

Yield of Routine Annual Laboratory Screening in the Institutionalized Elderly

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Abstract: We examined the yield of a battery of 19 screening laboratory tests performed routinely in 70 functionally intact patients, averaging 82.6 years of age and residing at a chronic care facility. The 70 patients underwent 3,903 screening tests (70 admission batteries and 156 batteries at annual intervals). Twenty per cent of the admission test results and 17 per cent of all subsequent annual test results were "abnormal". "New abnormal" results (previously unknown to the responsible physicians) occurred primarily in five of

the 19 screening tests; they were found in 13 per cent of all admission screening tests and in 6 per cent of all annual tests. However, many of the "new abnormalities" were only minimally outside the normal range, and only 26 (0.7 per cent) led to further diagnostic evaluation. Of these 26, only four (0.1 per cent of all tests ordered) led to changes in patient management, none of which benefited the patient in an important way. (*Am J Public Health* 1985; 75:243-245.)

The elderly (individuals aged 65 years and over) place a disproportionate demand on the limited health care resources of our society. The severity of this problem will accelerate as the number of elderly continues to increase. Although at any one time only 5 per cent of the elderly are institutionalized, 20 per cent of this group will spend some part of their lives in a long-term care facility.

Screening laboratory tests are often employed in monitoring the health status of patients in long-term care facilities. The present study was designed to evaluate the yield of routine annual laboratory screening tests in functionally intact institutionalized elderly patients in one particular long-term care facility. We evaluated the results of a screening battery of 19 standard laboratory tests which were performed routinely at the time of admission, and then annually thereafter, in 70 men and women.

Methods

Setting

The Hebrew Rehabilitation Center for Aged (HRCA) in Boston, Massachusetts is a 725-bed chronic care facility which admits approximately 150 elderly patients annually, all with at least one medical problem. There are no acute admissions, and 25 per cent of patients are admitted as transfers from other long-term care facilities. All HRCA patients are of Jewish cultural heritage. Most of them were born in Eastern Europe and migrated to the United States in the early 1900s.

Subjects

All patients selected for the study were from the "least care" level,* and relatively independent in activities of daily

*Patients at HRCA are divided and housed according to the level of care required.

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Editor's Note: See also related editorial p 227 this issue.

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living; they were the least likely of HRCA patients to have major medical problems requiring frequent use of the same diagnostic tests used for screening. Each patient had to have lived at the HRCA for at least a year; to have had a particular screening battery of laboratory tests (defined later) at the time of admission to HRCA; and to have had at least one annual screening battery performed since admission.

Seventy of the 120 "least care" patients met the above criteria. They ranged in age from 74 to 97 (mean 82.6 years, S.D. = 4.0) years; 53 (76 per cent) were women and 17 (24 per cent) were men. Fifty-one were admitted from their residences in the community, and 19 were transferred from other long-term care facilities. The 70 patients each had an average of 12.8 diagnoses, approximately five of which required ongoing medical management: 65 had cardiovascular disease, 51 had some ophthalmologic disorder, 34 had a psychiatric disorder, 29 had a neurologic disease, eight had dementia, 29 had anemia, and 20 had diabetes mellitus. At the time of final follow-up, four years from the time of the initial chart review, 37 per cent of the study population had died. The age and sex distribution as well as social history of the group that died did not differ from that of the other residents of the institution. The average annual mortality (approximately 11 per cent) of the group was slightly below that for the entire institution (17 per cent).

Although a few of the patients had minor cognitive impairment, all 70 were functionally intact and fully capable of performing the activities of daily living on an independent basis.

The Screening Battery

We reviewed the medical records of all patients over the entire four years of the study, noting the date and result of each screening test. Tests were defined as having been performed for screening purposes if they were obtained at the time of admission, or at annual intervals thereafter, without regard to a patient's clinical condition. The admission and annual screening battery usually consisted of a set of 19 tests: hematocrit; white blood count; urinalysis; stool guaiac; chest x-ray; electrocardiogram; and a battery of serum tests—glucose; uric acid; cholesterol; alkaline phosphatase; serum glutamic oxaloacetic transaminase; blood urea nitrogen; lactic dehydrogenase; total bilirubin; total protein; globulin; albumin; calcium; phosphorus.

