October 1, 2019

Furman S. McDonald, MD, MPH
Senior Vice President for Academic and Medical Affairs
Professor of Medicine
American Board of Internal Medicine
510 Walnut Street, Suite 1700
Philadelphia, PA 19106

Dear Dr. McDonald,

Thank you for engaging with the Critical Care Medicine community as you consider the request to co-sponsor the forthcoming American Board of Medical Specialties (ABMS) Neurocritical Care (NCC) Certification Examination. We support the recommendation by The Critical Care Medicine Board that the ABIM become a co-sponsor for certification in Neurocritical Care.

Critical Care Medicine has always supported a multidisciplinary approach to education and patient care. Despite a specialty-focused foundation, program requirements defined by the respective review committees yield considerable overlap for training across specialties. The evolution of pathways for certification such as those now available for Emergency Medicine physicians in Critical Care Medicine support a multidisciplinary approach. The baseline proficiency in critical care medicine acquired in fellowship training in Critical Care Medicine (Internal Medicine) or Pulmonary & Critical Care Medicine provides an exceptional baseline for the added knowledge and skills that would be acquired in Neurocritical Care. Through recognition of this specialty and co-sponsorship of the certification, the care of patients who are critically ill from neurological causes has the potential to be improved and the education of trainees in this discipline will be enhanced. However, by excluding physicians with training in Critical Care Medicine (Internal Medicine), an important opportunity would be missed and the education of an important group of learners may be negatively impacted.

In 2016, **[enclosure 1]** Dhar et el surveyed Neurocritical Care fellowship program directors regarding their interests in pursuing accreditation. Of those who responded, the most common subspecialty affiliation for faculty was neurology (68%), followed by anesthesiology (15%), pulmonary/internal medicine (6%), surgery (4%), neurosurgery (3%), and emergency medicine (3%). 79% of programs reported that they accept applicants from Internal Medicine training programs and 52% reported that they had trained a fellow from Internal Medicine **[enclosure 2]** in the past three years. 70% of responding programs stated that they offered one-year positions for trainees with critical care board eligibility or certification.

While several years have passed since this was published, the paper reflects the diversity of faculty and trainees engaged in these programs, and the importance of ensuring that diplomates in Critical Care Medicine (CCM) are assured the opportunity to contribute to and train in this specialty as it continues to grow.

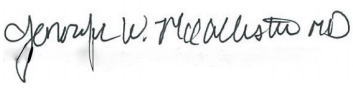
We appreciate and acknowledge the thoughtful approach that has been taken to consider the role of co-sponsorship of this specialty by the ABIM, and understand that the ABIM Board of Directors is currently seeking input from individuals certified in CCM or training in this discipline. However, we worry that the collective opinion of Diplomates in CCM at large may not accurately represent the needs of those who are currently engaged in training fellows in NCC or who currently have this

expertise and must be assured that their ability to gain certification will continue. We hope that you will consider that the voice of this smaller community should be amplified in this case, and considered above all others.

In summary:

1. We support the recommendation by the Critical Care Medicine Board that the ABIM Board of Directors vote to support ABIM co-sponsorship of neurocritical care certification.
2. We support a proposal that allows individuals who are diplomates of the ABIM and who complete an ACGME accredited neurocritical care fellowship to be eligible to take the Neurocritical Care certification examination.
3. We support a proposal that allows individuals who are diplomates of the ABIM who have been clinically active in Neurocritical Care to be eligible to take the certification examination via the practice pathway if they can document that they meet pre-specified criteria.

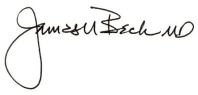
Sincerely,



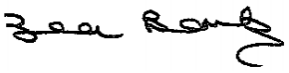
Jennifer McCallister, MD
Immediate Past President, Association of Pulmonary and Critical Care Medicine Program Directors

Peter Lenz, MD, MEd
President, Association of Pulmonary and Critical Care Medicine Program Directors

D. Craig Brater, MD
President and CEO, Alliance for Academic Internal Medicine



James Beck, MD, ATSF
President, American Thoracic Society



Zea Borok, MD, ATSF
President, Association of Pulmonary, Critical Care, and Sleep Division Directors

Clayton T. Cowl, MD, MS, FCCP
President, American College of Chest Physicians (CHEST)

Heatherlee Bailey, MD, FCCM
President, Society of Critical Care Medicine

frontiers in Neurology

ORIGINAL RESEARCH
published: 03 November 2017
doi: 10.3389/fneur.2017.00548

The State of Neurocritical Care Fellowship Training and Attitudes toward Accreditation and Certification: A Survey of Neurocritical Care Fellowship Program Directors

*Rajat Dhar[1†], Venkatakrishna Rajajee[2,3†], Anna Finley Caulfield[4], Matthew B. Maas[5,6], Michael L. James[7,8], Avinash Bhargava Kumar[9,10], Stephen A. Figueroa[11,12], David McDonagh[11,12,13] and Agnieszka Ardelt[14,15]**

[1] Department of Neurology, Washington University in St. Louis, St. Louis, MO, United States, [2] Department of Neurology, University of Michigan, Ann Arbor, MI, United States, [3] Department of Neurosurgery, University of Michigan, Ann Arbor, MI, United States, [4] Department of Neurology and Neurological Sciences, Stanford University School of Medicine, Stanford, CA, United States, [5] Department of Neurology, Northwestern University Feinberg School of Medicine, Chicago, IL, United States, [6] Department of Anesthesiology, Northwestern University Feinberg School of Medicine, Chicago, IL, United States, [7] Department of Neurology, Duke University Medical Center, Durham, NC, United States, [8] Department of Anesthesiology, Duke University Medical Center, Durham, NC, United States, [9] Department of Anesthesiology, Vanderbilt University Medical Center, Nashville, TN, United States, [10] Department of Critical Care Medicine, Vanderbilt University Medical Center, Nashville, TN, United States, [11] Department of Neurological Surgery, University of Texas Southwestern, Dallas, TX, United States, [12] Department of Neurology, University of Texas Southwestern, Dallas, TX, United States, [13] Department of Anesthesia and Pain Management, University of Texas Southwestern, Dallas, TX, United States, [14] Department of Neurology (Neurosurgery), University of Chicago, Chicago, IL, United States, [15] Department of Surgery (Neurosurgery), University of Chicago, Chicago, IL, United States

Neurocritical care as a recognized and distinct subspecialty of critical care has grown remarkably since its inception in the 1980s. As of 2016, there were 61 fellowship training programs accredited by the United Council for Neurologic Subspecialties (UCNS) in the United States and more than 1,000 UCNS-certified neurointensivists from diverse medical backgrounds. In late 2015, the Program Accreditation, Physician Certification, and Fellowship Training (PACT) Committee of the Neurocritical Care Society (NCS) was convened to promote and support excellence in the training and certification of neurointensivists. One of the first tasks of the committee was to survey neurocritical care fellowship training program directors to ascertain the current state of fellowship training and attitudes regarding transition to Accreditation Council for Graduate Medical Education (ACGME) accreditation of training programs and American Board of Medical Specialties (ABMS) certification of physicians. First, the survey revealed significant heterogeneities in the manner of neurocritical care training and a lack of consistency in requirements for fellow procedural competency. Second, although a majority of the 33 respondents indicated that a move toward ACGME accreditation/ABMS certification would facilitate further growth and mainstreaming of training in neurocritical care, many programs do not currently meet administrative requirements and do not receive the

OPEN ACCESS

Edited by:
Barak Bar, Loyola University Medical Center, United States

Reviewed by:
Dedrick Jordan, University of North Carolina at Chapel Hill, United States
Rick Gill, Hospital of the University of Pennsylvania, United States

***Correspondence:**
Agnieszka Ardelt
aaardelt@yahoo.com

†These authors have contributed equally to this work.

Specialty section:
This article was submitted to Neurocritical and Neurohospitalist Care, a section of the journal Frontiers in Neurology

Received: *06 June 2017*
Accepted: *27 September 2017*
Published: *03 November 2017*

Citation:
Dhar R, Rajajee V, Finley Caulfield A, Maas MB, James ML, Kumar AB, Figueroa SA, McDonagh D and Ardelt A (2017) The State of Neurocritical Care Fellowship Training and Attitudes toward Accreditation and Certification: A Survey of Neurocritical Care Fellowship Program Directors. Front. Neurol. 8:548. doi: 10.3389/fneur.2017.00548

level of institutional support that would be needed for such a transition. In summary, the results revealed that there is an opportunity for future harmonization of training standards and that a transition to ACGME accreditation/ABMS certification is preferred. While the results reflect the opinions of more than half of the survey respondents, they represent only a small sample of neurointensivists.

Keywords: neurocritical care, fellowship, training, certification, accreditation

INTRODUCTION

Critical care as a dedicated medical subspecialty developed largely because of scientific and technological innovations which allowed the support of patients through catastrophic illness involving organ failure. Neurocritical care as a subspecialty of critical care began in the 1980s as physicians caring for critically ill neurologic patients recognized their unique challenges and formed dedicated intensive care units (ICUs) to optimize their care (1). The Neurocritical Care Society (NCS) was founded in 2002, approximately 20 years after the clinical practice began, and the first annual society meeting was held 1 year later, in 2003 (2). Since then, neurocritical care has grown remarkably: as of 2017, the NCS has over 2,000 members from 50 countries comprising physicians, trainees, nurses, advanced practice providers, and pharmacists (3). Ensuring that a respected and rigorous mechanism exists for certification of physicians in this relatively new field and that future neurointensivists receive high-quality training are cornerstones of the development of the field and acceptance into the mainstream of critical care.

In the United States, accreditation of training programs and certification of physicians are managed by non-governmental, non-profit, self-governed organizations. The Accreditation Council for Graduate Medical Education (ACGME) is the most influential of the training program accrediting bodies, while the member boards of the American Board of Medical Specialties (ABMS) are examples of individual physician certifying bodies. ACGME and ABMS boards require a critical mass of practitioners and specific milestones to confirm that a specialty is clearly defined, recognized, and self-sustaining. Before the 1980s, there was no certification offered in critical care medicine. In September 1980, the ABMS approved the multidisciplinary subspecialty of Critical Care Medicine, and beginning in the late 1980s, individual ABMS member boards provided certification in several critical care subspecialties with overlapping competencies but distinct scopes of practice (4).

