The Declining Number and Variety of Procedures Done by General Internists: A Resurvey of Members of the American College of Physicians

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Background: A survey of general internist members of the American College of Physicians (ACP) in 1986 found that they did a large number and variety of procedures in their practices. Since then, changes in the practice of medicine, regulatory requirements, and availability of subspecialists may have affected the number and type of procedures done by internists.

Objective: To determine the number and types of procedures currently done by general internist members of the ACP compared with 1986.

Design: Mailed questionnaire.

Setting: National probability sample of general internists.

Participants: Respondents to a national survey of 2500 general internist members of the ACP who were similar in characteristics to those who participated in the 1986 survey. Of the 1389 questionnaires that were returned, 990 were from general internists who had completed the survey.

Measurements: Responses to questions about procedures done and practice characteristics.

Results: The number and variety of procedures done by general internists has decreased dramatically. On average, the percentage of general internists doing each procedure now is less than half of that in 1986. The average number of different procedures done in practice decreased from 16 in 1986 to 7 in 2004. As in the 1986 survey, the number of procedures related strongly to personal and practice characteristics. Internists who practice in smaller towns and smaller hospitals do twice as many procedures on average as those in larger cities and larger hospitals. The number and variety of procedures done by internists also increased with greater time spent in total patient care.

Limitations: The number and type of procedures were determined by self-reporting, not direct observation.

Conclusions: Both the number and variety of procedures done by general internists have decreased considerably since 1986. As in the 1986 survey, general internists who practice in smaller cities and smaller hospitals and those who spend more hours in patient care perform more procedures. Recommendations and practices for internal medicine residency training in procedures should be reexamined in light of these changes.

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Knowing which procedural skills general internists use in practice is important. Residency training programs need to know which procedures residents should master to prepare them for practice, and credentialing bodies need to know what procedures an internist is likely to do. The skill with which internists do procedures can affect patient safety and the accuracy of the diagnostic information obtained.

A survey of members of the American College of Physicians (ACP) in 1986 found that general internists did a large number and variety of procedures (1). On average, respondents did 16 different procedures in their practice. Those who practiced in smaller cities and smaller hospitals did more procedures than those in larger cities and larger hospitals. More recent graduates and those who spent more time in patient care also did more procedures.

Since 1986, however, the practice of general internal medicine has changed. Patients have greater access to subspecialists and to procedure-oriented services, such as interventional radiology. The practice of general internal medicine has come to be associated with primary care on the one hand and with the hospitalist movement on the other (2). New regulatory controls, such as the Clinical Laboratory Improvement Amendments of 1988, affect procedures, and credentialing standards are stricter (3). How physicians are paid for procedures has become more complex. Finally, technological change has made some procedures unnecessary and changed the way in which others are done.

We repeated the 1986 survey of ACP members to answer the following questions. Do general internists continue to perform as great a variety of procedures? Do they do as many procedures as they did in 1986? Do they do the same procedures? Do the number and variety of procedures relate to their practice characteristics in the same way?

Methods

Survey Design

In 2000, we began to resurvey the ACP membership by using the 1986 questionnaire, but we received responses

See also:

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Editorial comment. 392

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Table 1. **Characteristics of Respondents to the 1986 and 2004 Surveys**

Characteristic	Respondents to the 1986 Survey		Respondents to the 2004 Survey	
	Median (25th, 75th Percentile)	Mean (95% CI)	Median (25th, 75th Percentile)	Mean (95% CI)
Year of graduation from medical school	1971 (1955, 1977)	1966 (1965.2–1966.8)	1984 (1977, 1990)	1983 (1983.4–1984.6)
Number of different procedures done in practice	16 (10, 22)	15.9 (15.5–16.5)	7 (4, 11)	8.5 (8.1–8.9)
Number of different procedures done at least once in the past year	12 (7, 17)	12.5 (11.6–12.4)	5 (2, 10)	6.5 (6.1–6.9)
Hours per week spent in patient care	50 (40, 60)	51.6 (50.7–52.5)	50 (36, 60)	47.2 (46.1–48.3)
Hours per week spent in patient care in the hospital	Not asked		8 (2, 15)	11.7 (10.8–12.6)

from only 19% on the first mailing (compared with a final return rate of 72% in 1986). We concluded that the questionnaire should be abridged and simplified. We omitted questions on the number needed to gain competence and to maintain competence for each procedure, questions on which procedures required credentialing, and some questions about practice characteristics. We retained general questions about respondents' practices and the 2 central questions about each procedure: "Do you perform this procedure in your practice?" and "If yes, how many did you do in the last year?" These changes resulted in a 1-page survey, with much higher returns on test mailings.

