

# Asking for Help: Internal Medicine Residents' Use of a Medical Procedure Service

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**BACKGROUND:** Little is known about the professional help-seeking behavior of residents as they perform procedures in the hospital.

**OBJECTIVE:** To determine when residents seek formal supervision to perform inpatient medical procedures.

**DESIGN:** We conducted a prospective cohort study of resident physicians' use of formal supervision through a medical procedure service (MPS) for placing central venous catheters (CVCs) and performing thoracenteses. We compared resident, procedure, and patient characteristics among MPS and non-MPS procedures. We performed bivariable and multivariable analyses to examine factors associated with use of the MPS. We also performed a subgroup analysis of non-MPS procedures to assess the influence of resident, procedure, and patient characteristics on the choice of informal supervision.

**SETTING:** Boston teaching hospital.

**SUBJECTS:** Sixty-nine internal medicine residents.

**MAIN OUTCOME MEASURE:** Use of an elective MPS for formal faculty supervision.

**RESULTS:** Among 191 procedures performed, 79 (41%) used the MPS. Residents were more likely to seek faculty supervision via the MPS among patients with 3 or more comorbidities (odds ratio [OR], 2.1; 95% confidence interval [CI], 1.2-3.5). They were less likely to seek MPS supervision when procedures were performed urgently or emergently (OR, 0.4; 95% CI, 0.2-0.8). There were few differences in the characteristics of unsupervised and informally supervised procedures.

**CONCLUSIONS:** Resident physicians appear to seek formal assistance appropriately for procedures they perform on sicker patients. Additional research is needed to understand whether overconfidence or poor access to attending physicians is responsible for their failure to seek consultation with urgent and emergent cases. *Journal of Hospital Medicine* 2009;4:404-409. © 2009 Society of Hospital Medicine.

**KEYWORDS:** procedural skills, resident supervision, central venous catheterization.

There is little scientific evidence about professional help-seeking behavior among resident physicians. Although junior physicians have many sources of information available to them in the course of clinical practice—print materials, internet resources, curbside consultations, and advice from senior residents and faculty—we have little empirical knowledge about when, why, and how physician trainees ask for help.

To study this phenomenon, we examined the use of a medical procedure service (MPS) by resident physicians. The MPS is an inpatient service at a Boston teaching hospital that provides education, supervision, and evaluation of internal medicine residents who perform common bedside procedures; it has been described previously.<sup>1</sup> Residents who call the MPS review an online curriculum with self-assessment quizzes, perform procedures with faculty supervision and

feedback, and assess their own performance using online checklists. This program has been available to internal medicine residents since 2002. In a previous study, we found that residents reported greater "comfort" performing bedside procedures when they used the procedure service, when the operator was a postgraduate year (PGY)2 or PGY3 resident (compared to PGY1 residents), and while placing central venous catheters (CVCs) (compared to thoracenteses).<sup>2</sup>

The goal of the current study was to examine help-seeking behavior among resident physicians as they placed CVCs and performed thoracenteses. We interpreted the decision to use the MPS to indicate that the resident successfully sought and received assistance from pulmonary attending physicians or interventional pulmonary fellows. We hypothesized that: (1) residents earlier in their training would choose to use the

procedure service due to their relative lack of experience; (2) they would seek consultation when the procedure was performed in high-risk patients, as indicated by the number of comorbidities, presence of medications that increase the risk of bleeding, and treatment in an intensive care unit; and (3) residents would be less likely to call the MPS for urgent or emergent situations, when timely assistance may be difficult to obtain. To examine the potentially confounding influence of procedures supervised by non-MPS physicians, we also investigated differences between informally supervised procedures (i.e. by a non-MPS attending or fellow) and unsupervised procedures (i.e. no attending or fellow supervision) to determine whether any significant differences in their characteristics existed.

## Methods

### Study Site

We studied CVC placement and thoracenteses performed by internal medicine residents at a 556-bed Boston teaching hospital in 2003-2004. During the 9-month study period, 63 PGY1 residents (16 in a 1-year preliminary program) and 95 PGY2 and PGY3 residents were enrolled in the program.