Although the foundation of neurocritical care as a valuable independent critical care subspecialty has been propagated by dedicated practitioners for over three decades, accredited training in this field is just completing its first decade. As a relatively new subspecialty, neurocritical care did not initially have the requisite membership and track record to be considered for accreditation and certification through the ACGME–ABMS system but, rather, was developed through the United Council for Neurologic Subspecialties (UCNS). The aim of the UCNS and similar organizations was to organize and structure subspecialties that were not yet prepared for inclusion by the ACGME–ABMS. The UCNS was launched in 2003 with the support of five parent professional organizations representing clinical neuroscience practitioners. The first certificates in neurocritical care were issued in 2007, and fellowship program accreditation followed in 2008.[1]

As of 2017, there were 1,240 UCNS-certified physician neurointensivists with diverse backgrounds including neurology, internal medicine, emergency medicine, and anesthesiology (5). Arguably, neurocritical care in the United States has reached a state of maturity, as training is now offered through 66 UCNS-accredited neurocritical care fellowships (6). In addition to the 2-year fellowship training pathway, a 1-year fellowship is offered by UCNS to neurosurgery residents with at least 4 years of post-graduate clinical training and to fellows who have completed 1 year of post-graduate fellowship training in anesthesiology critical care, surgical critical care, or internal medicine critical care (7). Neurosurgeons also have an alternate pathway to neurocritical care certification through the Committee on Advanced Subspecialty Training (CAST) of the Council of The Society of Neurological Surgeons.[2]

Given the growth and maturation of neurocritical care, accreditation through the ACGME–ABMS pathway is the subject of much discussion among neurointensivists. The Program Accreditation, Physician Certification, and Fellowship Training (PACT) Committee of the NCS was convened to support and promote excellence in training and certification of neurointensivists, and one of the first tasks of the committee was to review the current state of fellowship training. In 2016, a survey was developed by the PACT Committee and e-mailed to fellowship directors to ascertain the level of institutional support, training environment, and challenges faced at this stage of the field's evolution. The PACT Committee specifically explored how the current UCNS pathway for accreditation of fellowship programs and certification of graduates was perceived and what program directors thought about the transition to the ACGME–ABMS pathway.

MATERIALS AND METHODS

Survey questions were compiled from ideas submitted by the members of the PACT Committee and addressed program accreditation, practitioner certification, institutional support, program director responsibilities, faculty and service structure characteristics, trainee characteristics, and training milestones.

[1] www.ucns.org.

[2] https://www.societyns.org/fellowships/index.asp.

Respondents were provided opportunities to select categorical answers or numerical entries as well as to enter free-text comments or numbers. Once the committee members were satisfied with survey content, the survey was operationalized using Survey Monkey.[3] An initial e-mail informing the program directors of the upcoming survey was sent by the NCS administrative office on June 16, 2016; the first e-mail containing the survey was sent to 54 program directors on July 13, 2016; and a reminder e-mail was sent on July 20, 2016. Survey results were analyzed beginning on September 13, 2016.

RESULTS

Surveys were e-mailed to program directors of 54 of the 57 fellowship programs in existence at the time of the survey, and 33 (61%) of program directors queried completed the surveys. Survey questions and responses are shown in online Supplementary Material.

Fellowship Accreditation

Thirty-two of 33 (97%) respondents reported UCNS accreditation, while 12 of 31 (39%) reported concomitant CAST accreditation. Among the 12 institutions offering both UCNS-accredited and CAST-accredited neurocritical care fellowships, 2 (17%) had a common program director and 11 (92%) shared faculty.

Of 32 respondents, 22% indicated that neurocritical care not being included in the ACGME–ABMS pathway may adversely affect candidate recruitment, and 35% felt that job opportunities available to graduating fellows may be adversely affected. However, 52% (15/29) felt that the ACGME–ABMS pathway would best facilitate integration of neurocritical care into the critical care mainstream in the future, and 68% (21/31) indicated that ACGME accreditation would be preferred as a vehicle for supporting future growth of neurocritical care as a field. Additionally, 69% (22/32) of respondents similarly indicated that ABMS certification was preferred, while 25% (8/32) preferred the UCNS and 6% (2/32) CAST, for future growth.

Institutional Support

Approximately half (16/33, 48%) of the responding program directors indicated that they receive institutional support, 30% (10/33) receiving protected time/effort and 18% (6/33) receiving a fixed stipend. The median designated effort reported was 8.5% (IQR 5–10).

Slightly over half of respondents (17/33, 52%) reported having an administrative coordinator with at least a fractional Full Time Equivalent dedicated to the neurocritical care fellowship, but only 18% (6/33) received salary support from the institution for the administrative coordinator.

Approximately three-quarters (25/33, 76%) of programs received institutional support for fellow salaries; one-third (11/33, 33%) utilized clinical revenue for fellow salaries. When institutional support for fellow salaries was provided, all fellows in the program were supported in 20/25 (80%) programs. Among these 20 programs which received salary support for all fellows in the program, the entire salary for each fellow was covered in 15 (75%), and only half of the salary was covered in the remaining 5 (25%). Among programs that received institutional support for fellow salaries, 59% reported that support provided to neurocritical care fellows was not different from that provided to fellows in ACGME-accredited programs at their institution. Three (9%) of 33 directors reported using clinical revenue to support fellows' research projects.

Administrative Responsibilities of Program Directors

Fellowship directors were queried about current administrative responsibilities such as would be required of an ACGME-accredited fellowship (**Figure 1**). While all programs were already completing semi-annual evaluations of their fellows, slightly more than half met other requirements such as having committees for program evaluation and clinical competency. Nonetheless, 69% (22/32) of fellowship directors did not consider fulfilling of all these administrative responsibilities to be unreasonably burdensome.

Program Faculty

The median number of faculty associated with the training programs surveyed was five; nine programs had eight or more faculty members affiliated with the fellowship, while 18 programs had seven or fewer. Of the 223 faculty members affiliated with fellowships, 149 (67%) were UCNS-certified in neurocritical care. The most common subspecialty affiliation was neurology (68%), followed by anesthesiology (15%), pulmonary/internal medicine (6%), surgery (4%), neurosurgery (3%), and emergency medicine (3%).

ICU Structure and Coverage Logistics

Sixty percent of respondents characterized their ICUs as "open," with open units defined as those in which services other than neurocritical care admit patients and enter orders, in contrast to closed units where admission and order entry are under the sole purview of the neurocritical care service.

The number of ICUs covered by the programs' faculty and fellows ranged from one to seven with the majority covering one (53% of 28) or two (36% of 28). Forty two percent of programs included a step-down unit. In terms of the number of beds covered, the responses ranged from 8 to 54, with a median of 23. The question did not specify the type of beds, ICU or step-down, or whether overflow patients in other patient care areas could be included in the response. Most programs (78%) reported that attending physicians and fellows provided consultations outside of their parent ICU.

Ninety-seven percent of programs included residents on the ICU team; 88% included acute care nurse practitioners; and 62% included physician assistants. Of those programs with advanced practice providers, 89% had advanced practice providers who were dedicated to the neurocritical care service. Thirty-two

[3]https://www.surveymonkey.com/.

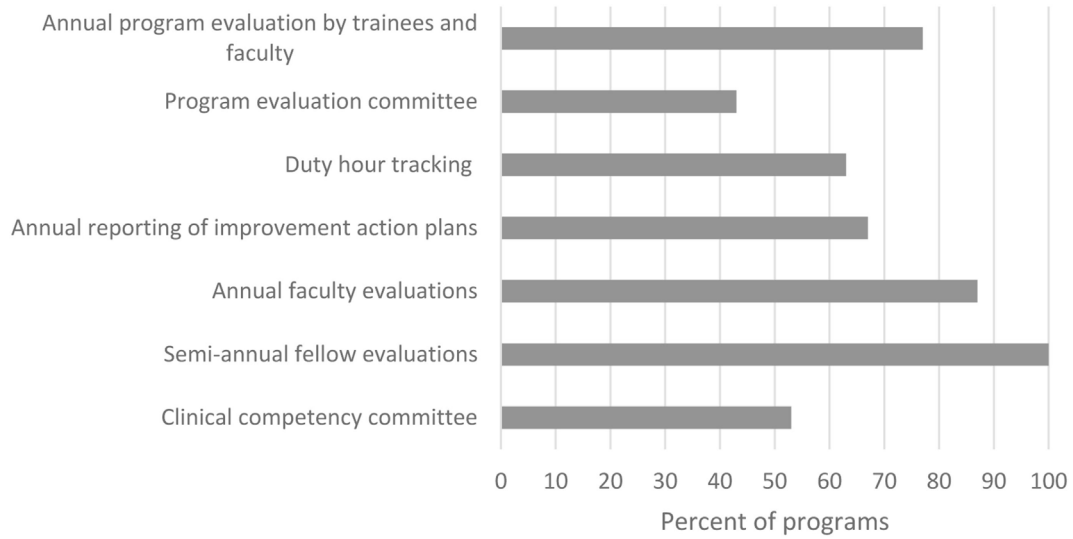


FIGURE 1 | Administrative program requirements reported by 30 fellowship directors.

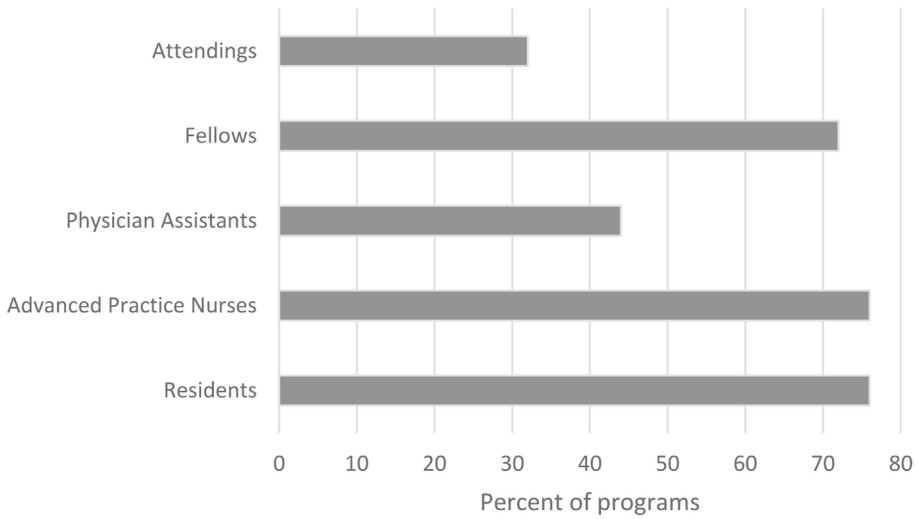


FIGURE 2 | Night-time in-house coverage by provider type reported by 25 respondents.

percent of the programs had night-time in-house attending coverage; the remainder had combinations of residents, fellows, and advanced practice providers in-house 24/7 (**Figure 2**).

Fellow Recruitment and Characteristics

Nearly all of responding fellowship programs (27/29, 93%) participated in the San Francisco Match system,[4] although 55% (16/29) reported also offering positions outside of the match. All programs accepted candidates from neurology, and the majority accepted candidates from neurosurgery (25/29, 86%), internal medicine (23/29, 79%), anesthesiology (22/29, 76%), and emergency medicine (21/29, 72%). Two programs (7%) accepted candidates from pediatric neurology and one (3%) from general pediatrics. For the past 3 years, the majority of neurocritical care fellows in training were from the primary specialty of neurology (126 fellows). Internal medicine (15), emergency medicine (7), anesthesia (7), and neurosurgery (2) were less represented.

Sixty-two percent of programs (18/29) required applicants to complete an ACGME or Royal College of Physicians and Surgeons of Canada-accredited residency program. Twenty five of 28 (89%) programs supported J1 visas; 11/28 (39%) H-1B visas; and 9/28 (32%) O-1 visas. Seventy-two percent (21/29) offered 1-year training programs for neurosurgeons and candidates with critical care board eligibility/certification.

[4] www.sfmatch.org

Most of the programs (20/28, 71%) credentialed fellows as post-graduate trainees; the remainder credentialed fellows as faculty.