Six of the 40 original procedures were replaced to reflect recent practice changes. The procedures in the 1986 survey had been selected from review of the literature, hospital credentialing lists, consultation with physicians, and review of billing records. Because of increased emphasis on outpatient care and after discussion with individual physicians and focus groups, we added 6 procedures to the new survey: soft-tissue injection, shave skin biopsy, cerumen removal, colposcopy, endometrial biopsy, and diaphragm fitting. We omitted 6 infrequently done procedures from the 1986 survey: flexible sigmoidoscopy with biopsy, percutaneous liver biopsy, repair of lacerations, thoracentesis with pleural biopsy, and tonometry. We omitted pelvic examination with Papanicolaou smear because nearly all respondents to the 1986 survey performed this procedure.

Survey Participants

We used a sample designed to replicate that of the original survey. We obtained from the ACP Office of Research, Planning and Evaluation a probability sample of 2500 members who are representative of the entire membership by region of the United States and year of graduation from medical school. We mailed the survey in the summer of 2004.

Statistical Analysis

We used the statistical programs of SAS software (SAS Institute, Inc., Cary, North Carolina) to analyze the responses. To compare the results of the current survey with those of the 1986 survey, we combined the 2 data sets to perform statistical analyses. We used the Fisher exact *t*-test and the chi-square statistic to analyze comparisons involving proportions and used the Mantel–Haenszel chi-square test to analyze trends. Because of the number of comparisons, we have used a stricter standard of significance, based on the Bonferroni correction (4). When year of graduation was divided into 2 groups, we chose the cut-point such that the older group of the new survey had the same range of year of medical school graduation as did the younger group of the previous survey. When the results appeared to be normally distributed, we used analysis of variance to analyze continuous data. Otherwise, we used the Kruskal–Wallis analysis of variance by ranks and the median test (5). This study was approved by the institutional review board of the University of Nebraska Medical Center (322-00-EX).

Role of the Funding Source

This study used no external funding.

Results

Of the 2500 questionnaires mailed, 2476 had valid addresses and 1389 (56%) were returned. Of the 1389 returned surveys, we excluded 96 because the physician had retired from active practice ($n = 56$) or had not completed the survey ($n = 40$). Of the 1293 remaining questionnaires, 303 reported that the physician's practice was in a subspecialty of medicine ($n = 234$) or "other" ($n = 69$). The remaining 990 responses were analyzed. Thus, at least 372 of 1389 respondents classified as general internists in the ACP database did not consider themselves to be practicing general internal medicine. This proportion is similar to that found on the 1986 survey. The mean age did not significantly differ between respondents and nonrespondents (46.9 years [95% CI, 46.4 to 47.4 years] vs 46.2 years [CI, 45.7 to 46.6 years], respectively). Respondents and nonrespondents did not differ in terms of sex (74% of each group were men).

Table 1 shows the characteristics of physicians who responded to the 2004 and 1986 surveys. The median number of different procedures done in practice decreased nearly by half between the 2 surveys, from 16 procedures to 7 (**Table 1**). The number of procedures done in the past year decreased similarly from a median of 12 procedures in

1986 to 5 in 2004. Both surveys reported a median of 50 hours spent in patient care, but the mean of the 2004 survey was 4.4 hours lower. When data were analyzed by the 4 ranges of hours spent in patient care, the percentage of respondents who reported fewer than 45 hours in patient care was greater in the 2004 survey (42%) than in the 1986 survey (28%).

