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RETENTION OF NAVY PHYSICIANS, FY 1984-1988

Amy E. Graham
Laurie J. May

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UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED					1b. RESTRICTIVE MARKINGS				
2a. SECURITY CLASSIFICATION AUTHORITY					3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for Public Release; Distribution unlimited.				
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE									
4. PERFORMING ORGANIZATION REPORT NUMBER(S) CRM 89-33					5. MONITORING ORGANIZATION REPORT NUMBER(S)				
6a. NAME OF PERFORMING ORGANIZATION Center for Naval Analyses			6b. OFFICE SYMBOL (If applicable) CNA		7a. NAME OF MONITORING ORGANIZATION				
6c. ADDRESS (City, State, and ZIP Code) 4401 Ford Avenue Alexandria, Virginia 22302-0268					7b. ADDRESS (City, State, and ZIP Code)				
8a. NAME OF FUNDING ORGANIZATION Office of Naval Research			8b. OFFICE SYMBOL (If applicable) ONR		9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N00014-87-C-0001				
8c. ADDRESS (City, State, and ZIP Code) 800 North Quincy Street Arlington, Virginia 22217					10. SOURCE OF FUNDING NUMBERS				
					PROGRAM ELEMENT NO. 65154N	PROJECT NO. R0148	TASK NO.	WORK UNIT ACCESSION NO.	
11. TITLE (Include Security Classification) Retention of Navy Physicians, FY 1984-1988									
12. PERSONAL AUTHOR(S) Amy E. Graham, Laurie J. May									
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM TO			14. DATE OF REPORT (Year, Month, Day) June 1989			15. PAGE COUNT 44	
16. SUPPLEMENTARY NOTATION									
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)						
FIELD	GROUP	SUB-GROUP	Active duty, Attrition, Billets (personnel), Manpower, Medical personnel, Naval personnel, Naval training, Officer personnel, Personnel retention, Physicians, Shortages, Specialists, Statistical analysis						
05	09								
19. ABSTRACT (Continue on reverse if necessary and identify by block number) One possible contributor to Navy Medicine's current manpower problem is the low retention rates of physicians. This research memorandum examines the retention of Navy physicians between FY 1984 and FY 1988 in the aggregate, by career phase, and by specialty.									
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED / UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS					21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED				
22a. NAME OF RESPONSIBLE INDIVIDUAL					22b. TELEPHONE (Include Area Code)			22c. OFFICE SYMBOL	

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30 June 1989

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Subj: Center for Naval Analyses Research Memorandum 89-33

Encl: (1) CNA Research Memorandum 89-33, *Retention of Navy Physicians, FY 1984-1988*, by Amy E. Graham and Laurie J. May, Jun 1989

1. Enclosure (1) is forwarded as a matter of possible interest.
2. One possible contributor to Navy Medicine's current manpower problem is the low retention rates of physicians. This research memorandum examines the retention of Navy physicians between FY 1984 and FY 1988 in the aggregate, by career phase, and by specialty.

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RETENTION OF NAVY PHYSICIANS, FY 1984-1988

Amy E. Graham
Laurie J. May

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ABSTRACT

One possible contributor to Navy Medicine's current manpower problem is the low retention rates of physicians. This research memorandum examines the retention of Navy physicians between FY 1984 and FY 1988 in the aggregate, by career phase, and by specialty.



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EXECUTIVE SUMMARY

One possible contributor to Navy Medicine's current manpower problem is the low retention rate of Navy physicians. Previous analysis using data from FY 1983 to FY 1987 revealed that Navy medicine had a growing retention problem among physicians completing their initial obligation, among certain specialties, and among experienced personnel in specific specialties. This research memorandum updates the analysis of physician retention with FY 1988 Bureau of Medicine Information System (BUMIS) data.

The lack of DOD-wide agreement on medical corps requirements makes it difficult to evaluate the adequacy of medical corps retention rates. This analysis compares FY 1988 retention rates with the rates needed to meet authorization levels and contrasts the current retention rates with historical rates to determine whether retention has declined.

AGGREGATE CONTINUATION AND RETENTION RATES

The yearly aggregate continuation rate for the medical corps has been nearly constant at around 88 percent since FY 1984, as shown in table I. The yearly aggregate continuation rate measures the percentage of medical officers (both obligated and unobligated) on active duty at the beginning of the fiscal year who were still on active duty at the end of the fiscal year.

Table I. Medical corps continuation and retention rates, FY 1984-1988 (population size in parentheses)

Fiscal year	Continuation rate (obligated and unobligated)	Retention rate (unobligated)
1984	88 (3,847)	76 (1,500)
1985	89 (3,930)	76 (1,573)
1986	89 (3,954)	76 (1,583)
1987	88 (3,947)	74 (1,569)
1988	88 (3,896)	72 (1,463)

Unlike continuation rates, retention rates discern between voluntary and involuntary continuation. The retention rates in table I give the percentage of unobligated physicians who remain on active duty. As table I shows, continuation rates have remained basically constant since FY 1984, but retention rates have declined from 76 to 72 percent in the last two years. This change in the retention rates is not reflected in the aggregate continuation rates primarily because of the decline in the size of the unobligated pool.

END OF INITIAL OBLIGATION

In general terms, the end of initial obligation marks a physician's first opportunity to leave the Navy. Retention behavior at the end of initial obligation separates physicians who remain in the Navy to fulfill an obligation from physicians who remain in the Navy based on the relative benefits of a military medical career. For a general medical officer (GMO), a physician who has not undertaken residency training, the initial obligation is the obligation incurred through the accession program. For a specialist, the initial obligation is the obligation incurred through the accession program and any participation in Navy residency training programs.

Earlier analysis of retention at the end of initial obligation revealed a marked drop in the retention rate between FY 1986 and FY 1987. Table II shows that retention in FY 1988 declined further from the FY 1987 levels for both specialists and GMOs. Over two-thirds of the medical corps officers who reached the end of initial obligation in FY 1988 left the Navy.

Table II. Medical corps retention rates at the end of fiscal year in which physicians reach the end of initial obligation (population size in parentheses)

Status	FY 1984	FY 1985	FY 1986	FY 1987	FY 1988
Fully trained specialists	47 (168)	45 (257)	44 (264)	34 (238)	33 (261)
GMOs	56 (41)	51 (117)	38 (81)	33 (98)	31 (146)
Other ^a	29 (7)	58 (26)	63 (16)	27 (15)	88 (8)
All	48 (216)	48 (400)	43 (361)	33 (351)	33 (415)

a. Defined as individuals who have at least started residency training but are currently coded as GMOs. This category includes GMOs who started residency training but failed to complete the program, fully trained individuals who have lost their specialty privileges, and individuals who completed specialty training but whose records were not updated to reflect the change.

Profiling the retention behavior of fully trained specialists for up to five years after completion of initial obligation reveals that the major loss of personnel comes within two years of completion of the initial obligation. Table III gives the cumulative retention rates for

fully trained specialists, which measure the retention status of the starting cohort at the end of each year after completion of the initial obligation. Both the first- and second-year cumulative retention rates have declined dramatically since FY 1986. Only 17 percent of the FY 1987 cohort were still on active duty at the end of FY 1988. In contrast, it was not until five years after completing their initial obligation that the FY 1984 cohort had fallen to 17 percent of its original size. The dramatic decline in retention at the end of initial obligation is expected to significantly affect the future pool of experienced physicians. If the FY 1987 cohort experiences the same retention rates that the FY 1984 cohort experienced in the third through fifth years, only 10 percent of the FY 1987 cohort will be retained five years after completion of the initial obligation.