Fellow Procedure Training and Billing

Most program directors (19/28, 68%) indicated that procedural volumes should be mandated, but there was a wide variation as to procedural requirements and even whether specific procedures were required as part of training (**Table 1**). All responding program directors required central venous and arterial line placement procedures. Few responding program directors had a required number for bedside tracheostomy and intracranial pressure monitor placement. Approximately one-quarter of responding fellowship programs (7/29, 24%) allowed fellows to independently charge/bill for evaluation and management (E/M) services and procedures.

DISCUSSION

This is the first comprehensive survey of neurocritical care fellowship training program directors and occurs at a time when changes to accreditation and certification are being pursued. Survey responses provide an overview of the state of training of this maturing field from the point of view of program directors of 33 training programs, which is currently representative of over half of the accredited programs. The main findings are that (1) most program directors favor the ACGME–ABMS pathway as a vehicle for future integration of neurocritical care into mainstream critical care; and (2) there is heterogeneity of institutional structures (open versus closed units, logistics of care provision, and level of fellow independence) and wide variation in procedural requirements among neurocritical care training programs.

Almost all survey respondents directed UCNS-accredited programs, and while UCNS-certification was not thought to be detrimental to fellow recruitment and post-graduate careers, more than half of the respondents indicated that future acceptance and integration of the subspecialty could benefit from ACGME accreditation and ABMS certification. Overall, neurocritical care fellowship programs received less institutional support than comparable fellowships governed by ACGME. While most programs received salary support for fellows, only half received support for the director, and most did not receive support for the administrative coordinator. Per ACGME guidelines, such support would be mandated and would represent a shift from what is currently provided to training programs at many institutions (8). Likewise, ACGME-mandated administrative tasks were already performed in most, but not all, programs. Adherence to these tasks by all programs after transitioning to ACGME accreditation could, therefore, increase costs and administrative burdens, requiring resource shifting or increased resources. There could also be other consequences of a transition to ACGME–ABMS: for example, as faculty-fellows would be disallowed, the change from billing to non-billing fellows might affect the financial viability of some programs. In all, the number of programs able to meet the rigorous ACGME accreditation requirements could be fewer than currently exists under the UCNS system. On the other hand, the number of training programs and fellows may not grow under the UCNS system as many hospitals' GME offices give credentialing and funding preference to ACGME-accredited programs.

TABLE 1 | Procedural requirements in neurocritical care fellowships.

				Procedural requirements, % respondents				
	Number of respondents	Procedure not required[a], % respondents	No procedural minimum, % respondents	≤5	10	15	20	≥25
Central venous line	25	0	20	20[b]	40[c]	8	8	4
Arterial line	25	0	24	28[b]	36[c]	0	4	8
Endotracheal intubation	24	8	13	8	17	13[c]	21[b]	21
Thoracentesis	22	14	36	36	14	0	0	0
Paracentesis	21	14	43	29	14	0	0	0
Bronchoscopy	24	21	25	8	33[b]	0	13	0
Bedside tracheostomy	21	62	19	0	0	0	14	5
Critical care ultrasound	21	33	38	5	5	5	10	5
Transcranial Doppler	23	26	30	0	0	0	4	39[d]
Carotid ultrasound	20	45	35	0	0	0	0	20[e]
Lumbar puncture	24	13	42	29[f]	17	0	0	0
Lumbar drain	21	48	29	14	5	5	0	0
Intracranial pressure monitor	21	52	33	0	5	5	5	0
Pulmonary artery catheter	21	19	43	19	19	0	0	0

The question regarding required minimum volumes for procedural competency appears to have been interpreted in two ways: (1) the minimum necessary for the fellow to complete prior to doing the procedure unsupervised during fellowship or (2) the minimum necessary to complete by the end of fellowship.

[a]*Not required, not applicable, or to be determined.*

[b]*One respondent reported that this was the number of supervised procedures required before independence.*

[c]*One respondent reported this as the number required per year.*

[d]*One reported 50 required; one required 50 performed and 100 read; and seven programs required 100.*

[e]*One program required 25; three required 100.*

[f]*One indicated 5 was a requirement for fellows without neurology training.*

The survey also revealed significant heterogeneity in fellowship training in neurocritical care related to differences in institutional structures as well as wide variation in fellow procedural requirements. While neurology is the major source of fellows, program faculty show a broader representation of backgrounds including a significant number from anesthesiology and other critical care subspecialties. Programs vary in whether they support foreign-trained or visa-sponsored trainees, something that would likely be standardized under ACGME. Although many programs accept candidates into 1-year pathways for neurosurgeons and those with prior critical care training, the percentage of graduates who have completed this track in recent years is unknown.

Fellows train within both open and closed units, and work with residents, advanced practice providers, and faculty. Most coverage models have 24/7 in-house coverage, with fellows as over-night providers in 72%, most often without a night-time attending in-house. Approximately one-quarter of fellows are credentialed as attendings and can bill independently for E/M services and procedures. As previously discussed, with transition to the ACGME–ABMS pathway, revenue in programs where fellows are so credentialed could decline, as independent billing would no longer be permitted.

While the heterogeneous background of faculty, trainees, and the institutional variations complicate the structure of neurocritical care training, they are not unique to neurocritical care. In fact, such heterogeneity is common among the currently recognized ACGME–ABMS disciplines (9).

Variation was also the theme of fellow procedural competency requirements. Although some caution needs to be exercised in the analysis of the results due to different interpretations of "minimum volumes required," most fellowship directors indicated that there should be specific requirements. Central venous catheter insertion and arterial catheter insertion appeared universally incorporated into fellowship training, but there was significant variability among programs in what was considered a minimum number required for competency. Procedures such as endotracheal intubation, thoracentesis, and intracranial procedures produced an even broader range of responses, from not being required to having various required minimums. These results highlight the current uncertainty around procedural requirements which could potentially lead to variable fellow competency on entry into independent practice. The results, however, also suggest an opportunity to derive consensus about procedural competency in neurocritical care which could lead to future standardization of requirements across training programs (10).

In conclusion, the subspecialty of neurocritical care has transitioned from a few scattered programs accepting and training fellows in an *ad hoc* manner to 66 fellowship training programs currently, most which are formally accredited by the UCNS and, therefore, offer a pathway to UCNS physician certification. The current broad training requirements have allowed many institutions with diverse ICU structures and faculty to match and train fellows in neurocritical care, but given the current maturity level of the subspecialty, an opportunity may exist to standardize some of the training, such as procedural competency. The finding with the greatest potential implications for the subspecialty, however, is that more than half of the survey respondents believe that the ACGME–ABMS pathway is more desirable than the current UCNS pathway going forward. Caution needs to be exercised when interpreting this finding: while this survey represents more than half of neurocritical care fellowship directors, it contains only a small sample of all neurointensivists and may not be reflective of the attitudes of the field as a whole.

AUTHOR CONTRIBUTIONS

All authors made substantial contributions to the design of the survey; analysis of the data; drafting, revision, and approval of the manuscript. All authors are accountable for the accuracy and integrity of the work. RD and VR contributed equally to manuscript preparation.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at http://www.frontiersin.org/article/10.3389/fneur.2017.00548/full#supplementary-material.

REFERENCES

1. Bleck TP. Historical aspects of critical care and the nervous system. *Crit Care Clin* (2009) 25:153–64. doi:10.1016/j.ccc.2008.12.004
2. Wijdicks EFM. The history of neurocritical care. *Handb Clin Neurol* (2017) 140:3–14. doi:10.1016/B978-0-444-63600-3.00001-5
3. *Neurocritical Care Society: Membership Benefits*. (2017). Available from: www.neurocriticalcare.org/Membership/Membership-Benefits
4. Grenvik A. Subspecialty certification in critical care medicine by American specialty boards. *Crit Care Med* (1985) 13:1001–3. doi:10.1097/00003246-198512000-00001
5. *UCNS Diplomates Certified in Neurocritical Care*. (2017). Available from: www.ucns.org/globals/axon/assets/12425.pdf
6. *Fellowships in Neurocritical Care*. (2017). Available from: www.ucns.org/apps/directory/index.cfm?event=public.program.searchResults&subspecialty_ids=5&inst_state=&submit=Start+Search
7. *UCNS Certification in Neurocritical Care Eligibility Criteria and Information for Applicants*. (2017). Available from: www.ucns.org/globals/axon/assets/12386.pdf
8. *Specialty-specific References for DIOs: Expected Time for Coordinator (ACGME)*. (2017). Available from: https://www.acgme.org/Portals/0/PDFs/Specialty-specific%20Requirement%20Topics/DIO-Expected_Time_Coordinator.pdf
9. Nadig NR, Vanderbilt AA, Ford DW, Schnapp LM, Pastis NJ. Variability in structure of university pulmonary/critical care fellowships and retention of fellows in academic medicine. *Ann Am Thorac Soc* (2015) 12:553–6. doi:10.1513/AnnalsATS.201501-026BC
10. Buckley JD, Addrizzo-Harris DJ, Clay AS, Curtis JR, Kotloff RM, Lorin SM, et al. Multisociety task force recommendations of competencies in pulmonary and critical care medicine. *Am J Respir Crit Care Med* (2009) 180:290–5. doi:10.1164/rccm.200904-0521ST

Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Enclosure 2

Supplementary Material

The State of Neurocritical Care Fellowship Training and Attitudes Toward Accreditation and Certification: A Survey of Neurocritical Care Fellowship Program Directors

Rajat Dhar, Venkatakrishna Rajajee, Anna Finley Caulfield, Matthew Maas, Michael James, Avinash Bhargava Kumar, Stephen A. Figueroa, David McDonagh, Agnieszka Ardelt*

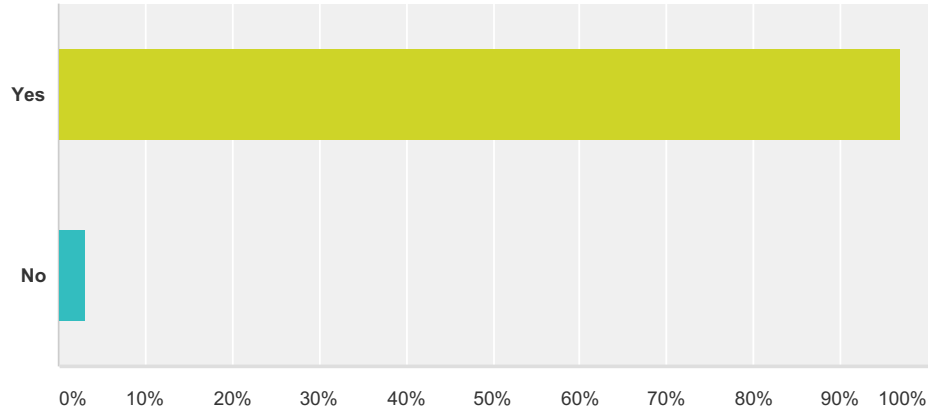
***Correspondence:** aaardelt@yahoo.com

1 Supplementary Data

Neurocritical care fellowship program directors survey: raw survey responses.

Q1 Is your neurocritical care fellowship program accredited by the UCNS?

