 with a death rate of 21 per 100,000. It is a slow growing tumor with an estimated average doubling time of 630 days. Five-year survival in localized cases is 66 percent and drops to five percent if distant metastases have occurred.[2] The controversy with regard to screening for colon cancer is what test or tests are available that are acceptable to patients, at reasonable cost, to detect the condition in the asymptomatic period (Criterion 5).

The digital rectal examination can be discarded as a screening test for colon cancer since it will only detect 9 to 13 percent of known established cancers and presumably detects a smaller percent of occult tumors.[2]

The barium enema is also not a feasible screening procedure because it is a poor detector of the 40 percent of cancers occurring in the rectum; it is expensive, time consuming, and, if periodically repeated, the 1 - 2 rads per test could amount to a significant radiation exposure. It is of course an important part of the work-up for suspected colon cancer.

Proctosigmoidoscopy has been and still is recommended as a screening test for colon cancer. Theoretically, the rigid sigmoidoscope should be able to detect any tumor in the distal 25 cm of the bowel. Formerly, 70 percent of cancers occurred in this area, but recent studies have shown the distribution of cancers has changed and only 60 percent of cancers occur within range of the rigid sigmoidoscope.[14] Studies show, however, that, in fact, the sigmoidoscope actually reaches an average depth of 18 to 20 cm and thus has the potential to detect perhaps 50 percent of colonic cancers.[14] Gilbertsen detected one cancer per 630 initial sigmoidoscopies, but only 1 per 4,000 repeat examinations.[15]

Sigmoidoscopy is a fairly expensive procedure, compared to other screening tests, and causes considerable patient discomfort. These two factors may be more important deterrents to its use as a routine screening procedure than any discussion of its sensitivity or specificity. It is significant that no community based studies of patient compliance to a program of routine repeat sigmoidoscopy have been reported. Recently, Dutton has suggested that fiberoptic flexible sigmoidoscopy which can reach a depth of 55 cm should be used in conjunction with or in place of rigid sigmoidoscopy.[14] The same problems of cost and patient acceptance pertain with the fiberoptic scope, and the procedure is too new to be recommended as a screening test for the general public at this time.

Testing stools for occult blood (Hemoccult) has been recommended as a more feasible screen for colon cancer than sigmoidoscopy. It has several advantages: it should detect cancers from the entire bowel, it is not invasive, it is inexpensive. It also has disadvantages. It is not specific for colon cancer and it requires patient follow-through at home.

Hemoccult slide testing as a screen for colon cancer is relatively new and several questions must be answered before it becomes established medical practice. These include: what are the rates of false positive and false negative results? and how good is patient compliance? Table 3 shows the results of several studies of the slide test as a screen for colon cancer. It also includes data from my own use of Hemoccult screening in rural family practice. The results show the rate of false positive results is between one and six percent. Working up these false positive cases does not create an excessive burden on physicians or patients.

Patient compliance is fair (56-85 percent). It is not surprising that unselected patients in my rural upstate New York practice have a lower compliance than those volunteering for a research program at a major cancer center, such as the Strang Clinic in Winawer's study.

The rate of false negative Hemoccult tests is a major concern, and only one study seriously addressed the question. The 22 percent false negative rate reported by Winawer is uncomfortably high.[16] These are false negatives found by sigmoidoscopy at the time of screening. The total found by retrospective follow-up may be greater.

In conclusion, no perfect screening test for colon cancer is available. Hemoccult slide testing is inexpensive and is fairly acceptable to patients. The false negative rate is not definitely known but may be disturbingly high. Sigmoidoscopy is expensive and probably not acceptable to patients on a periodic basis; at best it will detect 60 percent of cancers. Since 95 percent of colon cancers occur in persons 45 years or older, and 75 percent occur in persons over 55 years, I currently recommend Hemoccult testing every two years between ages 40 and 50 years, and every year after age 50. I do not currently do sigmoidoscopy on a routine basis. However, some physicians might want to do a single sigmoidoscopy at about 55 years of age, just before the peak incidence of colon cancer.

Barriers to General Implementation of Periodic Health Screening

The three major barriers to widespread implementation of periodic health screening are (1) lack of physician motivation, (2) patient resistance, and (3) the fragmentation of primary care. *Lack of physician motivation* is by far the most important of the three barriers. If the physician is not motivated and does not initiate screening, patient resistance and fragmented care are irrelevant.

There are several reasons why physicians are not motivated to implement a screening program. Screening is low priority. Family physicians are extremely busy. The patients' chief complaints, emergencies, and ongoing medical problems correctly take precedence over screening. The use of physician's assistants is one solution which many have used successfully in solving the problem of lack of time.

Screening must be sold to patients, they usually do not ask for it. The gratification a physician receives from screening is very real (discovering a curable bowel cancer is exciting), but it is infrequent (I'm waiting for my first) compared to treating acute medical problems.