Table III. Cumulative retention rates for fully trained specialists after completion of initial obligation

Cohort	Cohort size	Cumulative retention rate as of the end of fiscal year				
		1984	1985	1986	1987	1988
1984	168	47	34	27	21	19
1985	257		45	27	21	19
1986	264			44	32	25
1987	238				34	17
1988	261					33

SPECIALTY CONTINUATION AND RETENTION RATES

Comparison of historical continuation and retention rates with the corresponding rates from FY 1988 reveals that in 15 of the 23 specialties examined, the retention rate for unobligated specialists fell below the historical average for FY 1984 through FY 1987. The largest percentage point declines from historical retention rates occurred in thoracic surgery, plastic surgery, urology, and cardiology. The overall retention rate of fully trained specialists was 70 percent, which is below the historical average rate of 74 percent.

SPECIALTY CONTINUATION RATES AND AUTHORIZATION

Relative to authorization, many specialties have an acute manpower shortage. Although in practice, authorized billets do not reflect medical corps requirements, which are in dispute, they are the billets funded by Congress and generally reflect current inventory levels and short-term manpower goals.

Overall, fully trained specialty billets were manned as of the end of FY 1988 at 95 percent of authorization. Sixteen of the 23 specialties examined were manned below authorization. Furthermore, 13 of these specialties were manned at less than 90 percent of authorization. To illuminate the severity of the shortage, the specialty continuation rates needed to achieve authorized strength in FY 1991, which would allow three years to alleviate shortages, are given in table IV. The rates in table IV are calculated by assuming that the number of future gains mirrors recent historical experience.

Table IV. Continuation rates needed to fulfill FY 1991 authorized strength

Specialty	Average historical rate	Rate needed to meet authorization by the end of FY 1991	Maintenance rate
Aerospace	90	100	86
Anesthesiology	76	85	79
Dermatology	77	75	78
Emergency	89	95	84
Family practice	80	82	79
General surgery	80	89	80
Internal-general	76	69	76
Internal-cardiology	77	83	79
Internal-other	79	67	73
Neurology	78	81	83
Neurosurgery	84	78	73
OB/GYN	74	85	81
Ophthalmology	76	71	73
Orthopedics	78	84	78
Otolaryngology	76	85	80
Pathology	82	89	86
Pediatrics	84	76	81
Plastic surgery	80	81	88
Preventive	86	80	77
Psychiatry	85	89	83
Radiology	73	88	82
Thoracic surgery	74	-- ^a	--
Urology	73	78	77
Other	89	73	92

a. Authorized levels could not be met even with 100-percent retention.

Table IV contrasts the actual average continuation rates during the past two years for specialists (including those in executive medicine) who maintain their fully trained status with the continuation rate that is needed during the next three years to achieve FY 1991 authorized levels by the end of that year. The maintenance rate is the continuation rate needed to maintain authorized levels once they are achieved, given the assumptions regarding future gains.

Of the 23 specialties analyzed, only seven currently have yearly continuation rates that are high enough to meet authorization in FY 1991 under the assumptions regarding future gains. Furthermore, 11 specialties would need yearly continuation rates at least five percentage points higher than the recent historical rates to meet authorized levels in FY 1991. Authorized levels could not be met for thoracic surgery even if the continuation rate were 100 percent during the next three years.

CONCLUSIONS

The FY 1988 retention rate at the end of initial obligation remains far below historical averages. More than two-thirds of physicians reaching the end of an initial obligation in FY 1988 decided against pursuing a military medical career. Although only a small fraction of all active-duty physicians reach the end of initial obligation in a given year, continuation of these low retention rates may significantly degrade the experience profile of the medical corps. In addition, several specialties have experienced a decline in retention rates relative to their average historical rates. Most specialties are currently manned below authorized levels, and retention rates are currently too low to meet authorized strength in the near future.

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INTRODUCTION

One possible contributor to Navy Medicine's current manpower problem is the low retention rate of Navy physicians. Previous analysis using data from FY 1983 to FY 1987 revealed that Navy medicine had a growing retention problem among those completing their initial obligation, among certain specialties, and among experienced personnel in specific specialties (see [1]). This research memorandum updates the analysis of physician retention with FY 1988 data.

The lack of DOD-wide agreement on medical corps requirements makes it difficult to evaluate the adequacy of medical corps retention rates. This analysis compares FY 1988 retention rates with the rates needed to meet authorization levels and contrasts the current retention rates with historical rates to determine whether retention has declined.

DATA

The analysis of medical corps retention uses the Bureau of Medicine Information System (BUMIS) from FY 1983 to FY 1988. The Officer Master File (OMF) from FY 1974 to FY 1988 was also examined as a possible data source. BUMIS was chosen as the main analytical data base because it contains more detailed information and fewer missing fields than the OMF does for physicians. All of the retention measures are calculated for the actual population of physicians onboard during the specified time period.

AGGREGATE CONTINUATION AND RETENTION RATES

The yearly aggregate continuation rate for the medical corps has been nearly constant since FY 1984. The yearly aggregate continuation rate measures the percentage of medical officers (both obligated and unobligated) on active duty at the beginning of the fiscal year who were still on active duty at the end of the year. For example, the aggregate continuation rate for FY 1988 (C_{88}) is measured as follows:

$$C_{88} = \frac{\text{number on active duty at the beginning of FY 1988 who remained on active duty as of the end of FY 1988}}{\text{number on active duty at the beginning of FY 1988}}$$

The aggregate continuation rate has hovered around 88 percent during the last five years, as shown in table 1.

Table 1. Medical corps continuation and retention rates, FY 1984-1988 (population size in parentheses)

Fiscal year	Continuation rate (obligated and unobligated)	Retention rate (unobligated)
1984	88 (3,847)	76 (1,500)
1985	89 (3,930)	76 (1,573)
1986	89 (3,954)	76 (1,583)
1987	88 (3,947)	74 (1,569)
1988	88 (3,896)	72 (1,463)

Unlike continuation rates, retention rates discern between voluntary and involuntary continuation by focusing on unobligated physicians. (Although only unobligated physicians can choose to leave, each year typically 50 to 60 physicians leave the Navy while still under obligation. The loss of apparently obligated physicians may be due to erroneous obligation data, or the losses may be involuntary.) Based on their participation in the accession and training programs, most Navy physicians incur long obligations that can take up to seven or more years of active-duty service to work off. The retention rates in table 1 show the percentage of unobligated physicians who remain on active duty. For example, for FY 1988, the retention rate (R_{88}) is calculated as follows:

$$R_{88} = \frac{\text{number on active duty at the beginning of FY 1988 who are unobligated or are due off an obligation during FY 1988 who remained on active duty as of the end of FY 1988}}{\text{number on active duty at the beginning of FY 1988 who are unobligated or are due off an obligation during FY 1988}}$$

As table 1 shows, continuation rates have remained basically constant since FY 1984, whereas retention rates have declined from 76 to 72 percent in the last two years. This change in retention rates is not reflected in the aggregate continuation rates primarily because of the decline in the number of unobligated physicians. In general, any change in the retention rate of the unobligated will have a muted effect on the aggregate continuation rate due to the relatively small number of unobligated personnel. Over the last two years, the size of the unobligated pool has declined, with the major drop occurring in FY 1988. As shown in table 2, until FY 1988 a steady 60 percent of the medical corp were obligated during the year. In FY 1988, the percentage of obligated personnel rose to 62 percent and the pool of unobligated dropped by more than 100 persons. As a result, the lower retention rate among the

smaller pool of unobligated physicians translates into a smaller number of absolute losses and thus does not significantly affect the overall continuation rate.