The MPS was staffed by hospitalists and pulmonologists skilled in teaching and performing 4 common inpatient procedures: CVC placement, thoracentesis, lumbar puncture, and paracentesis. We chose to study only the first 2 procedures because supervision of CVCs and thoracenteses by pulmonologists was available 24 hours a day in this initial year of the MPS. The other procedures were supervised by hospitalists during business hours only at the time. Ultrasound guidance was available for all procedures, supervised or not. At the time of the study, the residency program recommended consulting the MPS for procedures, but this was not mandatory. A resident electing to use the MPS to supervise a procedure on her own patient would page the MPS physician. If she were performing a procedure for the first time, she was required to review an online multimedia curriculum and complete a 5-question cognitive test. She would then perform the procedure while supervised by the MPS physician, who would complete a checklist evaluation of the resident's performance online. All residents performing procedures, regardless of use of the MPS, would also complete procedure logs online to document procedural experience for the American Board of Internal Medicine requirements.

### Study Design and Data Sources

We prospectively collected data from resident procedure logs from July 2003 through April 2004. We elicited the following information from the residents for each procedure: name of operator, year of training, date of procedure, patient's medical record number, name of attending or fellow supervisor, procedure, immediate complications (pneumothorax, bleeding, other, or none), self-reported level of urgency (emergent, urgent, elective), time of day, procedure location, and the number of such procedures completed previously. We catego-

rized level of supervision as: (1) MPS-supervised if a pulmonary attending or interventional pulmonary fellow were listed as the supervisor (entailing formal faculty development as MPS faculty, resident use of the curriculum, and completion of faculty evaluations with structured feedback); (2) informally supervised if nonpulmonary attendings or fellows were involved (who may not supervise the entire procedure and would not complete a faculty evaluation); and (3) unsupervised if a resident physician or no supervisor was identified. Faculty development involved a single training session with the interventional pulmonary fellows and attendings and focused on optimal procedural teaching. During the session, we described the structure of the MPS, provided the curricular materials available to the residents, and reviewed the faculty evaluation forms in depth.

We abstracted patient characteristics (age, race/ethnicity, type of insurance, length of stay) from the electronic medical record. We performed retrospective chart reviews to record patient comorbidities (as defined by modified Deyo criteria<sup>3</sup>), to determine the number of medications associated with the risk of bleeding (such as anticoagulants and antiplatelet agents), and to discover complications that arose after the procedure was logged, including delayed bleeding, pneumothorax, or infection (localized site infection or line-related bloodstream infection).

### Data Analyses

We tabulated characteristics of residents (training level, gender, and self-reported number of procedures), procedures (procedure type, procedure location, level of urgency, time of day), and patients (number of comorbidities and number of medications that promote bleeding) by use of the MPS. We combined resident-reported (ie, immediate) complications and delayed complications (identified on retrospective chart review), stratified by use of the MPS. We also performed a subgroup analysis of non-MPS procedures by comparing resident, procedure, and patient characteristics by presence or absence of informal supervision.

We created a univariable logistic regression model to examine factors associated with elective use of the MPS. We dichotomized the following independent variables: resident characteristics (PGY status, female gender, first time performing the procedure), patient characteristics (nonwhite race, female gender, Medicaid recipient, 3 or more comorbidities, any "bleeding" medication), and procedure characteristics (intensive care unit procedures, nonelective procedures, procedures performed between 11 PM and 8 AM). We also included 2 patient-related interval variables (age and length of stay) in the univariable logistic regression model. We created a multivariable logistic regression model with backward elimination ( $P < 0.05$ ) using the same independent variables as in the univariable analyses, to identify factors associated with use of the MPS, clustering by resident. We repeated this method to create a multivariable model to examine factors associated with the use of informal

**TABLE 1. Resident Physician Characteristics**

Total residents, n (%)	69 (100)
Training year, n (%)	
PGY1	30 (43)
PGY2	23 (33)
PGY3	16 (23)
Gender, n (%)	
Female	36 (52)
Male	33 (48)
Self-reported number of prior procedures, n (%)*	
0	12 (17)
1-5	26 (38)
>6	31 (45)

\*At the time of the index procedure, residents reported the number of procedures they had performed previously.

supervision among non-MPS procedures. Analyses used Stata 7.0 (StataCorp, College Station, TX).