The number of different procedures done was strongly related to physicians' practice characteristics (**Table 2**). Internists who practiced in smaller towns and smaller hospitals did nearly twice as many different procedures as those in the largest cities and largest hospitals. Similarly, hours per week spent in patient care and the hours spent in care of patients in hospitals related directly to the number of procedures done. The finding that a greater variety of procedures was done by internists in smaller cities and smaller hospitals paralleled the results of the 1986 survey. **Table 3** shows the number and percentage of general internists who do a particular procedure in practice and the number who said that they did that procedure in the previous year for the 1986 and 2004 surveys. For some procedures, internists who perform it do so frequently (for example, treadmill exercise testing) but other procedures are done only a few times each year or not at all (for example, bone marrow aspiration or liver biopsy). Several endoscopic procedures and allergy skin testing are done by a small proportion of internists (≤3%), but those who perform these procedures do so often.

The number of internists doing each procedure has also decreased (**Table 3**). For all but 1 of the 34 procedures common to both surveys, fewer internists do them now than in 1986. For 22 of the 34 procedures in common (65%), the proportion of respondents who do each procedure has decreased by 50% or more. Wet mount of vaginal secretions, for example, which was previously done by 68% of internists, is now done by 30%; lumbar puncture, previously done by 73%, is now done by 26% (a 64% reduction); and thoracentesis, previously done by 66%, is now done by 23% (a 65% reduction). Two procedures, both of which are office dermatologic procedures, are done by a larger percentage of internists in the 2004 survey: elective cryosurgical removal of skin lesions (up from 24% in 1986 to 34%) and punch skin biopsy (up from 22% to 28%).

The percentage of internists who do most procedures has decreased, but those who do a particular procedure do it about as often as in 1986. Comparing the 2 surveys, the number of respondents who said they did each procedure in the past year increased for 7 procedures and decreased for 9. The frequency of the remaining procedures did not change appreciably (**Table 3**).

Procedures Required by the American Board of Internal Medicine

Six of the procedures in the survey are among those required by the American Board of Internal Medicine for certification (6): lumbar puncture, thoracentesis, central venous catheter placement, arterial puncture for blood gases, abdominal paracentesis, and joint aspiration (**Table**

Table 2. **Relationship between Procedures Done in Internists' Practices and Demographic and Practice Characteristics**

Demographic or Practice Characteristics	Different Kinds of Procedures Done in Practice		Mean Number of Different Kinds of Procedures Done in the Previous Year
	Number	Mean	
City size			
Large city (≥25 000 persons)	796	7.5*	5.7*
Smaller city (<25 000 persons)	120	11.4	8.9
Rural (<10 000 persons)	66	15.0	11.5
Hospital size			
<100 beds	130	13.0*	10.5*
100–250 beds	324	8.6	6.5
250–500 beds	292	7.7	5.4
>500 beds	175	7.2	5.7
No hospital practice	63	5.7	4.3
Hours per week in patient care			
<45	417	6.9*	5.1*
45–54	218	8.7	6.7
55–65	220	9.5	7.2
>65	135	11.5	8.1
Hours per week in hospital patient care			
<3	298	6.5*	4.9*
3–7	176	7.5	5.7
8–15	307	9.4	7.2
>15	209	10.9	8.1

* $P < 0.001$ for the differences in the number of procedures done by practice characteristic (Kruskal–Wallis analysis of variance by ranks).

Table 3. **Percentage of General Internists Who Do Each Procedure in Their Practice and the Number of Procedures Done in the Past Year: Comparison of the 1986 and 2004 Surveys**