Table 2. Percentage of the medical corps under obligation^a (population size in parentheses)

FY 1984	FY 1985	FY 1986	FY 1987	FY 1988
61 (3,819)	60 (3,914)	60 (3,924)	60 (3,926)	62 (3,896)

a. Excludes individuals who have missing data on obligation status.

Aggregate retention measures give no insight into the timing of the losses in terms of career path progression or into the characteristics of the losses in terms of skill and experience levels. Although the aggregate retention measures may not reveal a significant deterioration in the retention situation, retention problems can still exist at certain career decision points in specific specialties, and among certain experience levels.

RETENTION AT THE END OF INITIAL OBLIGATION

In general terms, the end of initial obligation marks a physician's first opportunity to leave the Navy. Retention behavior at the end of initial obligation separates physicians who remain in the Navy to fulfill an obligation from physicians who remain in the Navy based on the relative benefits of a military medical career. For a general medical officer (GMO), a physician who has not undertaken residency training, the initial obligation is the obligation incurred through the accession program. For a specialist, the initial obligation is the obligation incurred through the accession program and any participation in Navy residency training programs. The analysis underlying these definitions appears in [2] along with a detailed discussion of the methods used to identify physicians reaching the end of an initial obligation.

Earlier analysis of retention at the end of initial obligation (described in [1] and [2]) revealed a marked drop in the retention rate between FY 1986 and FY 1987. Table 3 shows that retention in FY 1988 declined further from the FY 1987 levels for both specialists and GMOs. More than two-thirds of the medical corps officers who reached the end of initial obligation in FY 1988 left the Navy.

Table 3. Medical corps retention rates at the end of initial obligation: 12-month window (population size in parentheses)

Status	FY 1984	FY 1985	FY 1986	FY 1987	FY 1988
Fully trained specialists	47 (168)	45 (257)	44 (264)	34 (238)	33 (261)
GMOs	56 (41)	51 (117)	38 (81)	33 (98)	31 (146)
Other ^a	29 (7)	58 (26)	63 (16)	27 (15)	88 (8)
All	48 (216)	48 (400)	43 (361)	33 (351)	33 (415)

a. Defined as individuals who have at least started residency training but are currently coded as GMOs. This category includes GMOs who started residency training but failed to complete the program, fully trained individuals who have lost their specialty privileges, and individuals who completed specialty training but whose records were not updated to reflect the change.

Table 4 shows retention rates at the end of initial obligation for direct accessions and scholarship accessions (individuals who participate in the Armed Forces Health Professionals Scholarship Program (AFHPSP)). The primary accession source for the Navy is the scholarship program. As expected, direct accessions, who generally join the Navy fully trained, historically have had a higher retention rate than scholarship accessions who agree to serve in the Navy in exchange for a medical school scholarship. Since FY 1984, all accession sources have experienced a dramatic decline in retention at the end of initial obligation. Although the retention rate for direct accessions improved between FY 1987 and FY 1988, the five-year trend reveals a significant decline since FY 1984. In addition, since direct accessions in FY 1988 represent only 12 percent of physicians reaching the end of initial obligation, the improvement did not raise the overall rate.

Table 4. Medical corps retention rates at the end of initial obligation by source of entry: 12-month window (population size in parentheses)

Fiscal year	Direct accessions	AFHPSP accessions	All physicians
1984	62 (81)	40 (135)	48 (216)
1985	60 (136)	41 (264)	48 (400)
1986	54 (110)	39 (251)	43 (361)
1987	34 (64)	33 (287)	33 (351)
1988	49 (49)	31 (366)	33 (415)

The retention figures in tables 3 and 4 reflect the actions of physicians at the end of the fiscal year in which they completed their initial obligation. Retention is measured at the end of the fiscal year because the BUMIS variable that records whether a physician has left active duty at the end of a given fiscal year is the most accurate indicator of the retention decision. Physicians who reach the end of an initial obligation late in the fiscal year have a shorter "window" to leave than those who reach the end of initial obligation early in the fiscal year. Some physicians who have decided against a military career may remain in the Navy for several months beyond the end of initial obligation in order to fulfill a pay contract or for other reasons, such as to conduct a job search. If these physicians reach the end of initial obligation late in the fiscal year, they may stay beyond the end of the fiscal year and be counted among the retained physicians. This possibility makes it important to measure retention after allowing a longer "window" for physicians to leave.

Table 5 contains retention rates after extending the observation window for an additional fiscal year. The retention rate at the 24-month window equals the proportion of physicians completing an initial obligation in a given fiscal year who remain on active duty at the end of the following fiscal year. Of the 238 specialists who reached the end of initial obligation in FY 1987, only 34 percent remained in the Navy at the end of FY 1987, as shown in table 3, and only 17 percent remained in the Navy at the end of FY 1988, as shown in table 5.

Table 5. Medical corps retention rates at the end of initial obligation: 24-month window (population size in parentheses)

Status	Cohort			
	FY 1984	FY 1985	FY 1986	FY 1987
Fully trained specialists	34 (168)	27 (257)	32 (264)	17 (238)
GMOs	41 (41)	42 (117)	32 (81)	27 (98)
Other ^a	29 (7)	54 (26)	44 (16)	20 (15)
All	35 (216)	33 (400)	33 (361)	20 (351)

a. Defined as individuals who have at least started residency training but are currently coded as GMOs. This category includes GMOs who started residency training but failed to complete the program, fully trained individuals who have lost their specialty privileges, and individuals who completed specialty training but whose records were not updated to reflect the change.

The retention behavior of fully trained specialists was profiled for up to five years after completion of initial obligation. (Although there is wide variation, completion of initial obligation typically occurs at about seven years of service for a scholarship accession and about three years of service for a direct accession.) This profile reveals that the major loss of personnel comes within two years of completion of the initial obligation. Table 6 gives the conditional retention rates for fully trained specialists, which measures the yearly retention rate of those who have survived until that point, by years of service after completion of the initial obligation.

Table 6. Conditional retention rates after completion of initial obligation for fully trained specialists (population size in parentheses)

Cohort	Conditional retention rate by fiscal year				
	1984	1985	1986	1987	1988
1984	47 (168)	72 (79)	79 (57)	78 (45)	91 (35)
1985		45 (257)	60 (115)	78 (70)	90 (54)
1986			44 (264)	73 (116)	78 (85)
1987				34 (238)	50 (80)
1988					33 (261)

The first-year conditional retention rates are the same as those given in table 3 and reflect the actions of fully trained specialists at the end of the fiscal year in which they completed their initial obligation. Measuring the retention rate of a group of individuals who became unobligated during a given year at a specific point in time mixes together people who have been unobligated different amounts of time. At the end of the first year these individuals are between 1 and 12 months beyond completing their initial obligations. Similarly, the second-year conditional retention rate reflects the actions of the remaining specialists at the end of the second fiscal year after completing their initial obligation. (They are between 12 and 24 months beyond completing their initial obligation.) As table 6 reveals, most physicians leave the Navy within two years of completing the initial obligation. In addition, the table shows that the post-initial-obligation retention rates for both the first and second years have declined dramatically since FY 1984.