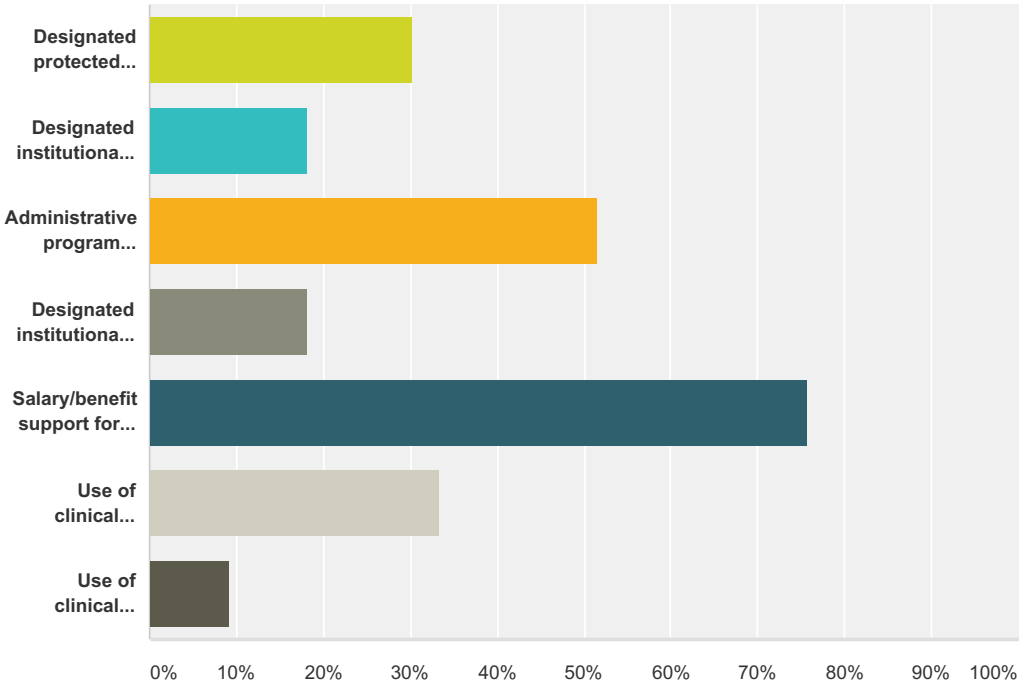
Answered: 33 Skipped: 0



Answer Choices	Responses	
Yes	**96.97%**	32
No	**3.03%**	1
Total		**33**

Q2 What forms of institutional program support does your neurocritical care fellowship receive (mark all that apply)?

Answered: 33 Skipped: 0



Answer Choices	Responses
Designated protected time/effort for the neurocritical care fellowship program director. This means a specific percentage of the program director's full time job is set aside for directing the fellowship and is funded institutionally, rather than by grants or clinical work.	30.30% 10
Designated institutional stipend for the neurocritical care fellowship program director. This means a specific dollar amount is set aside to compensate the program director for his/her work related to directing the fellowship, regardless of the actual effort expended. The stipend is funded institutionally, rather than by grants or clinical work.	18.18% 6
Administrative program coordinator for fellowship. This position must have at least a fractional FTE specifically designated for fellowship program administrative support.	51.52% 17
Designated institutional salary support for an administrative program coordinator.	18.18% 6
Salary/benefit support for fellows from the institution.	75.76% 25
Use of clinical revenue to support fellows' salaries.	33.33% 11
Use of clinical revenue to support projects.	9.09% 3
Total Respondents: 33	

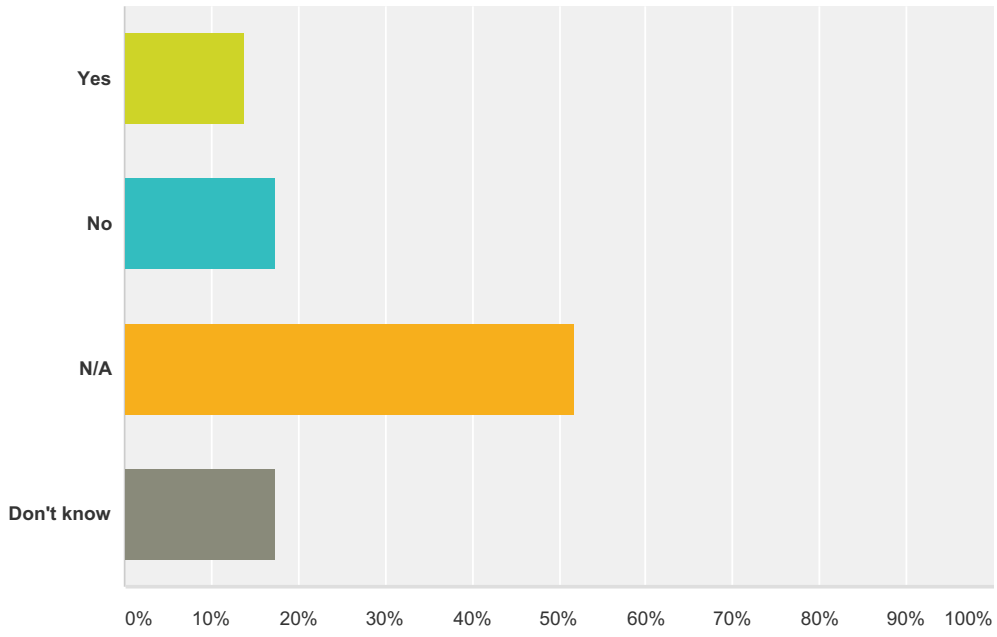
Q3 If there is designated/protected time for the neurocritical care fellowship director, what % effort is protected (please write in)? Those funded by a fixed stipend, please leave this question blank and mark N/A for Question 4.

Answered: 18 Skipped: 15

20% = 1
15% = 1
10% = 2
6% for one fellow, 10% when there are 2 fellows
5% = 5
.1 FTE = 1
.07 FTE = 1
0% = 3
NA = 3
percentage time but no fixed stipend given

Q4 If there is designated/protected time for the neurocritical care fellowship director, is the percent of designated/protected time different than for Accreditation Council for Graduate Medical Education (ACGME) - accredited programs at your institution?

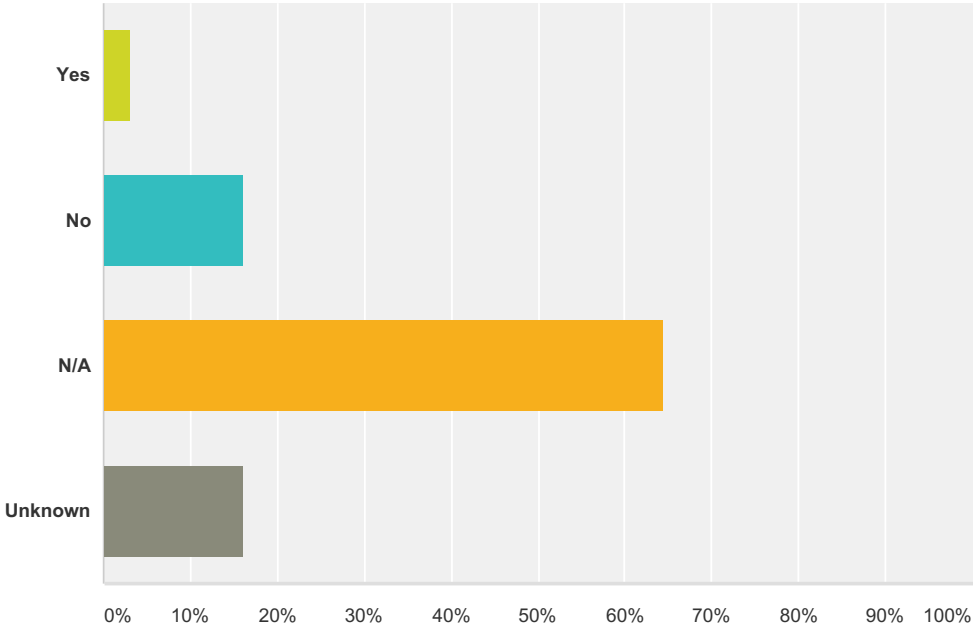
Answered: 29 Skipped: 4



Answer Choices	Responses	
Yes	13.79%	4
No	17.24%	5
N/A	51.72%	15
Don't know	17.24%	5
Total		29

Q5 If there is a designated institutional stipend for the neurocritical care fellowship director, is the amount of the stipend different than for ACGME - accredited programs at your institution? Those funded by percent effort rather than a fixed stipend should mark N/A here.

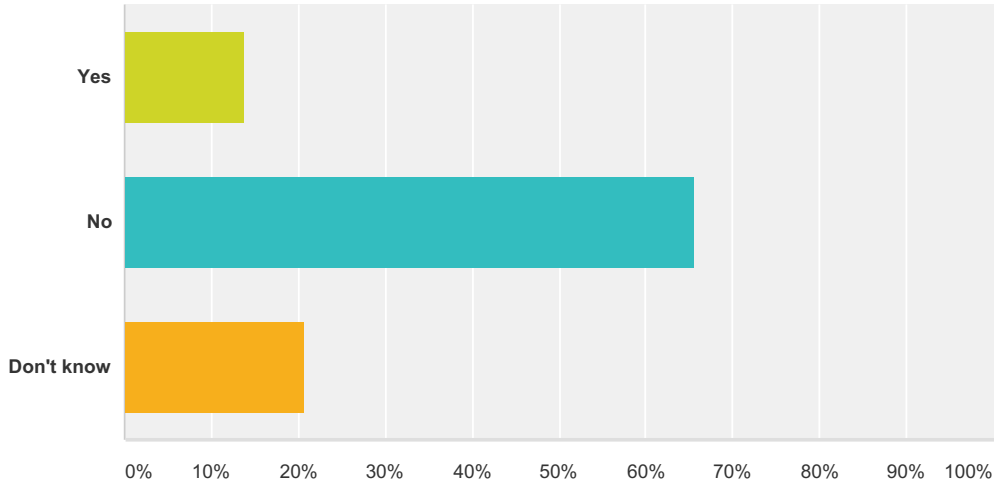
Answered: 31 Skipped: 2



Answer Choices	Responses	
Yes	3.23%	1
No	16.13%	5
N/A	64.52%	20
Unknown	16.13%	5
Total		31

Q6 If there is an administrative program coordinator for the neurocritical care fellowship, is this different than for ACGME - accredited programs at your institution?