The study protocol was approved in advance by the hospital investigational review board.

## Results

### Resident Characteristics

Sixty-nine residents reported procedures during the 9-month study period (Table 1). Thirty (43%) residents were PGY1 and 36 (52%) were female. Twelve (17%) residents performed the procedure for the first time.

### Patient Characteristics

The 134 patients in the study had a mean age of 65.6 years. One-half of patients were female, and 34% were nonwhite. The principal insurer was Medicare (57%); 24% were privately insured, and 17% received Medicaid. The mean length of stay was 18.4 days (range, 0-98 days).

### MPS and Non-MPS Procedures

As detailed in the bivariate analyses in Table 2, residents performed 191 procedures (156 CVCs and 35 thoracenteses). PGY1 residents performed approximately one-half of the 79 MPS procedures. Fifty-one (65%) of the 79 MPS procedures were CVC placements and 28 (35%) were thoracenteses ( $P < 0.001$ ). MPS procedures were less often performed in the emergency department than non-MPS procedures (1% versus 21%,  $P < 0.001$ ). There was no significant difference in the percentage of MPS and non-MPS procedures by time of day. Patients whose procedures were supervised by the MPS had on average 3.0 comorbidities, while patients who underwent non-MPS procedures had 2.6 comorbidities ( $P = 0.02$ ). Complications occurred in 11 (14%) of MPS and 22 (20%) of non-MPS procedures, a statistically nonsignificant difference.

In the univariable analysis, the only variable associated with elective use of the MPS was the presence of 3 or more

comorbidities (odds ratio [OR], 2.3; 95% confidence interval [CI], 1.2-4.1). In the multivariable analysis, residents were more likely to use the MPS when patients had 3 or more comorbidities (OR, 2.1; 95% CI, 1.2-3.5) and less likely to use the MPS when procedures were either urgent or emergent (OR, 0.4; 95% CI, 0.2-0.8).

### Unsupervised and Informally Supervised Procedures

Table 3 shows the results of the bivariate analyses of the characteristics of the 112 procedures that were unsupervised or supervised by non-MPS physicians. Twenty-seven (24%) were informally supervised by nonpulmonary attendings. Residents who had performed more than 6 procedures previously were more likely to be informally supervised than not supervised at all ( $P = 0.001$ ). More informally supervised procedures were performed in the emergency department (41%) than in other settings ( $P = 0.01$ ). There were no significant differences in year of training, gender, urgency, time of day, complications, comorbidities, or bleeding medications.

In the multivariable analysis, the only factor associated with the use of informal supervision (rather than absent supervision) was patient gender; informal supervision was less likely with female patients (OR, 0.3; 95% CI, 0.1-0.8).

## Discussion

To understand professional help-seeking behavior by internal medicine resident physicians, we studied factors associated with the use of a MPS for performing 2 common bedside procedures. We found that residents used the MPS more often when they performed procedures on patients with more comorbidities and less often during urgent or emergent procedures.