The dramatic decline in retention at the end of initial obligation is expected to significantly affect the future pool of experienced physicians. Table 7 gives the cumulative retention rate by years of service after completion of initial obligation. (The cumulative retention rate is the product of the conditional retention rates.) The first- and

second-year cumulative retention rates in table 7 are the same as the rates given in tables 3 and 5. Five years after completing initial obligation, 19 percent of the FY 1984 cohort remained on active duty. Given the dramatic decline in retention in FY 1987 and FY 1988 at the one- and two-year marks after completion of initial obligation, it is expected that a much lower percentage of these cohorts will be retained after five years. If the FY 1987 cohort experiences the same rates that the FY 1984 cohort experienced in the third through fifth years, only 10 percent of the FY 1987 cohort will be retained after five years.

Table 7. Cumulative retention rates after completion of initial obligation for fully trained specialists

Cohort	Cohort size	Cumulative retention rate as of the the end of the fiscal year				
		1984	1985	1986	1987	1988
1984	168	47	34	27	21	19
1985	257		45	27	21	19
1986	264			44	32	25
1987	238				34	17
1988	261					33

Examining post-initial-obligation retention behavior by specialty groupings reveals that retention varies by specialty. The number of fully trained specialists who complete their initial obligation in a given year is too small to support stratification by individual specialty. Instead, physicians are grouped into two broad specialty categories based on their potential earnings in the civilian sector. Stratification by high- and low-paying specialties reveals, as shown in table 8, that the recent decline in post-initial-obligation retention is primarily a result of very poor retention in specialties that are relatively high paying in the civilian sector. (See [3] for a detailed analysis of the relationship between physician retention and pay.)

The post-initial-obligation retention behaviors of specialists in low- and high-paying specialties were very similar for the 1984 cohort (those who completed their obligation in FY 1984). Since FY 1984, both specialty groups have experienced significant declines in their post-initial obligation retention, especially for the FY 1987 and FY 1986 cohorts. In high-paying specialties, only 11 percent of specialists in the FY 1987 cohort remained in the Navy by the end of the second year after completion of the initial obligation. In terms of actual numbers, only 17 physicians out of the 150 specialists in high-paying specialties who completed their obligation in FY 1987 remained at the end of FY 1988. If the FY 1987 high-paying-specialty cohort experiences the

same rates that the FY 1984 cohort experienced in the third through fifth years, only 6 percent of the FY 1987 high-paying-specialty cohort (nine physicians) will be retained after five years.

Table 8. Cumulative retention rates after completion of initial obligation and specialty group

	Cohort	Cohort size ^a	Cumulative retention rate as of the end of fiscal year				
			1984	1985	1986	1987	1988
High-paying specialties ^b	1984	86	42	34	30	21	20
	1985	146		44	23	17	14
	1986	131			40	24	17
	1987	150				27	11
	1988	156					33
Low-paying specialties ^c	1984	81	53	35	23	21	19
	1985	105		44	31	27	25
	1986	116			54	44	35
	1987	77				47	29
	1988	100					35

- a. Forty physicians either are missing their subspecialty codes or were in research. These records are excluded for the analysis by specialty.
- b. High-paying specialties include all surgical specialties, anesthesiology, ophthalmology, otolaryngology, urology, OB/GYN, radiology/nuclear medicine, all internal medicine subspecialties, dermatology, and emergency medicine.
- c. Low-paying specialties include aerospace, preventive/occupational medicine, general internal medicine, neurology, pathology, psychiatry, family practice, pediatrics, and all other specialties not mentioned in footnote b.

Rather than calculating separate sets of cumulative retention rates for each cohort group at the end of each fiscal year as is done in table 7, a single set of cumulative post-initial-obligation retention rates is calculated from the FY 1984-1988 data by applying a non-parametric statistical procedure called life-table. This procedure provides a means of combining the retention rates for each cohort into a single set of cumulative post-initial-obligation retention rates. In the life-table procedure, retention is measured by years of post-initial-obligation service rather than being measured at the end of the fiscal year.

Table 9 contains the life-table retention calculations that characterize physician retention beyond initial obligation. As table 9 shows, based on the retention behavior of physicians over the last five years, only 13 percent of those who complete their initial obligation remain on active duty five years later. Appendix A details the life-table procedure.

Table 9. Cumulative life-table retention rates by years of service after completing initial obligation for fully trained specialists

Retention after completion of initial obligation				
Year 1	Year 2	Year 3	Year 4	Year 5
39	24	17	13	13

SPECIALTY CONTINUATION AND RETENTION RATES

Table 10 compares historical continuation and retention rates with the corresponding rates from FY 1988 for 23 clinical specialties. The rates given in table 10 are for physicians who are working in their clinical specialties and exclude individuals in executive medicine. Appendix B outlines the specialty categories and the methodology used to identify physicians in executive medicine. In addition, appendix B gives parallel retention measures for specialty categories that include those in executive medicine. In 15 of the 23 specialties, the retention rate for unobligated specialists fell below the historical average for FY 1984 through FY 1987. The largest percentage-point differences between the current and historical retention rates occurred in thoracic surgery, plastic surgery, urology, and cardiology. FY 1988 continuation and retention were above the historical average in general surgery, other internal medicine, neurosurgery, otolaryngology, pediatrics, and psychiatry. In addition, retention in neurology in FY 1988 exceeded the historical average.

In many specialties, experience has been diluted during the last few years. Table 11 shows the percentage of fully trained specialists (excluding those in executive medicine) with five or fewer years since completion of initial residency training. (Appendix B uses a parallel experience measure by specialty that includes physicians in executive medicine.) Of the 23 specialties analyzed, 17 have experienced an increase in the percentage of newly trained physicians in the specialty since FY 1983. For specialties that have grown, an increase in the percentage of junior personnel was not necessarily accompanied by a

reduction in the number of experienced physicians. In contrast, for specialties that declined in size, an increase in the percentage of junior personnel was accompanied by a decline in the number of experienced physicians. Nine of the 14 specialties that declined in size experienced an increase in the percentage of junior personnel. Overall, the number of fully trained clinical specialists declined and the percentage with five or fewer years of experience rose from 52 percent in FY 1983 to 60 percent in FY 1988.

Table 10. Specialty continuation and retention rates for fully trained clinical specialists (excludes executive medicine) (population size in parentheses)

Specialty	Continuation		Retention	
	Average FY 1984-1987	Current FY 1988	Average FY 1984-1987	Current FY 1988
Aerospace	92 (72)	93 (15) ^a	91 (65)	89 (9) ^a
Anesthesiology	76 (396)	79 (112)	58 (196)	54 (46)
Dermatology	84 (152)	81 (37)	80 (112)	74 (23)
Emergency	83 (64)	88 (26)	77 (35)	70 (10) ^a
Family practice	80 (790)	80 (188)	71 (454)	66 (109)
General surgery	80 (483)	87 (108)	75 (298)	79 (62)
Internal--general	85 (529)	83 (142)	77 (321)	71 (78)
Internal--cardiology	81 (128)	69 (26)	73 (79)	50 (16) ^a
Internal--other	80 (424)	82 (91)	73 (313)	74 (58)
Neurology	84 (96)	80 (25) ^a	77 (64)	80 (15) ^a
Neurosurgery	68 (37)	91 (11) ^a	45 (20)	80 (5) ^a
OB/GYN	77 (470)	74 (105)	64 (268)	63 (56)
Ophthalmology	83 (213)	80 (50)	76 (143)	73 (30)
Orthopedics	81 (319)	76 (93)	68 (176)	55 (49)
Otolaryngology	76 (176)	76 (42)	65 (111)	66 (29)
Pathology	85 (317)	81 (74)	80 (226)	73 (49)
Pediatrics	87 (737)	90 (173)	82 (545)	85 (105)
Plastic surgery	84 (31)	77 (13) ^a	79 (14)	50 (6) ^a
Preventive medicine	87 (96)	85 (27)	83 (65)	85 (13) ^a
Psychiatry	85 (376)	88 (83)	81 (285)	83 (59)
Radiology	78 (430)	71 (91)	64 (244)	61 (64)
Thoracic surgery	79 (42)	60 (10) ^a	68 (22)	50 (8) ^a
Urology	80 (147)	64 (36)	73 (94)	54 (26)
Other	89 (64)	94 (16) ^a	88 (49)	92 (12) ^a
All fully trained	81 (6,589)	81 (1,594)	74 (4,199)	70 (937)

a. Rates may be significantly affected by the behavior of a few physicians due to small population size.

