The Procedure Coordinator: A Resident-Driven Initiative to Increase Opportunity for Inpatient Procedures

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ABSTRACT

Background Training residents to become competent in common bedside procedures can be challenging. Some hospitals have attending physician–led procedure teams with oversight of all procedures to improve procedural training, but these teams require significant resources to establish and maintain.

Objective We sought to improve resident procedural training by implementing a resident-run procedure team without routine attending involvement.

Methods We created the role of a resident procedure coordinator (RPC). Interested residents on less time-intensive rotations voluntarily served as RPC. Medical providers in the hospital contacted the RPC through a designated pager when a bedside procedure was needed. A structured credentialing process, using direct observation and a procedure-specific checklist, was developed to determine residents' competence for completing procedures independently. Checklists were developed by the residency program and approved by institutional subspecialists. The service was implemented in June 2016 at an 850-bed academic medical center with 70 internal medicine and 32 medicine-pediatrics residents. The procedure service functioned without routine attending involvement. The impact was evaluated through resident procedure logs and surveys of residents and attending physicians.

Results Compared with preimplementation procedure logs, there were substantial increases postimplementation in resident-performed procedures and the number of residents credentialed in paracenteses, thoracenteses, and lumbar punctures. Fifty-nine of 102 (58%) residents responded to the survey, with 42 (71%) reporting the initiative increased their ability to obtain procedural experience. Thirty-one of 36 (86%) attending respondents reported preferentially using the service.

Conclusions The RPC model increased resident procedural training opportunities using a structured sign-off process and an operationalized service.

Introduction

The number of procedures general internists perform has decreased substantially over the last 30 years,[1–3] and the American Board of Internal Medicine (ABIM) no longer requires procedural competency for internal medicine (IM) residency graduates.[4] Resident opportunities to perform procedures have diminished, as a number of procedures formerly performed by internists are now being performed by interventional radiologists.[5]

In response, some institutions have created attending-run procedure teams[6–9] that have been shown to increase the volume of procedures performed, residents' comfort, and self-reported knowledge and competence.[8,9] Significant barriers to starting a procedure service include the financial investment required and the lack of proceduralists to staff the service.

We established a resident-driven procedure service that could function without direct attending supervision, with the goals of increasing residents' opportunities to perform procedures and developing a critical mass of residents who are competent in independently performing and supervising procedures.

Methods

We developed the role of resident procedure coordinator (RPC), a designated resident whom medical providers throughout the hospital could contact for inpatient procedures, including paracenteses, thoracenteses, central line insertions (including dialysis and apheresis catheters), lumbar punctures, and ultrasound-guided peripheral intravenous (PIV) insertions. The

DOI: http://dx.doi.org/10.4300/JGME-D-18-00399.1

Editor's Note: The online version of this article contains the surveys for residents and attending physicians/advanced practice professionals and checklists for direct observation of procedural competence.

TABLE 1
Outcomes of Procedure Request Calls Received by Resident Procedure Coordinator

	Postimplementation Year 1, n (%)	Postimplementation Year 2, n (%)
Procedure completed	321/473 (68)	298/463 (64)
Paracentesis	173/321 (54)	155/298 (52)
Thoracentesis	27/321 (8)	21/298 (7)
Lumbar puncture	28/321 (9)	50/298 (17)
Central line	28/321 (9)	17/298 (6)
Ultrasound-guided PIV	62/321 (19)	55/298 (18)
Other	3/321 (1)	0/298 (0)
Procedure not completed	152/473 (32)	165/463 (36)
Canceled[a]	81/473 (17)	113/463 (24)
Unsuccessful attempt	19/473 (4)	16/463 (3)
Uncomfortable with bedside	11/473 (2)	11/463 (2)
Performed by another service	41/473 (9)	25/463 (5)

Abbreviation: PIV, peripheral intravenous.
[a] Requesting team changed their decision regarding a need for the procedure or the patient declined to consent.

intervention was implemented in June 2016 at an 850-bed academic medical center with 70 IM and 32 medicine-pediatrics (med-peds) residents.

The name of the RPC and a dedicated pager number were e-mailed weekly to hospitalists, subspecialists, IM and med-peds residents, and advanced practice professionals (APPs). Interested resident volunteers spent 1-week intervals serving as RPC on less demanding rotations. The initial group of RPCs consisted of 8 IM residents. When a procedure was requested, the RPC could perform the procedure independently (if credentialed) or with supervision from a credentialed professional, or page a list of interested residents and offer the procedure to them. Every resident received secure e-mail notifications for all procedure requests. Patients could decline a resident performing a procedure on them and instead be referred to interventional radiology.

We also enhanced the process for credentialing residents to perform procedures independently. In its final form, credentialing residents to independently perform a specific procedure required (1) the completion of at least 5 of the procedures[4]; (2) resident attestation of completion of required readings and videos that demonstrate proper technique and complication avoidance, and recognition that their sign-off represented a minimal level of competency and they should continue to seek supervision from experienced professionals; and (3) the completion of a sign-off procedure in which a supervising resident or attending attested that the resident demonstrated successful and independent performance of all critical steps using an observation checklist (available as online supplemental material). We chose 5 procedures because this is the minimum number the ABIM specifies a resident should actively participate in to assure adequate knowledge and understanding.[4] Checklists were procedure specific, developed by the residency program, and approved by our institutional subspecialists with expertise in each procedure. If a resident attempted a sign-off procedure, but did not correctly complete the steps, this would be discussed during a postprocedure debriefing and the resident would continue to need supervision until successfully completing a sign-off procedure.