These results are consistent with our hypothesis that residents use formal supervision when caring for high-risk patients. We had also hypothesized that they would seek the MPS for patients on medications that increase the risk of bleeding, but this was not borne out. One possible explanation is that invasive procedures on anticoagulated patients may be deferred or avoided. Additionally, we did not collect prothrombin times nor platelet count, which may represent better proxies for coagulopathy. Our hypothesis that residents would not seek the MPS for urgent and emergent procedures was confirmed; the time delay between contacting the faculty member and performing the procedure may have inhibited or obviated consultation of the MPS. We hypothesized that interns would use the MPS preferentially; we found instead that level of training did not influence use of the MPS. A resident early in training may struggle with the balance between autonomy and supervision, wanting instead to establish himself as able to solve clinical problems independently and by seeking consultation only as a last resort. Alternatively, interns may be primarily supervised by their residents and may seek expert assistance only for particularly challenging or high-risk cases. Additionally, as

**TABLE 2. Resident, Procedure, and Patient Characteristics of Bedside Procedures, by Use of Medical Procedure Service (MPS)**

	MPS	No MPS	P Value*
Total procedures, n (%)	79 (100)	112 (100)	
Resident characteristics			
Resident level, n (%)			0.77
PGY1	42 (53)	60 (54)	
PGY2	22 (28)	34 (30)	
PGY3	15 (19)	18 (16)	
Gender, n (%)			0.50
Female	42 (53)	54 (48)	
Male	37 (47)	58 (52)	
Self-reported number of prior procedures, n (%) <sup>†</sup>			0.11
0	14 (18)	13 (12)	
1-5	40 (51)	47 (42)	
>6	25 (32)	52 (46)	
Procedure characteristics			
Procedure, n (%)			<0.001
Central venous catheter	51 (65)	105 (94)	
Thoracentesis	28 (35)	7 (6)	
Location, n (%)			<0.001
Ward	18 (23)	17 (15)	
Emergency department	1 (1)	23 (21)	
Intensive care unit	53 (67)	71 (63)	
Other	7 (9)	1 (1)	
Urgency, n (%)			<0.001
Elective	32 (41)	22 (20)	
Urgent	42 (53)	78 (70)	
Emergent	5 (6)	12 (11)	
Time of day, n (%)			0.33
8 AM to 5 PM	50 (63)	65 (58)	
5 PM to 11 PM	15 (19)	20 (18)	
11 PM to 8 AM	14 (18)	27 (24)	
Complications or problems, n (%) <sup>‡</sup>			0.54
Bleeding	1 (1)	6 (5)	
Pneumothorax	1 (1)	2 (2)	
Infection <sup>§</sup>	5 (6)	5 (4)	
Other <sup>  </sup>	4 (5)	9 (8)	
None	68 (86)	90 (80)	
Patient characteristics			
Number of comorbidities, mean (SD, range) <sup>¶</sup>	3.0 (1.4, 0-7)	2.6 (1.6, 0-7)	0.02
Number of medications associated with bleeding risk, mean (SD, range) <sup>#</sup>	1.1 (1.0, 0-3)	1.1 (0.9, 0-3)	0.90

\* P value is reported as chi square for categorical variables, test of trend for ordinal variables, Wilcoxon rank sum for continuous variables, and Fisher's exact test for complications.

<sup>†</sup> At the time of the index procedure, residents reported the number of central lines or thoracenteses they had performed previously.

<sup>‡</sup> Complications reported by trainees at the time of completing the procedure log or uncovered on retrospective chart review.

<sup>§</sup> Site infection or line-related bloodstream infection.

<sup>||</sup> Includes arrhythmia, arterial puncture, dry tap, and hypotension.

<sup>¶</sup> According to modified Deyo criteria for comorbidity index, which includes dementia, coronary artery disease, diabetes, chronic obstructive pulmonary disease, congestive heart failure, peptic ulcer disease, hypertension, immunosuppression, leukemia, kidney disease, liver disease, Hodgkins lymphoma, non-Hodgkins lymphoma, peripheral vascular disease, metastatic solid tumor, rheumatologic disease, stroke, any tumor, arrhythmia, and other.

<sup>#</sup> Includes: aspirin, ticlopidine, clopidogrel, dipyridamole, eptifibatide, tirofiban, aspirin/dipyridamole, heparin, anagrelide, argatroban, enoxaparin, pentoxifylline, abciximab, streptokinase, tissue plasminogen activator, urokinase, warfarin, cilostazol, or other medications that increase the risk of bleeding.

newcomers to the training program, they may not be well acquainted with the role and availability of the service (although periodic announcements were made throughout the year). Our examination of procedures not supervised by the MPS showed that informally supervised and unsupervised procedures are quite similar to each other; the inverse

relationship between informal supervision and patient gender is difficult to explain and may be spurious.