Table 11. Percentage of fully trained clinical specialists (excludes those in executive medicine) with one to five years of experience (population size in parentheses)^a

Specialty	FY 1983		FY 1988	
Aerospace	9	(22)	55	(11)
Anesthesiology	62	(86)	81	(118)
Dermatology	50	(34)	58	(38)
Emergency	75	(12)	88	(34)
Family practice	74	(199)	82	(172)
General surgery	40	(114)	53	(128)
Internal--general	58	(146)	72	(137)
Internal--cardiology	41	(34)	42	(19)
Internal--other	36	(121)	28	(83)
Neurology	46	(24)	55	(33)
Neurosurgery	67	(12)	71	(14)
OB/GYN	53	(128)	65	(104)
Ophthalmology	58	(55)	62	(52)
Orthopedics	55	(69)	79	(90)
Otolaryngology	51	(43)	62	(39)
Pathology	54	(85)	41	(75)
Pediatrics	45	(206)	43	(175)
Plastic surgery	43	(7)	40	(10)
Preventive medicine	38	(26)	63	(32)
Psychiatry	39	(101)	38	(82)
Radiology	56	(102)	54	(85)
Thoracic surgery	30	(10)	38	(8)
Urology	62	(34)	70	(33)
Other	19	(16)	35	(17)
All fully trained	52	(1,686)	60	(1,589)

a. Excludes those records with missing residency completion dates.

SPECIALTY CONTINUATION RATES AND AUTHORIZATION

Relative to authorization, many specialties have an acute manpower shortage. Medical corps billet authorizations to some extent reflect short-term inventory goals and can help illuminate the magnitude of the shortages. In practice, authorized billets do not reflect medical corps requirements, which are in dispute, and thus do not represent "true" medical corps manpower needs. Instead, authorized billets are the billets funded by Congress and generally for the medical corps are a reflection of current inventory levels and short-term manpower goals.

Overall the fully trained specialty billets were manned at the end of FY 1988 at 95 percent of authorization. As shown in table 12, 16 of the 23 specialties examined were manned below authorization. Furthermore, 13 of the 23 specialties examined were manned at less than 90 percent of authorization. In addition, in 12 of the 23 specialties examined, at least one-fifth of the ending FY 1988 inventory is composed of new residency graduates from the training pipeline. Most specialties are below authorized levels, which are below medical requirements, and many specialties are achieving their strength levels through an influx of junior personnel.

To achieve authorized specialty strengths in the near future, the specialty continuation rates need to be much higher than they have been historically. Authorizations for specialists increase steadily until FY 1991 and then are maintained at that level through FY 1993. Using FY 1991 as the target year for achieving authorization levels would allow three years to alleviate current shortages.

Calculating the continuation rates needed to achieve authorized levels in FY 1991 requires making assumptions regarding the number of future gains expected from direct accession and the training pipeline. Because many specialty communities are small, the assumptions that are made about expected future gains can significantly affect the continuation rate needed to achieve authorizations. In addition, the volatility in the number of new specialists over the past few years, which is due primarily to the variation in direct accessions, makes it difficult to make reasonable assumptions about future gains by specialty. The actual number of individuals scheduled to complete their residency training during the next two years (FY 1989 and FY 1990) is currently known. The average number of physicians finishing training between FY 1989 and FY 1990 is used to approximate the expected number of pipeline graduates in FY 1991. This measure most likely overestimates the number of fully trained new gains from the pipeline because some individuals who complete training immediately enter follow-on training and remain in a training status. The average number of accessions who entered between FY 1985 and FY 1988 by specialty is used as a measure of the expected number of direct accessions each year for FY 1989 to FY 1991. This time period includes two moderately successful and two very poor recruiting years. The assumptions regarding future gains are detailed in appendix C.

Table 13 contrasts the actual average continuation rate during the past two years for specialists (including those in executive medicine) who maintain their fully trained status with the continuation rate that is needed during the next three years to achieve FY 1991 authorized levels by the end of that year. The maintenance rate is the continuation rate needed to maintain authorized levels once they are achieved given the assumptions regarding future gains. Specialists who undertake more training to acquire second or third specialties are counted, for this analysis, as losses to their previous specialty because they are in a training status. Therefore, the rates in table 13 differ slightly from those in table 10.

Table 12. Inventory and authorization levels of Navy specialists

Specialty	FY 1988 inventory	FY 1988 authorization ^a	FY 1988 authorization shortage	FY 1991 authorization	Gap between FY 1991 authorization and FY 1988 inventory
Aerospace	35	53	18	56	21
Anesthesiology	122	139	17	159	37
Dermatology	40	35	-5	34	-6
Emergency	37	39	2	60	23
Family practice	205	240	35	242	37
General surgery	135	161	26	204	69
Internal--general	158	114	-44	112	-46
Internal--cardiology	22	27	5	27	5
Internal--other	96	84	-12	73	-23
Neurology	31	28	-3	28	-3
Neurosurgery	14	16	2	20	6
OB/GYN	110	134	24	134	24
Ophthalmology	58	46	-12	49	-9
Orthopedics	98	109	11	126	28
Otolaryngology	45	52	7	56	11
Pathology	80	91	11	92	12
Pediatrics	198	158	-40	153	-45
Plastic surgery	11	8	-3	8	-3
Preventive	44	40	4	52	8
Psychiatry	92	112	20	115	23
Radiology	86	110	24	110	24
Thoracic surgery	9	18	9	19	10
Urology	36	39	3	40	4
Other	19	10	-9	9	-10
No classification ^b	3	0	-3	0	-3
Total	1,784	1,871	87	1,978	194

a. Authorization levels were obtained from the FY 1989 Incentive Special Pay Plan report of May 19, 1988, which was prepared for the Assistant Secretary of Defense for Health Affairs. Executive medicine billets are allocated to the specialties. Billets for those undertaking second and third residencies are excluded from the specialty authorization levels.

b. Three individuals are in specialties in FY 1988 that, given the coding changes of 1988, cannot be mapped into the specialty groupings as given.

Table 13. Continuation rates needed to fulfill FY 1991 authorized strength

Specialty	Two-year average rate, FY 1987-1988	Rate needed to meet authorization by the end of FY 1991	Maintenance rate
Aerospace	90	100	86
Anesthesiology	76	85	79
Dermatology	77	75	78
Emergency	89	95	84
Family practice	80	82	79
General surgery	80	89	80
Internal--general	76	69	76
Internal--cardiology	77	83	79
Internal--other	79	67	73
Neurology	78	81	83
Neurosurgery	84	78	73
OB/GYN	74	85	81
Ophthalmology	76	71	73
Orthopedics	78	84	78
Otolaryngology	76	85	80
Pathology	82	89	86
Pediatrics	84	76	81
Plastic surgery	80	81	88
Preventive	86	80	77
Psychiatry	85	89	83
Radiology	73	88	82
Thoracic surgery	74	-- ^a	-- ^a
Urology	73	78	77
Other	89	73	92

a. Authorization could not be met even with 100-percent retention.