The impact of the initiative was measured through procedure coordinator call tracking and procedure logs on the residency procedure tracking platform MedHub (MedHub, Minneapolis, MN). Resident, hospitalist, APP, and subspecialist perspectives were assessed 1 year postimplementation through an anonymous online survey developed by the authors without further testing (provided as online supplemental material). Two authors (M.G. and B.M.) reviewed electronic patient charts 1 to 2 weeks after each procedure to verify which resident performed each procedure and to track complications.

This study was declared exempt from Institutional Review Board approval.

Results

The RPC received 473 procedure requests in year 1 and 463 in year 2 (TABLE 1). Of these, 619 requests (66%) resulted in a completed procedure, with 89% (549 of 619) of these completed the same day as the request. Cancellation of the procedure request and patient refusal of the procedure were the most common reasons for noncompletion of procedure requests (TABLE 1).

Residents logged 385 procedures in the year before the RPC, compared to 648 (a 68% increase) and 548

TABLE 2
Total Procedures per Individual Resident Logs in Residency Credentialing System

Procedure	Preimplementation Year (N = 96)		Postimplementation Year 1 (N = 102)		Postimplementation Year 2 (N = 106)	
	Procedures, n	Credentialed Residents, n (%)	Procedures, n	Credentialed Residents, n (%)	Procedures, n	Credentialed Residents, n (%)
Paracentesis	87	8 (8)	288[a]	30 (29)	269	40 (38)
Thoracentesis	33	1 (1)	62	4 (4)	71	7 (7)
Lumbar puncture	48	2 (2)	56	6 (6)	61	9 (8)
Central line	217	24 (25)	242	34 (33)	147	25 (24)

[a] Large increase in paracentesis compared to other procedures may have been due to increased requests from the institution's expanding transplant hepatology service.

(a 42% increase) in the 2 years postimplementation. The number of residents credentialed in paracentesis, thoracentesis, and lumbar puncture increased from preimplementation to 2 years postimplementation by factors of 5, 7, and 4.5, respectively (TABLE 2).

There were 5 complications that required patient transfer to a higher level of care, all of which were completed by credentialed residents. Two patients developed bleeding at the site of a paracentesis (1 procedure was directly supervised by an attending). One patient developed atrial fibrillation with rapid ventricular rate after 2 separate large volume paracenteses. The other patient had an arterial injury from a central line insertion, which prompted changes to our credentialing process and a department-wide policy change for how venous placement was confirmed prior to vessel dilation.

Fifty-nine of 102 (58%) residents responded to the survey 1 year postimplementation. Of these, 56 (95%) reported that bedside procedures were important to their education, and 42 (71%) reported that the initiative increased their ability to obtain procedural experience.

Fifty-six of 193 (29%) of the procedure "requesters" responded to the survey 1 year postimplementation, including 11 subspecialists, 20 APPs, and 25 hospitalists. Thirty-six (100%) of the attending respondents reported that a bedside procedure team was needed at our institution, and 31 (86%) reported preferentially using the RPC over other options including interventional radiology. The majority of attendings (85%, 17 of 20) who had requested ultrasound-guided PIVs reported that they had prevented the need for central lines. All attending respondents reported feeling confident that paracenteses would be performed safely and by a competent resident when calling the procedure team. Thirty of 32 (94%), 27 of 32 (84%), and 22 of 32 (69%), respectively, reported confidence in the safe performance of central lines, lumbar punctures, and thoracenteses. When asked if routine attending supervision would make them more likely to use the procedure team, 13 of 32 (41%) responded yes, 15 of 32 (47%) responded no, and 4 of 32 (13%) were unsure.

Discussion

Several studies described outcomes of attending-led bedside procedure services, but to our knowledge there are no previous reports describing a resident-driven bedside procedure service without routine attending involvement.[6–9] The RPC increased the total number of procedures available to residents. The availability of ultrasound-guided PIVs resulted in a perceived decrease in the need for more invasive central line insertion with its associated complications. Notably, a larger study found that ultrasound-guided PIV availability was associated with a decrease in central line insertion.[10] Despite the service being resident-driven and regulated, the service was used by attending physicians throughout the hospital and was perceived to be a safe alternative to interventional radiology. As the number of credentialed residents available to serve in supervisory roles increases, we anticipate a sustained increase in the rate of credentialing of other residents.

There were some limitations to the study. RPCs may not have been called as frequently as more residents became credentialed to independently perform procedures. This might have led to underestimation of numbers of procedures performed and/or missed complications. The surveys were developed by the authors without validity evidence, and items may have been interpreted differently than intended. There was a low response rate to the procedure "requesters" survey, which may not have captured the opinions of requesters who felt the intervention was unsuccessful. Finally, our single site intervention potentially limits generalizability of the findings to other institutions and specialties.

Future research is needed to determine if using a sign-off checklist approach correlates with a decrease in complications or failed procedure attempts by

trainees. Additional research could explore whether this process could be used to retrain hospitalists to perform bedside procedures.

Conclusion

Using a structured sign-off process and an operationalized service, we found that the RPC model was a feasible, effective way to increase procedural experience for residents at an institution without an attending-run procedure team.

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Funding: The authors report no external funding source for this study

Conflict of interest: The authors declare they have no competing interests.

An earlier version of the manuscript was a podium presentation at the Northeast Group on Educational Affairs Annual Conference, Rochester, New York, May 4–6, 2017.

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Received May 18, 2018; revisions received June 10, 2018, and July 11, 2018; accepted July 17, 2018.