To our knowledge, only 1 author has postulated a theoretical foundation for help-seeking in trainees, depicted in the context of the patient-resident-attending triadic relationship.<sup>4</sup> The mature help-seeker, whether patient, resident, or

**TABLE 3. Resident, Procedure, and Patient Characteristics of Procedures, by Type of Informal Supervision**

	Informal Supervision	No Supervision	P Value*
Total procedures, n (%)	27 (100)	85 (100)	
Resident characteristics			
Resident level, n (%)			0.13
PGY1	10 (37)	50 (59)	
PGY2	12 (44)	22 (26)	
PGY3	5 (19)	13 (15)	
Gender, n (%)			0.99
Female	13 (48)	41 (48)	
Male	14 (52)	44 (52)	
Self-reported number of prior procedures, n (%) <sup>†</sup>			<b>0.001</b>
0	2 (7)	11 (13)	
1-5	4 (15)	43 (51)	
>6	21 (78)	31 (36)	
Procedure characteristics			
Procedure, n (%)			0.53
Central venous catheter	26 (96)	79 (93)	
Thoracentesis	1 (4)	6 (7)	
Location, n (%)			0.01
Ward	1 (4)	16 (19)	
Emergency department	11 (41)	12 (14)	
Intensive care unit	15 (56)	56 (66)	
Other	0 (0)	1 (1)	
Urgency, n (%)			0.33
Elective	4 (15)	18 (21)	
Urgent	19 (70)	59 (69)	
Emergent	4 (15)	8 (9)	
Time of Day, n (%)			0.11
8 AM to 5 PM	13 (48)	52 (61)	
5 PM to 11 PM	4 (15)	16 (19)	
11 PM to 8 AM	10 (37)	17 (20)	
Complications or problems, n (%) <sup>‡</sup>			0.45
Bleeding	0 (0)	6 (7)	
Pneumothorax	0 (0)	2 (2)	
Infection <sup>§</sup>	0 (0)	5 (6)	
Other <sup>  </sup>	2 (7)	7 (8)	
None	25 (93)	65 (76)	
Patient characteristics			
Number of comorbidities, mean (SD, range) <sup>¶</sup>	2.2 (1.3, 1-5)	2.7 (1.7, 0-7)	0.22
Number of medications associated with bleeding risk, mean (SD, range) <sup>#</sup>	0.9 (.93, 0-3)	1.1 (0.9, 0-3)	0.24

\* P value is reported as chi square for categorical variables, test of trend for ordinal variables, Wilcoxon rank sum for continuous variables, and Fisher's exact test for complications.

<sup>†</sup> At the time of the index procedure, residents reported the number of procedures they had performed previously.

<sup>‡</sup> Complications reported by trainees at the time of completing the procedure log or uncovered on retrospective chart review.

<sup>§</sup> Site infection or line-related bloodstream infection.

<sup>||</sup> Includes arrhythmia, arterial puncture, dry tap, and hypotension.

<sup>¶</sup> According to modified Deyo criteria for comorbidity index, which includes dementia, coronary artery disease, diabetes, chronic obstructive pulmonary disease, congestive heart failure, peptic ulcer disease, hypertension, immunosuppression, leukemia, kidney disease, liver disease, Hodgkins lymphoma, non-Hodgkins lymphoma, peripheral vascular disease, metastatic solid tumor, rheumatologic disease, stroke, any tumor, arrhythmia, and other.