Answered: 29 Skipped: 4



Answer Choices	Responses	
Yes	**13.79%**	4
No	**65.52%**	19
Don't know	**20.69%**	6
Total		**29**

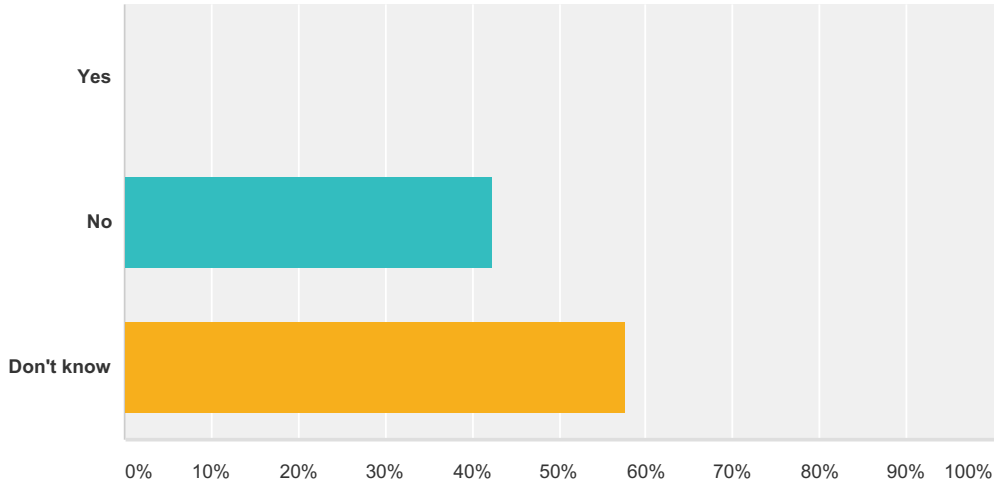
Q7 If there is designated institutional salary support for the neurocritical care fellowship administrative program coordinator, what % effort is institutionally supported (please write in)?

Answered: 13 Skipped: 20

#	Responses	Date
1	N/A	7/22/2016 10:34 AM
2	n/a	7/22/2016 8:12 AM
3	this comes from clinical income	7/20/2016 7:47 PM
4	100%	7/20/2016 2:34 PM
5	It's not specified, but rather "fellowship" activities are listed as part of her job description, which I am told is not unlike other subspecialities with small fellowship programs at our institution.	7/15/2016 6:15 PM
6	I don't know the percentage	7/14/2016 3:43 PM
7	None	7/14/2016 11:05 AM
8	30%	7/13/2016 9:59 PM
9	None	7/13/2016 6:02 PM
10	Na	7/13/2016 5:48 PM
11	I don't know	7/13/2016 5:23 PM
12	don't know	7/13/2016 4:54 PM
13	NA	7/13/2016 4:29 PM

Q8 If there is designated institutional salary support for the neurocritical care fellowship administrative program coordinator, is this different than for ACGME - accredited programs at your institution?

Answered: 26 Skipped: 7



Answer Choices	Responses	
Yes	**0.00%**	0
No	**42.31%**	11
Don't know	**57.69%**	15
Total		**26**

Q9 If there is salary/ benefit support for neurocritical care fellows from the institution, how many fellows receive institutional support (please write how many out of the total)?

Answered: 26 Skipped: 7

#	Responses	Date
1	4 out of 4	7/22/2016 1:03 PM
2	7/7	7/22/2016 10:34 AM
3	2/4	7/22/2016 8:12 AM
4	1	7/21/2016 12:46 PM
5	None	7/20/2016 7:47 PM
6	4 of 4	7/20/2016 5:12 PM
7	4 (all)	7/20/2016 3:34 PM
8	all two of them per year	7/20/2016 3:13 PM
9	4/4	7/20/2016 2:34 PM
10	7	7/20/2016 9:24 AM
11	2/2 (1 per year for 2 year accredited fellowship) First year funded by hospital Second year funded through Vascular neurology ACGME fellowship slot and they have to meet Vascular Neurology requirements in addition to UCNS NCC requirements.	7/19/2016 12:45 PM
12	9/9	7/18/2016 5:07 PM
13	All	7/15/2016 6:15 PM
14	6/6	7/14/2016 5:19 PM
15	4 of 5/year	7/14/2016 3:43 PM
16	1	7/14/2016 11:05 AM
17	2 out of 2	7/13/2016 9:59 PM
18	4 fellows	7/13/2016 9:41 PM
19	9	7/13/2016 8:03 PM
20	None	7/13/2016 6:02 PM
21	3 of 4	7/13/2016 5:48 PM
22	They receive salary, benefits, and trip / travel reimbursement for presentations, talks, and basic memberships	7/13/2016 5:23 PM
23	2/2	7/13/2016 4:54 PM
24	One	7/13/2016 4:38 PM
25	1	7/13/2016 4:29 PM
26	5/5	6/22/2016 11:18 AM

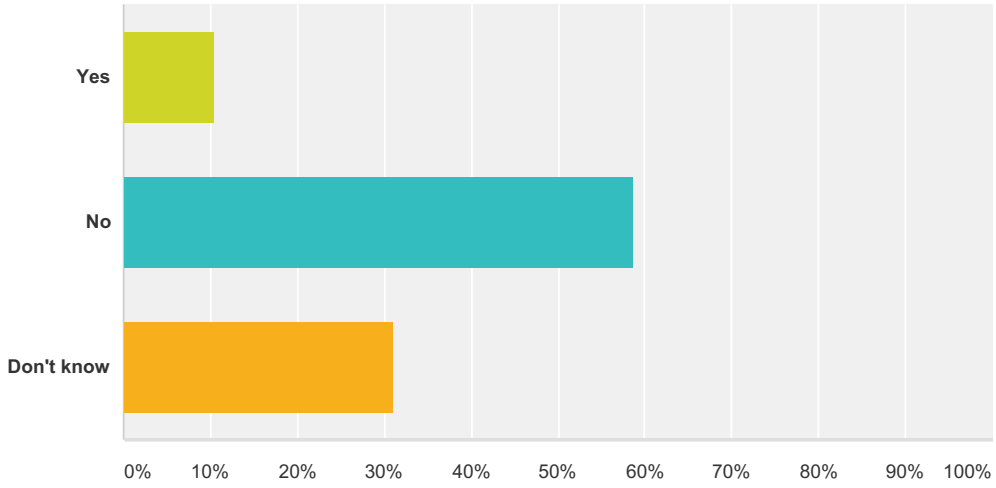
Q10 If there is salary/ benefit support for neurocritical care fellows from the institution, what % FTE is supported (please write in)?

Answered: 23 Skipped: 10

#	Responses	Date
1	50%	7/22/2016 1:03 PM
2	100	7/22/2016 10:34 AM
3	1.0	7/22/2016 8:12 AM
4	1.0	7/21/2016 12:46 PM
5	None	7/20/2016 7:47 PM
6	Hospital 100%	7/20/2016 5:12 PM
7	100%	7/20/2016 3:34 PM
8	100%	7/20/2016 2:34 PM
9	100	7/20/2016 9:24 AM
10	100%	7/19/2016 12:45 PM
11	They are fully supported by the institution	7/18/2016 5:07 PM
12	100%	7/15/2016 6:15 PM
13	100% of the 4. 0% of the 5th	7/14/2016 3:43 PM
14	0.5	7/14/2016 11:05 AM
15	100%	7/13/2016 9:59 PM
16	100%	7/13/2016 9:41 PM
17	100%	7/13/2016 8:03 PM
18	None	7/13/2016 6:02 PM
19	Full fte for 3 of 4 fellows	7/13/2016 5:48 PM
20	I don't know	7/13/2016 5:23 PM
21	100	7/13/2016 4:54 PM
22	50 percent	7/13/2016 4:38 PM
23	100%	6/22/2016 11:18 AM

Q11 If there is salary/ benefit support for neurocritical care fellows from the institution, is this different than for ACGME - accredited programs at your institution?

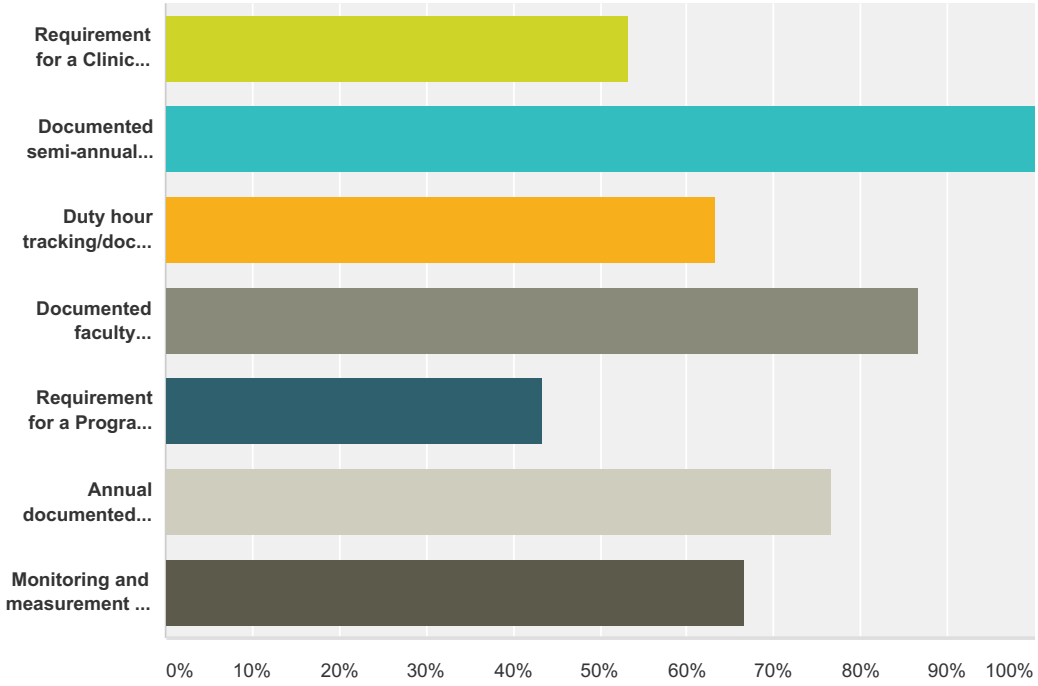
Answered: 29 Skipped: 4



Answer Choices	Responses	
Yes	**10.34%**	3
No	**58.62%**	17
Don't know	**31.03%**	9
Total		**29**

Q12 With which of the following policies and procedures currently required of ACGME - accredited programs does your neurocritical care fellowship program currently have to comply (mark all that apply)?

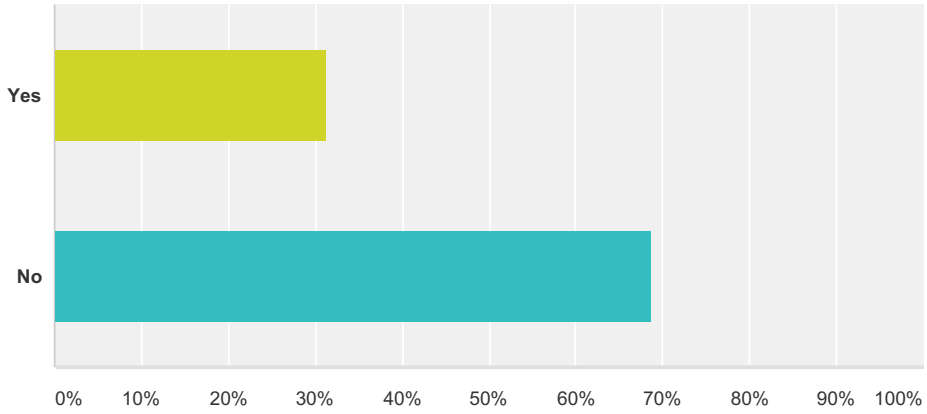
Answered: 30 Skipped: 3



Answer Choices	Responses
Requirement for a Clinical Competency Committee for fellow evaluations	53.33% 16
Documented semi-annual fellow evaluations	100.00% 30
Duty hour tracking/documentation	63.33% 19
Documented faculty evaluations, at least annually	86.67% 26
Requirement for a Program Evaluation Committee (PEC)	43.33% 13
Annual documented program evaluations using written feedback from trainees and faculty (Note: the ACGME requires annual reporting in the areas of fellow performance, faculty development and progress on previous years' action plans)	76.67% 23
Monitoring and measurement of trainee and faculty performance/development with annual reporting of action plans for improvement	66.67% 20
Total Respondents: 30	

Q13 Do you think the policy and procedural requirements of ACGME accreditation will impose an unreasonable burden on your fellowship program?