Procedure	Respondents to the 1986 Survey		Respondents to the 2004 Survey	
	Percentage Who Do the Procedure in Practice	Median Number of Times That Procedure Was Done in the Past Year	Percentage Who Do the Procedure in Practice	Median Number of Times That Procedure Was Done in the Past Year
Electrocardiogram interpretation	98	300	93*	200*
Cerumen removal	Not asked		73	30
Joint aspiration and injection†	72	12	54*	20*
Interpretation of chest radiography	76	100	50*	90*
Soft-tissue injection	Not asked		47	20
Spirometry interpretation	62	30	46*	30
Elective cryosurgical removal of skin lesions	24	20	34*	50*
Holter monitor interpretation	53	30	33*	20
Wet mount of vaginal secretions	68	30	30*	20*
Treadmill exercise test	45	50	29*	50
Microscopic examination of urine	70	60	28*	100
Skin biopsy, punch	22	3	28*	13*
Abdominal paracentesis†	60	1	26*	2*
Lumbar puncture†	73	5	26*	3
Management of mechanical ventilation	59	10	26*	10
Thoracentesis†	66	3	23*	3
Skin biopsy, shave	Not asked		23	10
Flexible sigmoidoscopy	42	30	20*	11*
Arterial puncture for blood gas analysis†	52	10	17*	5
Control of nasal bleeding	32	2	17*	5*
Central venous catheter placement†	39	5	16*	5
Endotracheal tube placement	41	3	15*	3
Interpretation of peripheral blood smear	41	10	8*	10
Elective cardioversion	38	2	8*	2
Bone marrow aspiration	37	4	8*	2
Arterial cannula	27	2	8*	2
Swan–Ganz catheter placement	22	3	7*	1*
Gram stain of sputum	50	10	5*	5
Aspiration of breast mass	10	2	6*	4
Rigid proctosigmoidoscopy	74	20	5*	2*
Temporary venous pacemaker placement	20	2	5*	1
Diaphragm fitting	Not asked		5	2
Esophagogastroduodenoscopy	7	0	3*	50*
Indirect laryngoscopy	23	5	2*	5
Percutaneous liver biopsy	17	1	2*	2
Colonoscopy	3	0	2*	87*
Endometrial biopsy	Not asked		2	5
Allergy skin testing	5	0	1*	16
Peritoneal dialysis	9	0	1*	3
Colposcopy	Not asked		0	2

* $P < 0.001$ compared with 1986 responses.
† This procedure is required by the American Board of Internal Medicine.

3). In the 1986 survey, all but 1 of these procedures were done by most internists. In the 2004 survey, however, only 1 was done by a majority of internists. Except for joint aspiration, the required procedures now were done by one fourth or fewer of the 2004 respondents.

Effect of City Size

For all but 4 procedures, the smaller the community, the greater the proportion of internists who did the procedure. Abdominal paracentesis, for example, was done by only 23% of internists in larger cities, 37% of those in small cities, and 50% of those in rural communities ($P <$ 0.001). For 18 of the 40 procedures, the percentage of internists who do the procedure differed by 20% or more between largest and smallest communities. The direction and size of this effect parallel the findings of the 1986 study.

Effect of Hospital Size

For 26 of the 40 procedures, the smaller the hospital, the greater the proportion of internists who perform each procedure. Lumbar puncture, for example, was done by 47% of internists in the smallest hospitals and by 24% in the largest. This effect was not seen for some office-based

procedures, such as microscopic examination of urine or wet mount of vaginal discharge. This effect was also similar in size and direction to that seen in the 1986 survey.

Effect of Total Hours Spent in Patient Care and Hours Spent in Hospital Care Alone

Both the total hours spent in patient care and the hours spent in hospital care related to the percentage of internists who did each procedure. Using the same ranges as in the 1986 survey, we found that for 31 of the 40 procedures, the more hours internists spent in patient care, the larger the percentage who did each procedure. Thoracentesis, for example, was done by 13% of those who worked fewer than 45 hours per week and 44% of those who worked more than 64 hours per week ($P < 0.001$). The effect of total hours was similar to that found in the 1986 survey (the number of hospital care hours was not asked in the 1986 survey). With regard to hours spent in hospital care, the effect was strong for hospital-based procedures, such as management of mechanical ventilators, central venous catheter placement, and thoracentesis ($P < 0.001$). The direction was reversed for some outpatient procedures, such as wet mount of vaginal secretions and cerumen removal.

DISCUSSION

To determine whether changes in the practice of general internal medicine affected the procedures that internists perform, we repeated a national survey of ACP members done 18 years ago. We sent an abridged version of the same survey to a national sample of generalist ACP members. The results showed a striking decrease in the percentage of internists who do most procedures and a reduction of nearly 50% in the number of different procedures they do.