A valid reason for physician reluctance to devote major commitments to screening is that physicians do not believe the value of screening has been proven. Politicians are sure screening is worthwhile, will lower the cost of medical care, and convince all those people who are living longer and happier lives to vote for them. Physicians, however, aware of the controversy that surrounds almost every screening procedure, are not necessarily convinced that screening will benefit their patients.

Patients are often reluctant to undergo screening procedures. If they feel well they frequently see no need to visit a physician. Many doubt that physicians can detect hidden diseases. There are numerous stories of people who had a complete physical examination, were proclaimed healthy, and dropped dead the next week. Screening procedures are often uncomfortable or distasteful and will be subconsciously or consciously avoided. Having blood drawn, having a Pap smear, or smearing feces on pieces of cardboard may not cause severe pain but they are not things people would choose to do just for fun. Finally, screening costs money. People are reluctant to spend money unless they perceive a clear return. In short, people are reluctant to spend money for uncomfortable procedures to detect diseases they probably do not have and may not even have heard of.

Fragmented primary care is a significant frustration to the family physician trying to provide health screening. It comes from two sources: patients with multiple physicians and sporadic categorical screening programs.

Patients with multiple physicians pose the dilemma of who is responsible for screening. If the patient sees a gynecologist for her "annual check-up," presumably the gynecologist does a Pap smear and breast examination. But, does he check her blood pressure, ask about smoking and drinking habits, or suggest that stools be tested for occult blood? In such situations it is difficult to determine who is responsible for screening, with the result that frequently no physician takes this responsibility.

Categorical screening programs, primarily for hypertension, coronary risk factors, or cancer are becoming more common. They are sponsored by the American Heart Association, American Cancer Society, government agencies, industries, and local service organizations. The intent is

	Table 3. Hemoccult Testing for Colon Cancer						
Source	Number of Patients	Compliance (%)	Slides/ Patient	Modified Diet	Positive Slides (%)	Detected Cancers	False Negatives
Winawer[16] 1977	6,597	85	6	Yes	1	7 (.1%)	2 (22%)
Hastings[17] 1974	2,625	80 (76)*	3	Yes	6	5 (.2%)	unknown, one third follow-up
Goodman[18] 1977	2,500 (women)	68	3	Yes	0.23	0	0
Greegor[19] 1971	900	?	6	Yes	5	9 (1%)	0-1
Frame unpublished	479 (968 sets)	56	3-6	No	1.4	0	1

*80 percent of persons who took the slides returned them. Some persons refused to take the slides

good but the result is sporadic care and fragmented care with no one clearly responsible for the patient's welfare. The child who receives periodic care at the well baby clinic and only sees his or her physician for emergencies, the woman who is "ok" because she was checked at the family planning clinic, and the man who is hypertensive but stops his medication because he was told his blood pressure is "ok" at a hypertension clinic are all examples of this problem.

Implementing Screening in Private Practice

I practice in Cohocton, New York, a village of 1,000 population 60 miles south of Rochester. The population is rural and largely lower middle class. The practice is part of a larger group, Tri-County Family Medicine which provides primary care to a large rural area surrounding the village of Dansville (population 6,000) located 15 miles from Cohocton. I am in the Cohocton office six half-days per week and spend three half-days per week in the central Dansville office. A physician's assistant is employed full time in the Cohocton office. For the past three years we have vigorously tried to involve all our current patients in a periodic health screening program. We have not yet tried outreach to inactive patients or the community at large.

When a new patient enters the practice, he/she is encouraged to have a comprehensive examination to establish an individual data base. This data base includes the traditional review of medical systems and past medical history; it also includes questions about the patient's job, family and social situation, and behavioral questions such as use of tobacco and alcohol. A "complete" physician examination is done but is not usually the main focus of the visit. Next, a problem list is formulated and a discussion is held with the patient concerning his/her ongoing medical problems, risk factors which can be modified, and any further tests or treatment which are indicated. During this discussion the patient is given a handout on screening, and the screening program is described including any modifications which may be necessary because of that patient's specific problems or risk factors. The back side of the screening handout has a copy of the screening flow sheet (Figure 1). The complete physical examination usually includes the following laboratory studies: hematocrit, urinalysis, serum cholesterol, serology, and Tine test. Women will have a Pap smear, and if of child bearing age and not immunized, a rubella titer. Chest x-ray, electrocardiogram, and/or chemistry profiles are not done unless indicated by the patient's problems. Asymptomatic patients are told to return for a screening visit every two years until age 50 and every year thereafter.

The specific procedures to be done at each visit are outlined in Figure 1. At each visit the physician

Table 4. Cohocton Adult Screening Audit
(100 charts reviewed for two-year period, June 1976-June 1978)

	Screening Flow Sheet Used (%)	Blood Pressure (%)	Guaiac (Age 50) (%)	Smoking History (%)	Refused or Screened Elsewhere	Pap (%)	CPE (%)	VDRL (%)
Men (39)	66.6	97	65	92	—		77	28
Women (61)	77	100	57	86	3	75	75	44
Total (100)	73	99	61	90	3		76	38

is also alert for signs of life crises and family or behavioral problems. Usually observation of the patient and a few simple questions such as, "How are things?" "What are you doing for fun these days?" or "How are you sleeping?" will enable one to evaluate the patient's well being.