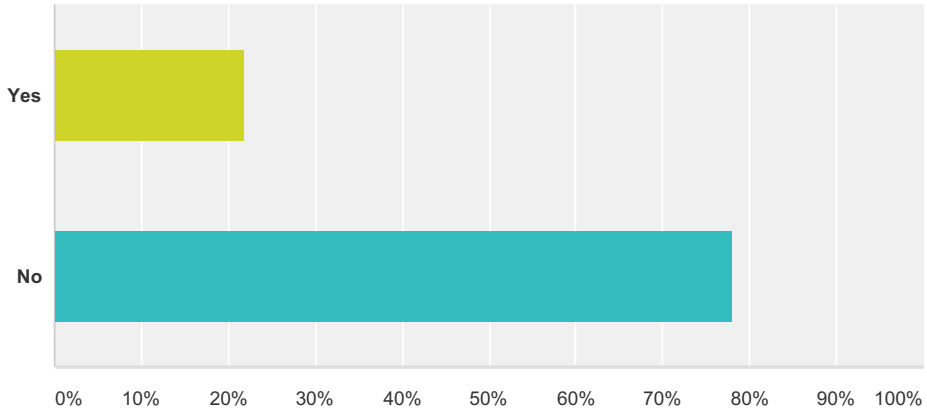
Answered: 32 Skipped: 1



Answer Choices	Responses	
Yes	**31.25%**	10
No	**68.75%**	22
Total		**32**

Q14 Do you believe the accreditation system for neurocritical care (UCNS instead of ACGME) has negatively affected your program's ability to recruit excellent candidates?

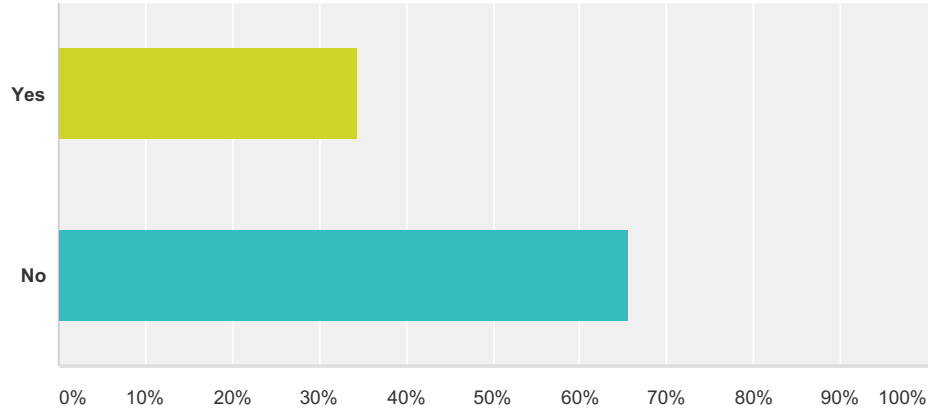
Answered: 32 Skipped: 1



Answer Choices	Responses	
Yes	**21.88%**	7
No	**78.13%**	25
Total		**32**

Q15 Does the source of accreditation and certification for neurocritical care through a non - ACGME or non - American Board of Medical Specialties (ABMS) system negatively influence job opportunities available to your graduating fellows?

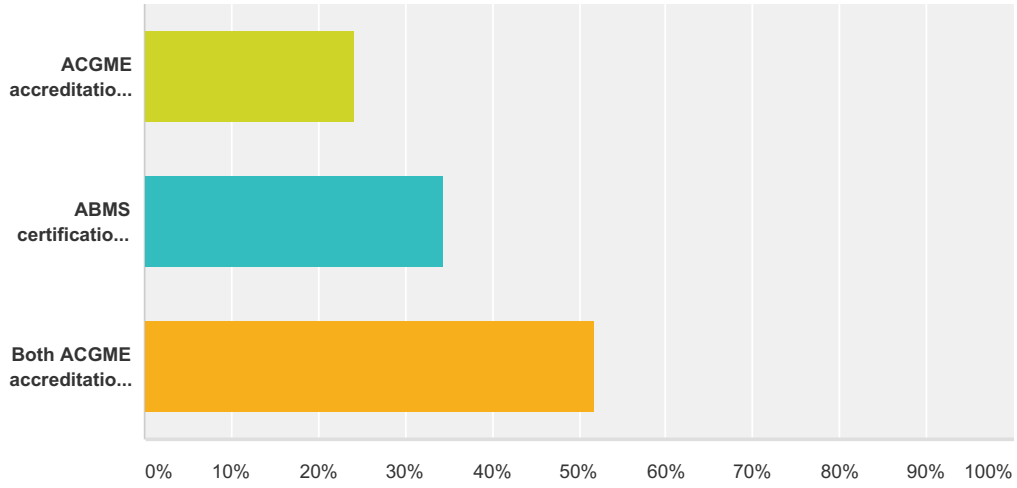
Answered: 32 Skipped: 1



Answer Choices	Responses	
Yes	34.38%	11
No	65.63%	21
Total		32

Q16 Future integration of neurointensivists into general critical care training and certification pathways would be best facilitated by (in other words, what would best facilitate "mainstreaming" of NCC into the critical care world so that we could participate in joint certification pathways with medical/anesthesiology/surgical intensivists?)

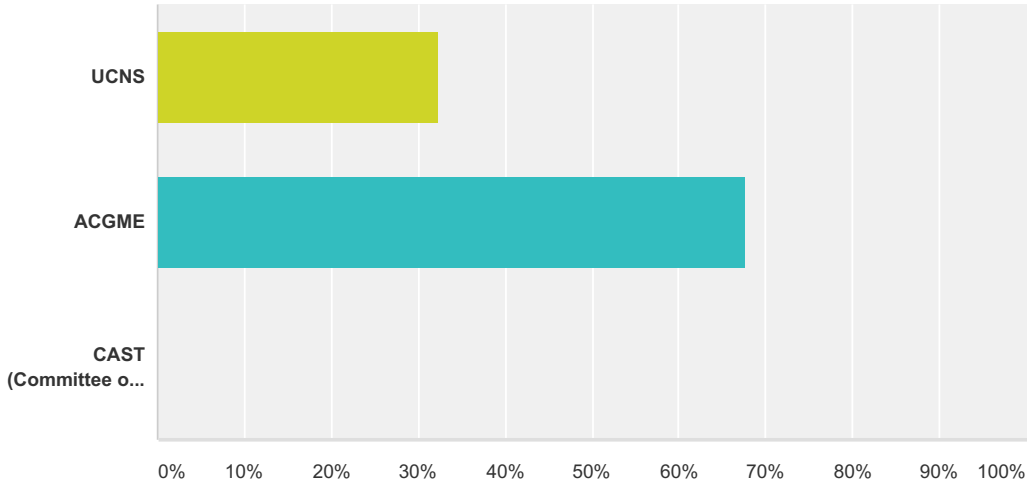
Answered: 29 Skipped: 4



Answer Choices	Responses	
ACGME accreditation of neurocritical care training	**24.14%**	7
ABMS certification of neurointensivists	**34.48%**	10
Both ACGME accreditation and ABMS certification	**51.72%**	15
Total Respondents: 29		

Q17 What is the best administrative structure for ACCREDITATION in order to support the growth of neurocritical care as a field?

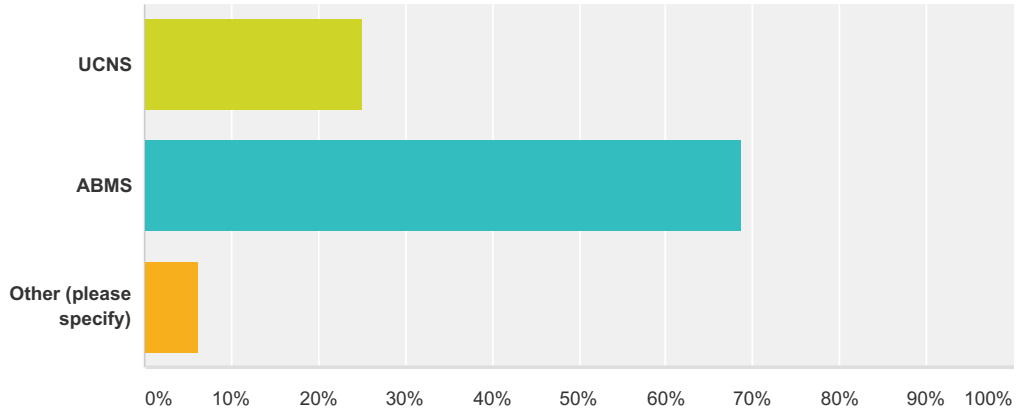
Answered: 31 Skipped: 2



Answer Choices	Responses	
UCNS	**32.26%**	10
ACGME	**67.74%**	21
CAST (Committee on Subspecialty Training)	**0.00%**	0
Total		**31**

Q18 What is the best administrative structure for CERTIFICATION in order to support the growth of neurocritical care as a field?

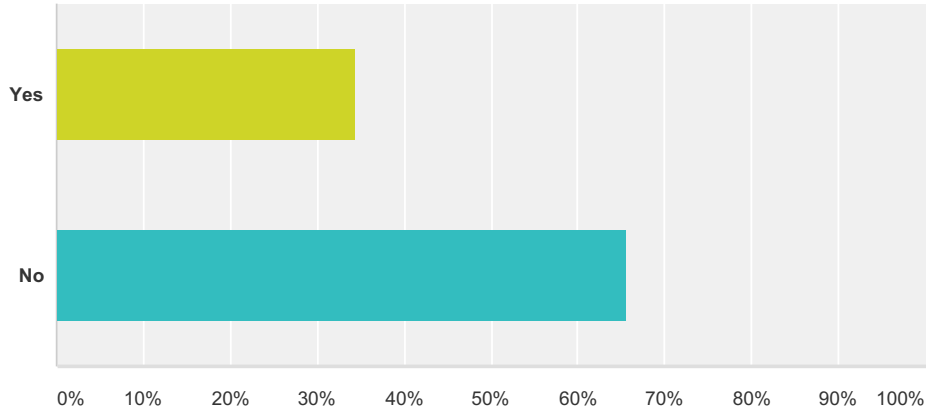
Answered: 32 Skipped: 1



Answer Choices	Responses	
UCNS	**25.00%**	8
ABMS	**68.75%**	22
Other (please specify)	**6.25%**	2
Total		**32**

Q19 Does your institution offer a CAST - accredited neurocritical care fellowship?