As in the 1986 survey, the number of procedures done related strongly to personal and practice characteristics. Internists who practice in smaller hospitals and smaller cities did twice as many procedures on average as those in larger hospitals and larger cities. Also, those who spent more time in total patient care and in-hospital patient care did more procedures. Possible explanations for the decrease in procedures include changes in the practice of general internal medicine; increases in regulatory oversight of procedures; diagnostic and therapeutic advances; and the greater availability of subspecialists and procedure-oriented services, such as open-access colonoscopy and interventional radiology.

The practice of general internal medicine has changed considerably in the 18 years between the 2 surveys. The consultative–inpatient model has given way to a primary care outpatient model in many instances, particularly in larger cities (7). The emergence of the hospitalist is producing 2 very different practice models for internists (2). Increased regulatory oversight of outpatient procedures came with the passage of the Clinical Laboratory Improvement Amendments in 1988. Although many of the procedures that are now done less often require little effort to comply with the Clinical Laboratory Improvement Amendments (for example, microscopic analysis of urine and vaginal fluid when done by the physician), the regulations are not well-known to individual practitioners and may inhibit setting up office procedures (3). In addition, hospital credentialing has become stricter. Hospital staffs are looking more closely at experience and training and are less likely to grant privileges in a blanket manner on the basis of specialty.

Subspecialists and procedure-oriented services have become more widely available, more so in larger cities and larger hospitals. Such procedures as elective cardioversion, which was done by 38% of internists in 1986 but only 8% in 2004, are now done routinely by subspecialists in all but the smallest communities. Arterial puncture for arterial blood gases, previously done in part by physicians, is now routinely done by technicians. Arterial cannulation, right-atrial catheter placement, and endotracheal intubation are done by fewer general internists as intensive care units become the domain of intensivists. The decrease in thoracentesis (from 66% to 23% of general internists), for example, could relate to multiple factors: the increasing use of ultrasonography, availability of interventional radiologists, and increasing time pressures in inpatient services. Gram stain of sputum, which decreased from 50% of internists to 5%, could have been affected by Clinical Laboratory Improvement Amendments protocols and changes in the standards of practice.

The movement to primary care medicine may have affected the frequency of outpatient procedures. Performance of some procedures has increased—for example, cryosurgical removal of skin lesions (24% to 34%) and punch skin biopsy (22% to 28%)—but performance of others has not (for example, joint aspiration and microscopic examination of urine and vaginal fluid). Some primary care procedures not included in the 1986 survey (cerumen removal [done by 73% of internists] and soft-tissue injection [done by 50%]) were among the 5 most commonly done procedures in 2004; however, other primary care procedures added for this survey (colposcopy and diaphragm fitting) were done by fewer than 2% of internists.

These results are important in planning procedural skills training in the general internal medicine residency. There may no longer be a core of procedures that all residents should learn. Only 3 of the 40 procedures on the survey were done by most general internist members of the ACP. Even in rural towns, only 8 of the procedures were done by the majority of internists. Furthermore, the decrease in procedures done by general internists may reduce the opportunities available for residents to learn procedures. An additional consideration is that most residents now in training will go on to a subspecialty and may not use many of these procedures in their practice.

When procedures are no longer done by most internists, should they continue to be required or become optional, separately certified parts of training? Teaching procedures to all residents could result in dilution of the limited number of procedures available for training, increased reliance on simulations, and perhaps a shift to lower standards for mastery. Teaching only to selected residents, however, means that residents who change practice type or practice site later and decide to do new procedures will need to find training in the community or learn informally on their own.

As with any questionnaire survey, the results must be interpreted with caution because they are based on self-reporting and not direct observation. All reports of procedure numbers are estimates by the respondents. Also, the responses of ACP members might differ from those of other general internists. The purpose of this survey, however, was to compare the results to a previous study of ACP members, and we have done our best to make the selection process identical to that used for the 1986 survey.

In conclusion, since 1986, both the variety of procedures done and the percentage of general internists who do those procedures have decreased dramatically. Internists in smaller cities, those at smaller hospitals, and those who spend more hours in patient care perform a greater number and variety of procedures. The residency curriculum for internal medicine should be reexamined in light of these changes.

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