In some patients, not all the tests in the usual battery were obtained at the time of routine screening. Sometimes the test was deliberately omitted from the battery because it

had been obtained in the preceding six months for diagnostic purposes. On other occasions, a test was inadvertently omitted, for no reason apparent in the patient's medical record.

Definition of Test Results

"Abnormal" test results were identified as those with values outside the normal range set by the clinical laboratory. No modification in the range of "normality" was made on the basis of age.

A test value outside the normal range was categorized in one of three ways:

A *new abnormality* was one in which there were no previous results for that test (for example, in patients admitted to HRCA without medical records from elsewhere), or one in which previous results for that test were normal, as documented in the HRCA record or medical records from elsewhere.

A *recurrent abnormality* was one in which the medical records revealed both normal and abnormal results for that test in the past.

An *old abnormality* was one in which the previous results were consistently abnormal.

We noted when an abnormal screening test result or a

"further diagnostic test" led to changes in management of the patient's care.

Results

Admission Screening Tests

As summarized in Table 1, 256 of 1,301 (20 per cent) of the results were "abnormal". The rate of abnormality by specific test is reported in Table 2. Virtually all of the "new" abnormalities were so classified because there was no previous record of that test in referral records available to the physician. Two (0.2 per cent) led to changes in patient management. In one patient, a urinalysis revealed asymptomatic bacteriuria, which was monitored with repeated urinalyses and urine cultures in subsequent months; antibacterial therapy was never prescribed. In a second patient, an elevated cholesterol level led to a change in the patient's diet.

Annual Screening Tests

As summarized in Table 1, 447 of 2,602 (17 per cent) of the results were "abnormal". The rate of abnormality by specific test is reported in Table 2. Many of the new abnormal results were only slightly outside the "normal" range, a range which had not been modified on the basis of age. It is possible that some of these results would have been normal if age-adjusted values had been used to define normal levels.

Two (0.1 per cent of all tests) led to changes in patient management. In one patient, a urinalysis revealed a case of asymptomatic bacteriuria which was confirmed by subsequent urine culture and treated with antibacterials. In a second patient, a positive stool guaiac led to radiologic investigation of the gastrointestinal tract, which revealed a previously unsuspected Zenker's diverticulum; the diverticulum was assumed to be the source of the positive stool guaiac; it was not approached surgically, nor was the patient treated for blood loss or anemia.

Discussion

Our results demonstrate that in the very old functionally intact HRCA patient (mean age 82.6 years), admission and subsequent annual screening tests had little yield: of 3,903 tests performed on 70 patients, there were only four instances (occurring in three patients) where a new abnormality was uncovered which led to a change in patient care. Furthermore, in our judgment, none of these changes in patient management could be said to have benefited the patient in an important way.

To the best of our knowledge, there is presently no other reported study of the yield of periodic laboratory screening in elderly institutionalized patients. The only study in the American literature to report the yield of any annual examination in an institutionalized population was mainly concerned with physical examinations and only secondarily with some undefined "appropriate laboratory tests"; that study was conducted in an all male veteran population in which 17 of the 96 patients were under 60 years old.² The authors concluded that in their nursing home setting, annual physical examinations in male veterans may not always make a significant contribution to patient care.

It may be that at other nursing homes the yield of routine annual screening tests would be higher than what we found in the present study. For one thing these patients were under unusual medical scrutiny. The facility where this

TABLE 1—Admission and Annual Repeat Screening Batteries

	Admission Screening Batteries	Annual Repeat Screening Batteries	Total
Number of Screening Batteries	70	156	226
Maximum Number of Tests Possible (#Batteries × 19)	1330	2964	4294
Number of Tests Actually Performed (% of Maximum Number of Tests Possible)	1301 (98)	2602 (88)	3903 (91)
Number of Tests Inadvertently Omitted (%)	29 (2)	196 (7)	225 (5)
Number of Tests Deliberately Omitted	N/A*	166 (6)	N/A*
Number of Abnormal Test Results (As % Of Tests Completed)	256 (20)	447 (17)	703 (18)
Number of New Abnormal Test Results	165 (13)	168 (6)	333 (9)
Number of Patients with At Least One New Abnormal Result	63 (90)	56 (80)	70 (100)
Number of Abnormal Test Results Which Led to Further Testing	14 (1.1)**	12 (0.5)†	26 (0.7)
Number of Patients in Whom Further Testing Ordered	11 (16)	10 (6)	21 (9)
Number of Abnormal Test Results, or Subsequent Diagnostic Tests, Which Led to Changes in Patient Management	2 (0.2)	2 (0.1)	4 (0.1)
Number of Patients with Changes in Management	2 (2.8)	1 (0.6)	3 (1)

NOTE: Percentages shown in parentheses.