Of the 23 specialties analyzed, only seven currently have yearly continuation rates that are high enough to meet authorization in FY 1991 under the assumed scenario regarding future gains. Furthermore, 11 specialties would need the yearly continuation rates to be at least five percentage points higher than the recent historical rates to meet authorized levels in FY 1991. Authorized levels could not be met for thoracic surgery even if the continuation rate were 100 percent during the next three years.

CONCLUSIONS

The FY 1988 retention rate at the end of initial obligation remains far below historical averages. Over two-thirds of physicians reaching the end of an initial obligation in FY 1987 and FY 1988 decided against pursuing a military medical career. Although only a small fraction of all active-duty physicians reach the end of initial obligation in a given year, continuation of these low retention rates may significantly degrade the experience profile of the medical corps. The experience level of the fully trained specialists has already declined significantly over the past five years. In addition, several specialties have experienced a decline in retention rates relative to the average historical rates. Most specialties are currently manned below authorized levels and, given reasonable assumptions about future recruiting levels, retention rates are currently too low to meet authorized strength in the near future.

REFERENCES

- [1] CNA Research Memorandum 88-231, *Medical Manpower Shortages and the Retention of Navy Physicians*, by Amy E. Graham, Laurie J. May, and Michelle A. Dolfini, Mar 1989 (27880231)¹
- [2] CNA Research Memorandum 88-229, *Defining Initial Obligation for Navy Physicians*, by Amy E. Graham, Feb 1989 (27880229)
- [3] CNA Research Memorandum 88-266, *Pay and the Retention of Navy Physicians*, by Joyce S. McMahon et al., forthcoming (27880266)

1. The number in parentheses is a CNA internal control number.

APPENDIX A
LIFE-TABLE PROCEDURE

APPENDIX A

LIFE-TABLE PROCEDURE

The life-table procedure, used to generate the data in table 9, is a statistical technique used in survival analysis. Survival analysis is concerned with describing survival over time (or time until "failure") of a given population. In this example, the population consists of Navy physicians who have completed an initial obligation and "failure" is defined as leaving the Navy. Survival analysis, using the life-table procedure, is used to calculate the probabilities that a Navy physician remains on active duty for given lengths of time (years) following the end of initial obligation. These probabilities are the cumulative retention rates that appear in table 9. In estimating these retention rates, the life-table procedure combines the experience of five physician cohorts, which consist of all physicians reaching the end of an initial obligation in each year from FY 1984 to FY 1988.

Applying survival analysis to analyze physician retention is complicated by the fact that the accuracy of the physicians' loss date in terms of the month an individual leaves is poor in the early years of the time period analyzed. The lack of precise information on the timing of losses may introduce error into the measurement of length of service beyond initial obligation.

The life-table procedure uses a particular technique to correct for censoring, a problem that occurs in most applications of survival analysis. Censored data arise because the experiment or observation period ends before the "failure" time of everyone is observed. In the case of physician retention, the observation period ends in FY 1988. The number of censored observations equals the number of physicians who remain on active duty at the end of FY 1988, or approximately 25 percent of the observations. Although these physicians will eventually leave the Navy through attrition or retirement, the only information known about when they will leave is that it will occur sometime after the end of the observation period.

Calculating retention rates by years of service since completion of initial obligation without explicitly addressing the censoring problem would result in an overestimation of the retention level. The censoring problem is best illustrated by an example. Suppose 100 specialists completed their initial obligation in FY 1987. By the end of FY 1988, those who became unobligated at the beginning of FY 1987 have served in the Navy potentially for two years after their initial obligation. In contrast, those who became unobligated at the end of FY 1987 have served in the Navy potentially only one year after their initial obligation. The retention behavior between one and two years of those individuals who became unobligated at the end of FY 1987 is not observed (i.e., it is censored). The cumulative retention rate R_j at a given time interval j equals the product of one minus the number of specialists who quit

during each time interval q_i divided by the number who could possibly quit each period (i.e., those individuals who are at risk) r_i :

$$R_j = \prod_{i=1}^j 1 - q_i/r_i \quad . \quad (A-1)$$

Specialists who have previously quit or are censored are assumed not to be at risk in the above formula. Suppose half of the 100-person cohort quit by year 1. The retention rate for the first year (period 1) would equal 0.50 or $(1 - 50/100)$. Suppose ten persons quit in the second year and another ten were not observed for a full two years (i.e., they were censored in the second year). If no censoring took place, the cumulative retention rate at the end of two years would be:

$$R_2 = \prod_{i=1}^2 1 - q_i/r_i = (1 - 50/100)(1 - 10/50) = 0.40 \quad . \quad (A-2)$$

This measure overstates the cumulative retention level at two years because it implicitly treats censored persons as if they were not quitters. A more accurate measure of the cumulative retention rate can be calculated using the life-table procedure, which explicitly accounts for censoring. The life-table formula is as follows:

$$R_j = \prod_{i=1}^j \frac{1 - q_i}{r_i - c_i/2} \quad , \quad (A-3)$$

where

q_i = the number who quit during period i

r_i = the number at risk at the beginning of period i

c_i = the number censored during period i .

The life-table procedure implicitly assumes that censoring occurs evenly throughout the period. The life-table measure of the two-year retention rate in the preceding example is

$$R_2 = (1 - 50/100) \left(1 - \frac{10}{50 - 10/2} \right) = .389 \quad . \quad (A-4)$$

Thus adjusting for censoring gives a lower, more accurate estimate of the two-year cumulative retention rate.

The assumption that censoring occurs evenly throughout the period is equivalent to assuming that on average censored observations are at risk for half of the time period (which would be six months if the time periods are years). For specialists completing their initial obligation this assumption is not realistic. Most specialists complete their initial obligation during late summer, about two months before the end of the fiscal year. As a result observations that are censored during a given year interval are typically at risk for two months during that year rather than six months. In the example outlined above, people who are censored during their second year of post-initial-obligation service typically have been observed 14 months in an unobligated status as of the end of FY 1988 (i.e., they completed their initial obligation in July 1987). These individuals are at risk for two months during their second year rather than six months. In tracing the post-initial-obligation careers of specialists, the censoring assumption used by the life-table procedure overstates the at-risk time for the typical censored observation. Therefore, although the standard life-table procedure provides a more accurate measure of retention levels than is obtained when censoring is ignored, the measure still overstates retention levels given that uneven censoring exists.

APPENDIX B

**CLASSIFICATION OF SUBSPECIALTIES AND RETENTION MEASURES
BY ALTERNATIVE SPECIALTY CLASSIFICATIONS**

APPENDIX B

CLASSIFICATION OF SUBSPECIALTIES AND RETENTION MEASURES BY ALTERNATIVE SPECIALTY CLASSIFICATIONS

For analytical purposes, board-certified and fully trained specialists are grouped in 23 general specialties. Table B-1 shows the grouping of subspecialties into the 23 categories and an "other" grouping and lists the BUMIS codes that identify each subspecialty.

The classification of physicians in executive medicine (administration) has been changed several times since 1983. A major definitional change occurred in 1986 when the subspecialty codes changed. Prior to 1986, individuals who were in executive medicine were classified under a separate subspecialty code and were not included with the clinical specialists. In 1986, the subspecialty codes were changed and executive medicine was folded into the clinical specialty codes. As a result of this definitional change, disaggregation by subspecialty code creates an inconsistent series over time. For example, a physician who was in executive medicine in 1985 but trained as a surgeon is categorized under executive medicine in 1985 and general surgery in 1986. Generally, those in executive medicine are senior-level captains and flag officers.