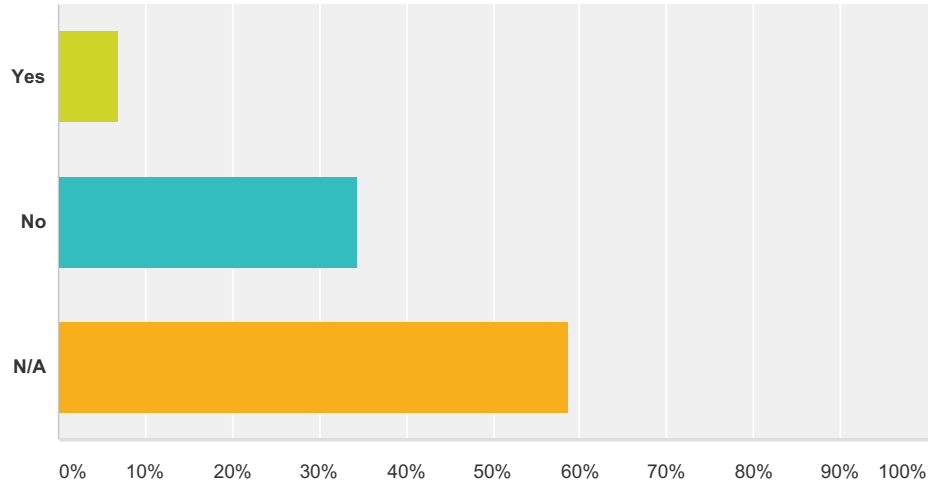
Answered: 29 Skipped: 4



Answer Choices	Responses	
Yes	**34.48%**	10
No	**65.52%**	19
Total		**29**

Q20 For institutions with both UCNS - accredited and CAST - accredited neurocritical care fellowship programs, do the programs have the same program director?

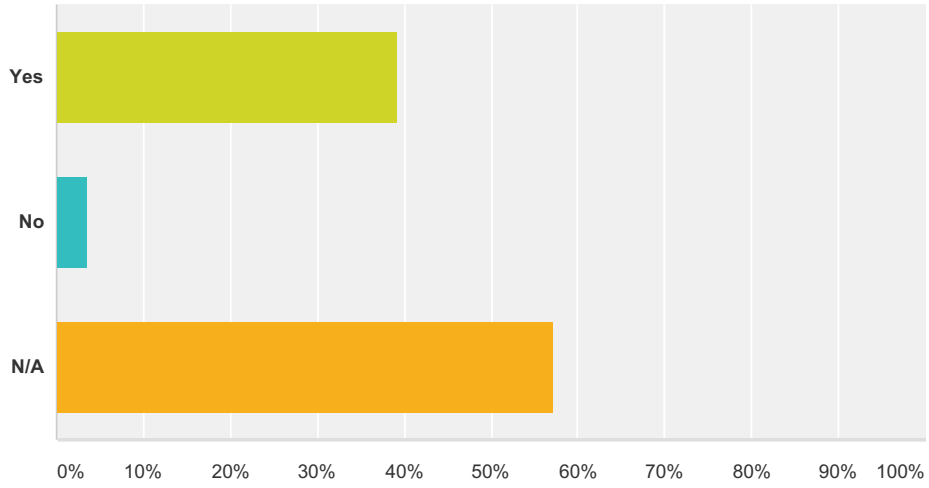
Answered: 29 Skipped: 4



Answer Choices	Responses	
Yes	**6.90%**	2
No	**34.48%**	10
N/A	**58.62%**	17
Total		**29**

Q21 For institutions with both UCNS - accredited and CAST - accredited neurocritical care fellowship programs, do the programs have the same faculty?

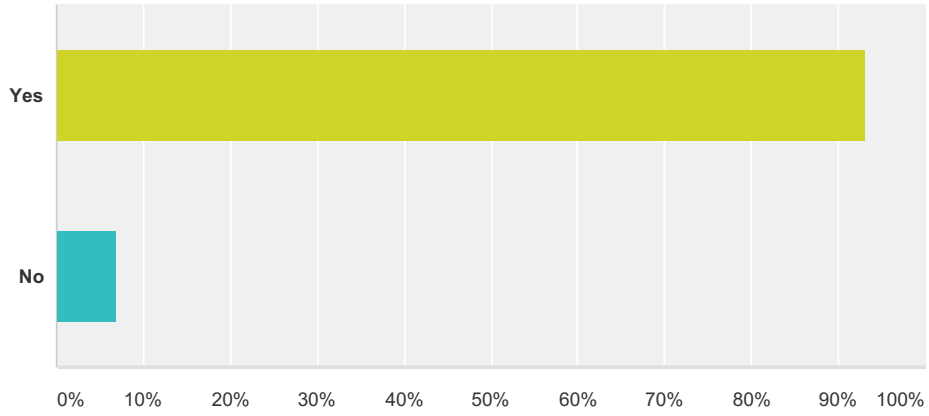
Answered: 28 Skipped: 5



Answer Choices	Responses	
Yes	**39.29%**	11
No	**3.57%**	1
N/A	**57.14%**	16
Total		**28**

Q22 Does your neurocritical care fellowship program participate in the San Francisco (SF) Match?

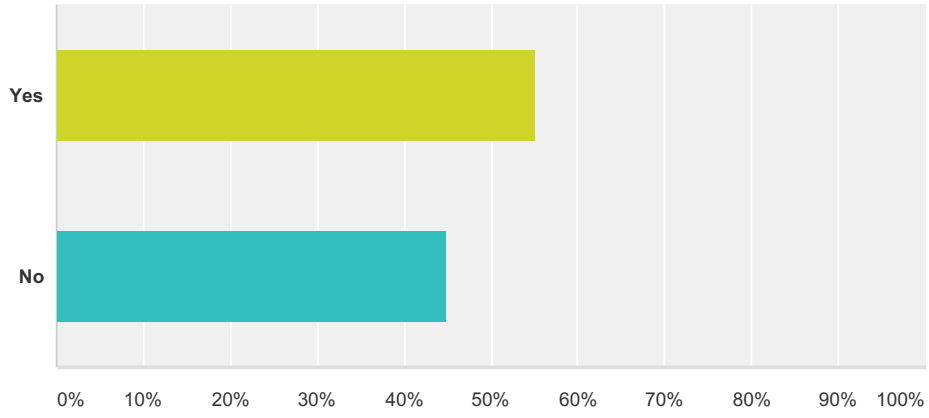
Answered: 29 Skipped: 4



Answer Choices	Responses	
Yes	**93.10%**	27
No	**6.90%**	2
Total		**29**

Q23 Does your neurocritical care fellowship program ever offer positions outside of the SF Match?

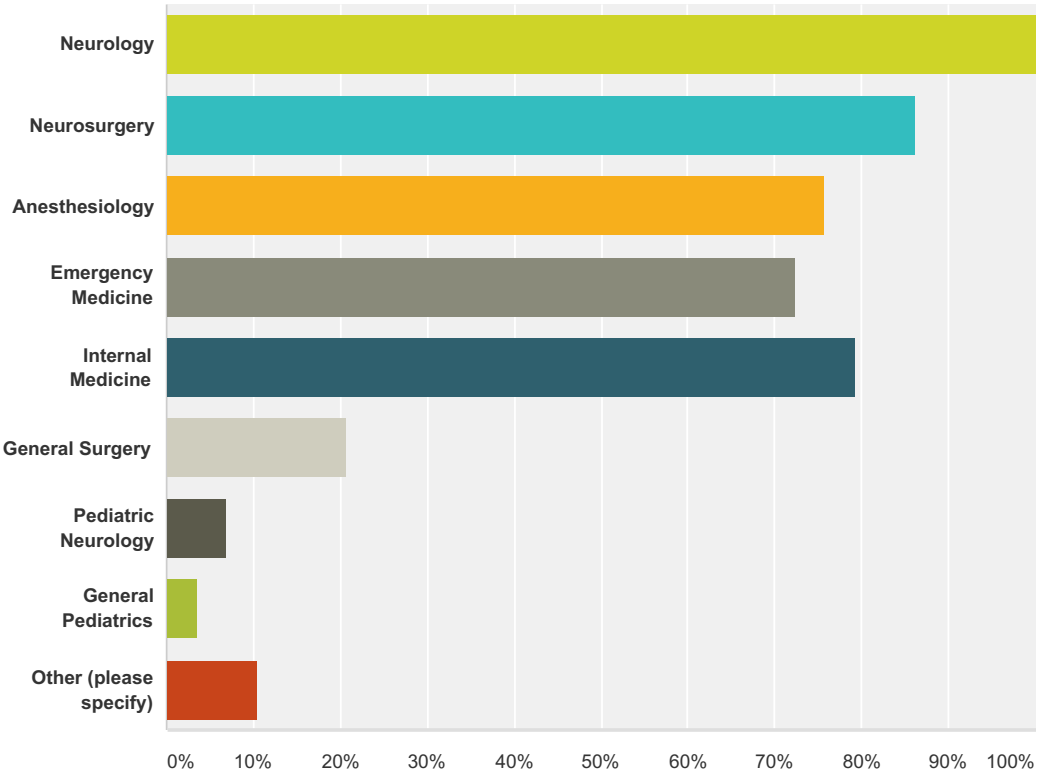
Answered: 29 Skipped: 4



Answer Choices	Responses	
Yes	**55.17%**	16
No	**44.83%**	13
Total		**29**

Q24 From which specialties does your neurocritical care program accept candidates for training (mark all that apply)?

Answered: 29 Skipped: 4



Answer Choices	Responses	
Neurology	100.00%	29
Neurosurgery	86.21%	25
Anesthesiology	75.86%	22
Emergency Medicine	72.41%	21
Internal Medicine	79.31%	23
General Surgery	20.69%	6
Pediatric Neurology	6.90%	2
General Pediatrics	3.45%	1
Other (please specify)	10.34%	3
Total Respondents: 29		

Q25 How many fellows from each one of the specialties below have trained/are training in your neurocritical care fellowship program during the past three years (please write in)?