*N/A = Not applicable.

**1 chest x-ray, 1 blood urea nitrogen, 2 serum glucose, 1 serum cholesterol, 1 lactic dehydrogenase, 4 urinalyses, 1 alkaline phosphatase, 1 serum glutamic oxaloacetic transaminase, 1 hematocrit, and 1 bilirubin.

†1 electrocardiogram, 3 blood urea nitrogen levels, 3 hematocrits, 1 alkaline phosphatase level, 1 stool guaiac, and 3 urinalyses.

TABLE 2—Frequency of Abnormal Results in Different Tests

Test	At Admission			At Annual Intervals		
	Number Tested	Number Abnormal*	Number New Abnormal	Number Tested	Number Abnormal*	Number New Abnormal
Chest X-ray	69	50	23	62	54	9
Blood urea nitrogen	69	30	21	153	97	23
Electrocardiogram	69	55	19	110	86	11
Serum glucose	68	20	18	151	59	31
Serum cholesterol	70	19	17	154	18	11
Lactic dehydrogenase	70	14	14	153	7	4
Urinalysis	63	9	9	98	5	3
Alkaline phosphatase	70	9	9	154	6	0
Serum glutamic oxaloacetic transaminase	70	9	9	153	17	14
Hematocrit	70	17	8	124	38	18
Uric acid	70	7	6	150	22	14
Stool guaiac	58	3	3	96	9	3
White blood count	70	4	3	124	10	7
Total protein	70	6	2	154	2	2
Bilirubin	69	2	2	154	4	4
Calcium	70	1	1	153	3	3
Phosphate	68	1	1	153	2	1
Albumin	70	0	0	154	6	5
Globulin	68	0	0	154	1	1
TOTAL	1301	256	165	2602	447	168

*Detailed reports of the specific levels of "abnormality" can be obtained from the authors.

study was conducted is academically oriented, sponsors an active geriatric fellowship program, and is closely affiliated with an acute care university teaching hospital. Physician coverage is like that of an acute care hospital: the primary care physician makes rounds five days a week on his/her units, and is readily available to examine, evaluate, and treat any illness as needed. Subspecialty consultations are also easily accessible. It is possible, therefore, that in the nursing homes which have less physician presence, routing screening would result in the discovery of a greater number of previously undiagnosed abnormalities than were found in our study.

In addition, this group of institutionalized patients, who could ambulate independently and who could communicate well with care providers, are representative of only a minority of patients in extended care facilities. It is possible that the yield of annual screening would be higher in less independent and communicative patients.

We cannot estimate how much money might be saved by eliminating screening batteries in such patients. For one thing, it is not known how often such screening is performed in patients such as ours in other long-term care facilities throughout the nation. For another thing, a reduction in laboratory test volume and charges does not equate with a

reduction in the real costs of performing these tests, given a laboratory's fixed costs.

We can estimate an upper bound on the potential savings, however. If all the 1.1 million residents of long-term care facilities in the United States³ were to be screened with the same frequency and test batteries as were the patients we studied, the annual charges would be approximately \$200–300 million. This suggests that it would be valuable to scrutinize the yield of screening batteries performed at the time of admission and regularly thereafter in other populations of patients living in long-term care facilities.

REFERENCES

1. Soldo BJ: America's elderly in the 1980s. *Population Bulletin* 1980; 35:18.
2. Gambert SR, Duthie EH, Wiltzius F: The value of the yearly medical evaluation in a nursing home. *J Chron Dis* 1982; 35:65–68.
3. Rabin DL: Physician care in nursing homes. *Ann Intern Med* 1981; 94:126–128.

ACKNOWLEDGMENTS

We wish to thank Richard Besdine, MD, Marie Feltin, MD, Edvardas Kaminskas, MD, Arthur Linenthal, MD, and John Rowe, MD, for their support and advice. This research supported in part by grants (HS 02063 and HS 04066) from the National Center for Health Services Research.

ERRATUM: Notes from the Field

We apologize for the error in the Table of Contents of the January issue of this Journal which incorrectly identified the two studies appearing in the *Notes from the Field* Section. We managed to get it right this month.