A copy of the screening flow sheet (Figure 1) is on the inside front cover of each patient's chart. As tests are done, the date is placed above the patient's age. A single slash is recorded for normal tests and a double slash or "X" is recorded for conditions which are abnormal. Since this particular flow sheet extends only to age 70 but, except for dropping cholesterol and PPD screening, does not change after age 50, persons over 70 years are put in the slot 20 years younger than their true age. The age listed is crossed out and their true age inserted. Notations can also be made on the flow sheet to indicate special conditions such as a previous hysterectomy. Figure 1 illustrates how the flow sheet would be filled out for a woman born in 1904 who had a previous hysterectomy, is hypertensive, and quit smoking in 1975.

The physician's assistant plays a major role in implementing this screening program, and indeed in the entire practice. Exactly how she functions in our practice has been described in a previous paper.[20] For many patients, especially those who are relatively healthy, the PA provides continuity and is the person in the practice that the patient identifies with. She is capable of doing the data base physical examination, formulating the problem list, and providing continuity of care at subsequent screening visits. Unless complicated problems arise, the physician may be involved only in a supervisory role.

How well have we done? Table 4 shows the results of an audit of randomly selected charts done to see if we were practicing what we

preached. The results are fairly good by real world standards, but not perfect. About 75 percent of regular patients are being screened for most indicated conditions. A few conditions, hypertension and smoking history, are screened more frequently than average, while serologic testing is being done less frequently. This may reflect a semi-conscious ranking in my mind of the value of screening for these conditions. It may also reflect procedural differences in doing the screening.

Suggestions for Implementing Screening

The most important difficulty in instituting a screening program is maintaining physician motivation. The physician must check to see if screening has been done or is needed at practically every patient visit. Several factors can facilitate this task. Obviously, a well-organized record is necessary with some form of flow sheet so the physician can tell at a glance if screening is needed. The screening program should be kept simple, both in terms of periodicity of screening visits and number of conditions screened for. If the screening program requires a complex schedule of visits, neither the patient nor the physician will remember when the patient should return. Having the patient return every two years to age 50 and every year thereafter, is easily remembered even though it may require compromises in the frequency of individual screening tests.

Screening is hard work and requires an ongoing day-to-day commitment. The physician should start screening for those conditions he feels are most important. This might mean initially screening only for hypertension; breast, colon, and cervical cancer; and smoking habits. Other conditions can easily be added to the program later, once the basic program is established and is actually being done on a regular basis. It is preferable to add new

procedures and tests to an established program than to get bogged down in an overly ambitious program and loose interest in preventive care.

Paramedical personnel should be utilized to ease physician time pressures. Nurses and even nonmedical office personnel can learn to do some screening procedures. Physician's assistants can do the entire screening program for certain patient populations. The details of how specific persons are utilized will vary from practice to practice but the physician who does not use paramedical personnel will have difficulty maintaining a screening program along with the demands of acute problems.

A system of checks is needed to be sure that screening is actually being done. In my practice, the physician and PA reject each other's charts if the screening flow sheet is not complete. Since I review and co-sign all the PA charts, I look to see if screening was done; if not, I make a note to that effect and the chart goes back to her desk. After a while, such "harassment" gets to the PA who writes pointed comments on charts of mine and sends them back when screening was not done. Other practices may use different systems. Computers have the capacity to check for physician compliance with screening. Whatever the mechanism, a system of performance checks is needed to prevent motivation from slipping.

The retrospective performance audit as shown in Table 4 is a very useful method of evaluating the screening program. First, it allows a general evaluation of how well screening is being done. Secondly, it allows evaluation of specific areas which differ from the average. In Table 4, for example, VDRLs were done only 38 percent of the time. This could mean I do not really believe it is valuable to screen for syphilis. If so, I should admit it, stop doing VDRLs, and take it off the flow sheet. On the other hand, if I do believe the VDRL is worthwhile, I have identified a problem and should investigate what procedural changes can be made to improve compliance.

Conclusion

A rational selective screening program is feasible and can be implemented in private practice. The most difficult aspect of implementation is maintaining physician motivation. Points to remember when starting a screening program include:

1. Keep it simple
2. Have an organized record system
3. Use paramedical personnel
4. Have a system of checks to ensure compliance
5. Analyze what you are doing by means of a retrospective audit

Many of the specific recommendations for screening are controversial and may change in the future. The hypothesis that selective screening and longitudinal health monitoring are worthwhile is one of the cornerstones of current thinking in family medicine. This hypothesis must be tested by long-term implementation of screening programs by family physicians.

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