In addition to the codes reclassification in 1986, there have been several minor adjustments regarding which billets are considered to be executive medicine positions. This is evident by the wide variation in executive medicine inventory levels given in table B-2. As a result, it is extremely difficult with the FY 1983 to FY 1987 BUMIS data to define consistently those physicians in executive medicine. In an attempt to create consistently defined subspecialty categories over time for this analysis, steps were taken to exclude executive medicine personnel from the subspecialty categories after 1986. All individuals who were classified under the executive medicine subspecialty code in 1985 are excluded from the clinical specialty classifications in the later years. To exclude individuals who entered executive medicine after 1985, a second screen using the billets currently identified as executive medicine positions (billet codes equaling 0002, 0004, 0610, 0690, 3283, 3970, 9087, 9420, 9421, 9436, 9942, 9965, 9970, 9992, 0020, 0048) was used. Although currently not all physicians in these billets are considered to be in executive medicine, the billets approximate the definition of executive medicine that was used before 1986. Using this methodology, 153 physicians in FY 1986 and 168 physicians in FY 1987 were identified as being in executive medicine.

Table B-1. Classification of subspecialties

Specialty	Subspecialty	BUMIS specialty codes	
		1983-85 ^a	1986-87 ^b
Family practice	Family practice	1618	1625
	Adolescent medicine	c	1626
	Gerontology	c	1627
Pediatrics	General pediatrics	1613	1630
	Critical care	c	1631
	Oncology	c	1632
	Pediatric cardiology	1615	1633
	Endo/metabolism	c	1634
	Gastroenterology	c	1635
	Hematology	c	1636
	Hem/oncology	c	1637
	Hematopathology	c	1638
	Allergy/immunology	1614	1639
	Immunopathology	c	1640
	Nephrology	1617	1641
	Pediatric neonatology	1616	1642
	Neurology	c	1643
	Adolescent medicine	c	1644
	Infectious diseases	c	1645
Internal medicine, cardiology	Cardiology	1603	1604
Internal medicine, general	General internal medicine	1601	1601
Internal medicine, other	Critical care	c	1602
	Medical oncology	1609	1603
	Endo/metabolism	1604	1605
	Hematology	1606	1607
	Hem/oncology	c	1608
	Hematopathology	c	1609
	Allergy/immunology	1602	1610
	Immunopathology	c	1611

a. From *Manual of Navy Officer Manpower and Personnel Classifications*, NAVPERS 15839D, Vol. I (Major Code Structures).

b. From *Manual of Navy Officer Manpower and Personnel Classifications*, NAVPERS 15839F, Vol. I (Major Code Structures).

c. An old subspecialty code does not exist.

Table B-1. (Continued)

Specialty	Subspecialty	BUMIS specialty codes	
		1983-85 ^a	1986-87 ^b
Internal medicine, other (continued)	Diagnostic lab immunology	c	1612
	Nephrology	1608	1613
	Pulmonary diseases	1610	1614
	Rheumatology	1611	1615
	Adolescent medicine	c	1616
	Infectious diseases	1607	1617
	Tropical medicine	1612	1618
	Gerontology	c	1619
Pathology	Anatomic/clinical pathology	1629	1585
	Clinical pathology	1630	1586
	Anatomic pathology	1628	1587
	Neuropathology	c	1588
	Dermatopathology	c	1589
	Forensic pathology	1631	1590
	Hematopathology	c	1591
	Radioisotopic pathology	c	1592
	Immunopathology	c	1593
Psychiatry	Psychiatry	1620	1675
	Critical care	c	1676
	Child psychiatry	1621	1677
Radiology	Diagnostic radiology	1636	1650
	Pediatric radiology	1637	1651
	Neurologic radiology	c	1652
	Nuclear radiology	c	1653
	Therapeutic radiology	1625	1655
Obstetrics and gynecology (OB/GYN)	General OB/GYN	1510	1550
	Critical care	c	1551
	Maternal/fetal medicine	1511	1552
	Gynecologic oncology	1512	1553
	Perinatal biology	1513	1554
	Reproductive endocrinology	c	1555
	Gynecologic pathology	c	1556

a. From *Manual of Navy Officer Manpower and Personnel Classifications*, NAVPERS 15839D, Vol. I (Major Code Structures).

b. From *Manual of Navy Officer Manpower and Personnel Classifications*, NAVPERS 15839F, Vol. I (Major Code Structures).

c. An old subspecialty code does not exist.

Table B-1. (Continued)

Specialty	Subspecialty	BUMIS specialty codes	
		1983-85 ^a	1986-87 ^b
Anesthesiology	Anesthesiology	1622	1540
	Critical care	1591	1541
General surgery	General surgery	1503	1510
	Critical care	c	1511
	Surgical oncology	1505	1512
	Renal transplant surgery	1509	1513
	Colon-rectal surgery	1506	1514
	Peripheral vascular surgery	1508	1515
	Pediatric surgery	1504	1516
Orthopedic surgery	General orthopedic surgery	1514	1530
	Pediatric orthopedics	1515	1531
	Hand surgery	1507	1532
	Spine surgery	c	1533
Neurological surgery ^d	Neurological surgery	1517	1522
Urology	Urology	1516	1560
	Pediatric urology	c	1561
	Urologic oncology	c	1562
Otolaryngology	Otolaryngology	1524	1565
	Head and neck surgery	c	1566
	Facial plastic and reconstruction	c	1567
	Otology	c	1568
Ophthalmology	Ophthalmology	1520	1570
	Pediatric ophthalmology	1521	1571
	Corneal and external disease	c	1572
	Retinal surgery	1523	1573
	Neuroophthalmology	c	1574

a. From *Manual of Navy Officer Manpower and Personnel Classifications*, NAVPERS 15839D, Vol. I (Major Code Structures).

b. From *Manual of Navy Officer Manpower and Personnel Classifications*, NAVPERS 15839F, Vol. I (Major Code Structures).

c. An old subspecialty code does not exist.

d. Population of ten or less.

Table B-1. (Continued)

Specialty	Subspecialty	BUMIS specialty codes	
		1983-85 ^a	1986-87 ^b
Ophthalmology (continued)	Ophthalmic pathology	c	1575
	Oculoplastics	c	1576
	Facial plastic and reconstruction	c	1577
	Glaucoma	c	1578
Thoracic cardiovascular surgery ^d	Thoracic cardiovascular surgery	1518	1519
	Thoracic surgeon	c	1517
Dermatology	Dermatology	1619	1660
	Dermatopathology	c	1661
	Derm immunology	c	1662
Neurology	General neurology	1623	1670
	Child neurology	c	1671
	Neuropathology	c	1672
Plastic surgery	Plastic surgery	1519	1525
	Facial plastic and reconstruction	c	1526
	Head and neck surgery	c	1527
Aerospace	Aerospace	1632	1683
Emergency	Emergency	1592	1695
Other	Nuclear medicine	1626	1658
	Hyperbaric medicine	c	1688
	Physical rehabilitation	1624	1690

a. From *Manual of Navy Officer Manpower and Personnel Classifications*, NAVPERS 15839D, Vol. I (Major Code Structures).

b. From *Manual of Navy Officer Manpower and Personnel Classifications*, NAVPERS 15839F, Vol. I (Major Code Structures).

c. An old subspecialty code does not exist.

d. Population of ten or less.