<sup>#</sup> Includes: aspirin, ticlopidine, clopidogrel, dipyridamole, eptifibatide, tirofiban, aspirin/dipyridamole, heparin, anagrelide, argatroban, enoxaparin, pentoxifylline, abciximab, streptokinase, tissue plasminogen activator, urokinase, warfarin, cilostazol, or other medications that increase the risk of bleeding.

attending, is willing to confront problems, receptive to new information, able to acknowledge dependence on expertise, and able to apply new input with self-reliance. However, little is known about how this model manifests itself empirically in professional help-seeking or what the optimal conditions of faculty supervision are. One observational study

suggested that faculty who spent more time on hospital floors created environments with higher resident satisfaction scores, higher perceived quality of patient care, and, paradoxically, increased perceptions of autonomy.<sup>5</sup> These results are consistent with our previous work showing that residents' comfort with bedside procedures increased with use

of the MPS.<sup>2</sup> In the related field of consultation medicine, 2 studies<sup>6,7</sup> showed that family practitioners prefer to consult internal medicine subspecialists over general internists. One of these studies<sup>7</sup> demonstrated that the primary need was for a consultant with “technical” (ie, procedural) skills. Our use of MPS faculty who are specifically skilled in performing medical procedures appears to be consistent with this observation that specific technical expertise is valued over general supervision or guidance.

How can we best design formal procedural supervision programs that allow residents to obtain help when they need it? In addition to fostering mature help-seeking behavior, help-giving requires: (1) an environment that encourages help-seeking; (2) a mechanism to provide assistance when and where it is needed; (3) supervisors with technical expertise; and (4) supervision that supports learning, skill acquisition, and graduated autonomy. It is difficult to devise mechanisms that include all of these elements. For instance, 24-hour per day faculty coverage may be logistically challenging and expensive. Physicians with technical expertise may not be good teachers despite faculty development on procedural teaching. Obstacles to successful help-seeking may include differences in residents’ and supervisors’ perceptions about the need for supervision. For example, a supervisor may be available and willing to assist, but the resident may feel capable of performing independently. When assistance is provided, residents and supervisors may differ in their perceptions of the quality of supervision.<sup>8</sup> Ultimately, any educational intervention to increase supervision must confront a cultural norm of self-sufficiency among many residency programs, in which managing a situation without assistance is equated with competence. To address this issue, our hospital has mandated the use of the MPS for all bedside procedures since 2005 and staffed the program 24 hours a day, in recognition of the potential risk of procedural complications<sup>9,10</sup> among inexperienced trainees.

This study has several limitations. We had a small number of thoracenteses. The study was not designed or powered to examine differences in complication rates among MPS and non-MPS procedures. Because we represent a single institution, our findings may not be generalizable to other teaching hospitals or nonteaching settings. Our data on procedure characteristics were ascertained through resident self-reports and, though typically submitted in a timely way, are subject to recall bias. In particular, discrepancies in the reported level of urgency may have affected our results about the time-dependent nature of help-seeking. Additionally, our findings about the types of patients about which residents seek consultation are somewhat at odds; use of the modified Deyo criteria to adjust for clinical severity weighs chronic conditions heavily and may translate into complication risk, but the level of urgency may better reflect the acuity of the clinical presentation. We could not distinguish between resident-supervised procedures and those

performed without supervision because of limited data. We also acknowledge the possibility that some non-MPS faculty (classified for the study as “informal supervisors”) may serendipitously provide an equal quality of supervision that our MPS faculty did, by being present throughout the procedure and giving structured and valuable feedback.

Nevertheless, our results suggest that many residents do seek formal help appropriately when they perform procedures on the sickest patients, recognizing the risk and technical difficulty associated with bedside procedures in these patients. Our results also point to a greater area of inquiry: how do we optimally address the help-seeking needs among trainee physicians? How do we create an environment in which help-seeking is encouraged? How do we overcome the logistical barriers of providing timely assistance to residents, particularly at times of greatest need (urgent or emergent procedures)? How do we confront a longstanding culture in which independence is equated with competence, especially as it relates to procedural skills? A better understanding of how the widespread availability of programs like our MPS would affect the residents’ use of supervision in general may guide the design of resident curricula and the development of mechanisms to ensure safe and effective clinical care.

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