Table B-2. Inventory of physicians in executive medicine (based on the classification of the time period)

Fiscal year	Inventory
1983 ^a	106
1984 ^a	152
1985 ^a	148
1986 ^b	140
1987 ^b	80

SOURCE: FY 1989 Incentive Special Pay Plan, MEDCOM-5125, 19 May 1988.

- a. Executive medicine defined by subspecialty code "1500."
- b. Executive medicine defined by billet codes 0002, 0004, 0610, 3283, 9087, 9420, 9421, 9436, 9942, 9965, 9970, 9992, 0020, 0048. Not all individuals in these billets are considered to be in executive medicine under the current category definition.

Table B-3 gives the current and historical continuation and retention rates for specialty groupings that include those physicians in executive medicine. Individuals in executive medicine are included in the clinical specialty in which they are trained. The results in table B-3 are highly similar to the results for the specialty categories that exclude those in executive medicine. In 18 of the 23 specialties, the retention rate for unobligated specialists fell below the historical average for FY 1984 through FY 1987.

Many specialties have experienced a dilution of experience during the last few years. Table B-4 gives the percentage of fully trained specialists (including those in executive medicine) with five or fewer years since completion of initial residency training. The results are highly similar to the results for the specialty categories that exclude those in executive medicine. Of the 23 specialties analyzed, 19 have experienced an increase in the percentage of newly trained physicians in the specialty since FY 1983.

Table B-3. Specialty continuation and retention rates for fully trained specialists (includes executive medicine) (population size in parentheses)

Specialty	Continuation				Retention			
	Average FY 1984-1987		Current FY 1988		Average FY 1984-1987		Current FY 1988	
Aerospace	94	(123)	89	(37)	93	(114)	83	(24)
Anesthesiology	77	(417)	79	(117)	61	(217)	57	(51)
Dermatology	83	(162)	83	(40)	80	(122)	77	(26)
Emergency	84	(70)	89	(28)	80	(41)	70	(10)
Family practice	81	(853)	81	(214)	73	(515)	69	(134)
General surgery	80	(518)	87	(114)	75	(331)	81	(67)
Internal--general	85	(572)	84	(158)	78	(362)	74	(92)
Internal--cardiology	81	(133)	72	(29)	74	(84)	58	(19)
Internal--other	80	(459)	83	(101)	74	(348)	76	(67)
Neurology	85	(97)	80	(25)	77	(65)	80	(15)
Neurosurgery	68	(37)	91	(11)	45	(20)	80	(5)
OB/GYN	77	(488)	74	(111)	65	(286)	63	(62)
Ophthalmology	83	(238)	80	(55)	77	(168)	74	(35)
Orthopedics	82	(337)	78	(99)	71	(194)	59	(54)
Otolaryngology	76	(187)	77	(48)	66	(122)	71	(34)
Pathology	85	(329)	80	(80)	81	(238)	73	(55)
Pediatrics	87	(818)	90	(196)	83	(624)	86	(125)
Plastic surgery	82	(34)	77	(13)	76	(17)	50	(6)
Preventive medicine	87	(127)	84	(37)	84	(92)	82	(22)
Psychiatry	85	(403)	88	(91)	81	(312)	83	(66)
Radiology	77	(441)	72	(92)	64	(255)	62	(65)
Thoracic surgery	78	(45)	60	(10)	68	(25)	50	(8)
Urology	80	(160)	66	(38)	75	(107)	57	(28)
Other	90	(78)	94	(18)	89	(63)	92	(13)
All fully trained	82	(7,126)	82	(1,762)	75	(4,722)	73	(1,083)

Table B-4. Percentage of fully trained specialists with one to five years of experience (includes executive medicine) (population size in parentheses)^a

Specialty	All specialists (includes those in executive medicine)			
	FY 1983		FY 1988	
Aerospace	10	(30)	34	(32)
Anesthesiology	58	(92)	79	(122)
Dermatology	45	(38)	55	(40)
Emergency	75	(12)	83	(36)
Family practice	73	(201)	76	(189)
General surgery	37	(124)	51	(134)
Internal-general	56	(153)	66	(153)
Internal-cardiology	40	(35)	35	(23)
Internal-other	35	(126)	25	(93)
Neurology	46	(24)	55	(33)
Neurosurgery	67	(12)	71	(14)
OB/GYN	52	(132)	63	(108)
Ophthalmology	53	(60)	55	(58)
Orthopedics	52	(73)	72	(99)
Otolaryngology	48	(46)	59	(44)
Pathology	52	(88)	40	(78)
Pediatrics	42	(219)	39	(195)
Plastic surgery	38	(8)	40	(10)
Preventive medicine	32	(31)	48	(42)
Psychiatry	36	(107)	34	(91)
Radiology	54	(105)	53	(86)
Thoracic surgery	27	(11)	38	(8)
Urology	55	(38)	66	(35)
Other	16	(19)	32	(19)
All fully trained	49	(1,784)	56	(1,742)

a. Excludes those records with missing residency completion dates.

APPENDIX C
ASSUMPTIONS REGARDING FUTURE GAINS

APPENDIX C

ASSUMPTIONS REGARDING FUTURE GAINS

Table C-1 gives the assumed number of future gains used in calculating the continuation rate needed to achieve authorized specialty levels in FY 1991. The number of direct accessions for FY 1989 to FY 1991 equals the average number of direct accessions acquired between FY 1984 and FY 1988. Data from four years of recruiting experience were used to calculate the expected number of direct accessions in an attempt to smooth over some of the volatility direct accession recruiting has experienced in recent years. FY 1984 and FY 1988 were generally good recruiting years, and FY 1986 and FY 1987 were very poor years. For FY 1989 and FY 1990, the number of trained physicians expected to be gained through the pipeline equals the actual number of physicians scheduled to graduate from residency training. Since there are always some physicians who immediately undertake further training by entering second residencies, these numbers overestimate the number of gains to the fully trained status. The training pipeline estimate for FY 1991 equals the average of gains for FY 1989 and FY 1990.

Table C-1. Assumed level future gains each year

	Direct accessions	Pipeline		
	(FY 1989-91)	(FY 1989)	(FY 1990)	(FY 1991)
Aerospace	.00	9.0	7.0	8.0
Anesthesiology	.50	34.0	33.0	33.5
Dermatology	.25	8.0	7.0	7.5
Emergency Medicine	.00	4.0	16.0	10.0
Family Practice	.75	44.0	60.0	52.0
General Surgery	5.75	30.0	42.0	36.0
Internal-General	1.75	21.0	31.0	26.0
Cardiology	.25	6.0	5.0	5.5
Internal-Other	.00	20.0	20.0	20.0
Neurology	1.00	5.0	3.0	4.0
Neurosurgery	.50	2.0	8.0	5.0
OB/GYN	1.00	26.0	25.0	25.5
Ophthalmology	.25	13.0	13.0	13.0
Orthopedics	.50	35.0	20.0	27.5
Otolaryngology	.50	13.0	9.0	11.0
Pathology	4.00	10.0	9.0	9.5
Pediatrics	2.00	25.0	30.0	27.5
Plastic Surgery	.00	2.0	.0	1.0
Preventive Medicine	.75	12.0	11.0	11.5
Psychiatry	2.00	17.0	18.0	17.5
Radiology	.50	21.0	18.0	19.5
Thoracic Surgery	.25	1.0	.0	.5
Urology	.50	7.0	11.0	9.0
Other	.25	1.0	.0	.5