Answered: 29 Skipped: 4

Answer Choices	Responses	
Neurology	**96.55%**	28
Neurosurgery	**34.48%**	10
Anesthesiology	**34.48%**	10
Emergency Medicine	**37.93%**	11
Internal Medicine	**51.72%**	15
General Surgery	**13.79%**	4
Pediatric Neurology	**13.79%**	4
General Pediatrics	**13.79%**	4
Other	**10.34%**	3

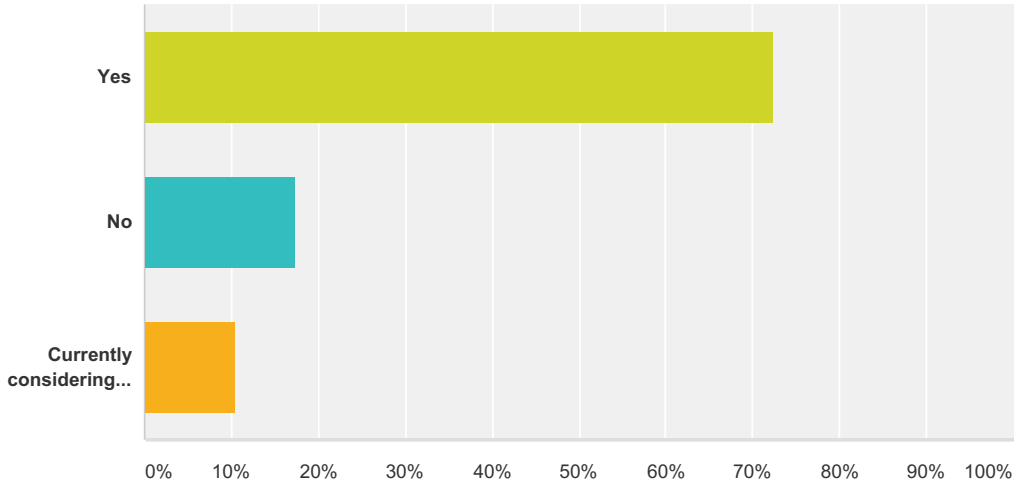
#	Neurology	Date
1	3	7/22/2016 3:04 PM
2	6	7/22/2016 1:06 PM
3	10	7/22/2016 10:42 AM
4	6	7/22/2016 8:20 AM
5	1	7/21/2016 12:49 PM
6	5	7/21/2016 9:20 AM
7	4	7/21/2016 3:55 AM
8	6	7/20/2016 7:49 PM
9	6	7/20/2016 5:14 PM
10	5	7/20/2016 3:39 PM
11	3	7/20/2016 3:17 PM
12	1	7/20/2016 2:37 PM
13	5	7/20/2016 1:25 PM
14	13	7/20/2016 9:41 AM
15	6	7/15/2016 6:22 PM
16	1	7/15/2016 7:03 AM
17	6	7/14/2016 3:46 PM
18	3	7/13/2016 10:11 PM
19	5	7/13/2016 9:45 PM
20	8	7/13/2016 8:11 PM

21	2	7/13/2016 6:04 PM
22	3	7/13/2016 5:55 PM
23	2	7/13/2016 5:26 PM
24	3	7/13/2016 5:22 PM
25	5	7/13/2016 5:03 PM
26	0	7/13/2016 4:40 PM
27	2	7/13/2016 4:32 PM
28	6	6/22/2016 11:21 AM
#	**Neurosurgery**	**Date**
1	0	7/22/2016 1:06 PM
2	0	7/21/2016 9:20 AM
3	0	7/20/2016 7:49 PM
4	0	7/20/2016 5:14 PM
5	0	7/20/2016 1:25 PM
6	0	7/14/2016 3:46 PM
7	1	7/13/2016 9:45 PM
8	0	7/13/2016 8:11 PM
9	1	7/13/2016 5:55 PM
10	0	7/13/2016 4:40 PM
#	**Anesthesiology**	**Date**
1	0	7/22/2016 1:06 PM
2	1	7/21/2016 12:49 PM
3	0	7/21/2016 9:20 AM
4	1	7/20/2016 5:14 PM
5	1	7/20/2016 3:39 PM
6	2	7/20/2016 1:25 PM
7	0	7/14/2016 3:46 PM
8	1	7/13/2016 8:11 PM
9	1	7/13/2016 5:55 PM
10	0	7/13/2016 4:40 PM
#	**Emergency Medicine**	**Date**
1	0	7/22/2016 1:06 PM
2	1	7/22/2016 10:42 AM
3	1	7/22/2016 8:20 AM
4	0	7/21/2016 12:49 PM
5	0	7/21/2016 9:20 AM
6	1	7/21/2016 3:55 AM
7	1	7/20/2016 2:37 PM
8	0	7/14/2016 3:46 PM
9	2	7/13/2016 10:11 PM
10	1	7/13/2016 8:11 PM

11	0	7/13/2016 4:40 PM
#	**Internal Medicine**	**Date**
1	0	7/22/2016 1:06 PM
2	2	7/22/2016 10:42 AM
3	0	7/21/2016 9:20 AM
4	2	7/21/2016 3:55 AM
5	1	7/20/2016 7:49 PM
6	1	7/20/2016 3:39 PM
7	1	7/20/2016 3:17 PM
8	1	7/20/2016 1:25 PM
9	1	7/20/2016 9:41 AM
10	0	7/14/2016 3:46 PM
11	1	7/14/2016 11:10 AM
12	1	7/13/2016 8:11 PM
13	2	7/13/2016 5:55 PM
14	0	7/13/2016 4:40 PM
15	2	6/22/2016 11:21 AM
#	**General Surgery**	**Date**
1	0	7/22/2016 1:06 PM
2	0	7/21/2016 9:20 AM
3	0	7/14/2016 3:46 PM
4	0	7/13/2016 4:40 PM
#	**Pediatric Neurology**	**Date**
1	0	7/22/2016 1:06 PM
2	0	7/21/2016 9:20 AM
3	0	7/14/2016 3:46 PM
4	0	7/13/2016 4:40 PM
#	**General Pediatrics**	**Date**
1	0	7/22/2016 1:06 PM
2	0	7/21/2016 9:20 AM
3	0	7/14/2016 3:46 PM
4	0	7/13/2016 4:40 PM
#	**Other**	**Date**
1	0	7/22/2016 1:06 PM
2	0	7/14/2016 3:46 PM
3	0	7/13/2016 4:40 PM

Q26 Does your neurocritical care fellowship program offer a one - year training pathway for candidates with critical care board eligibility / certification?

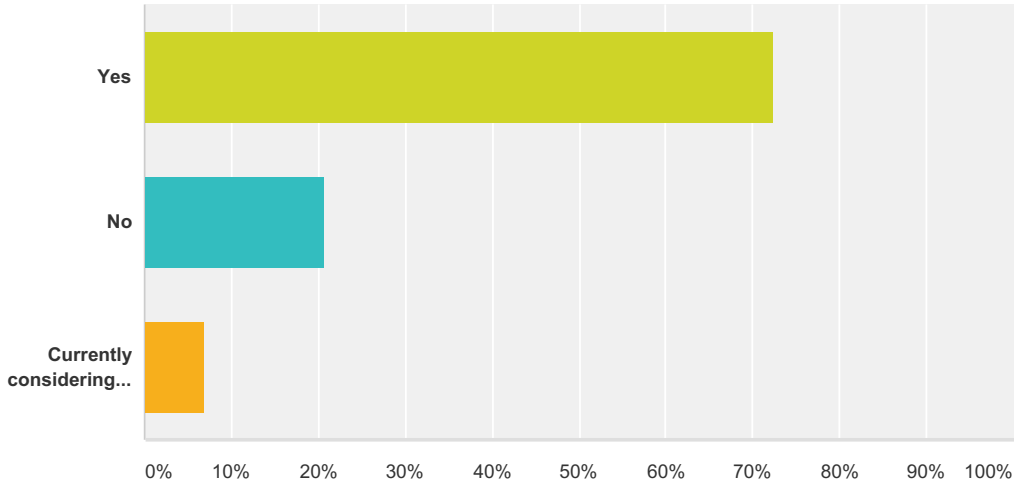
Answered: 29 Skipped: 4



Answer Choices	Responses	
Yes	**72.41%**	21
No	**17.24%**	5
Currently considering offering	**10.34%**	3
Total		**29**

Q27 Does your neurocritical care fellowship program offer a one - year training pathway for candidates with the requisite neurosurgical training?

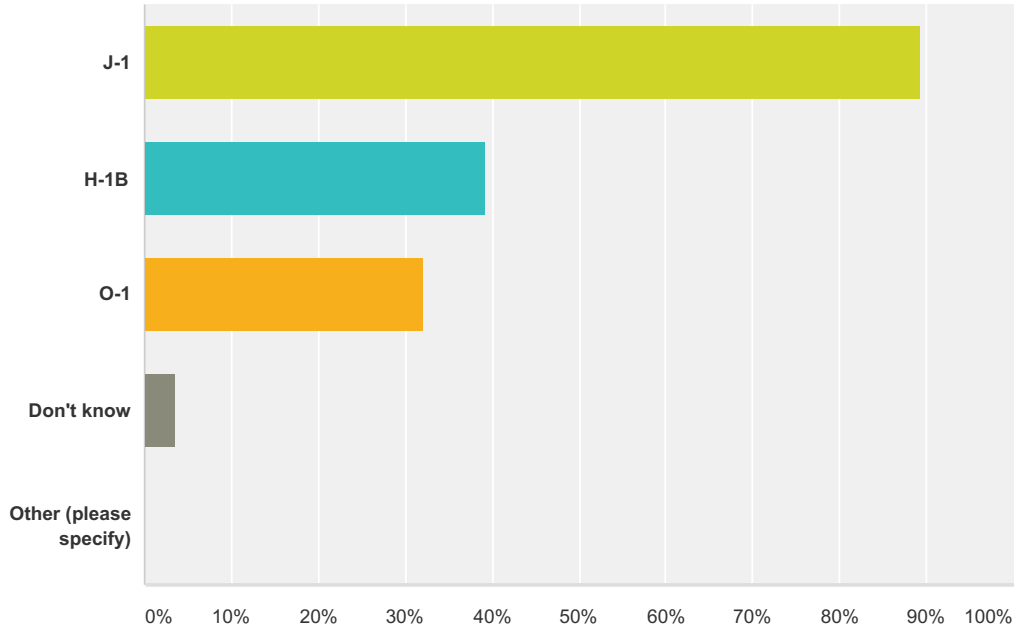
Answered: 29 Skipped: 4



Answer Choices	Responses	
Yes	**72.41%**	21
No	**20.69%**	6
Currently considering offering	**6.90%**	2
Total		**29**

Q28 Which of the following visas does your institution sponsor for international medical graduates in the neurocritical care fellowship (mark all that apply)?

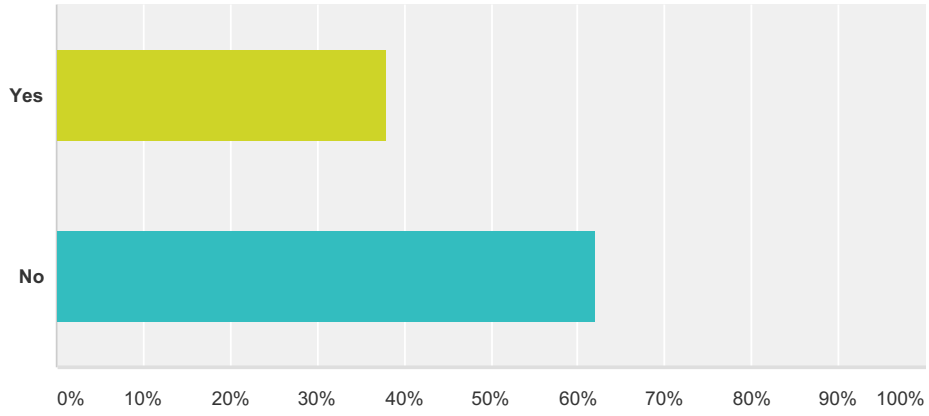
Answered: 28 Skipped: 5



Answer Choices	Responses	
J-1	**89.29%**	25
H-1B	**39.29%**	11
O-1	**32.14%**	9
Don't know	**3.57%**	1
Other (please specify)	**0.00%**	0
Total Respondents: 28		

Q29 Do you accept candidates for training in your neurocritical care fellowship who did not finish residency in North America?

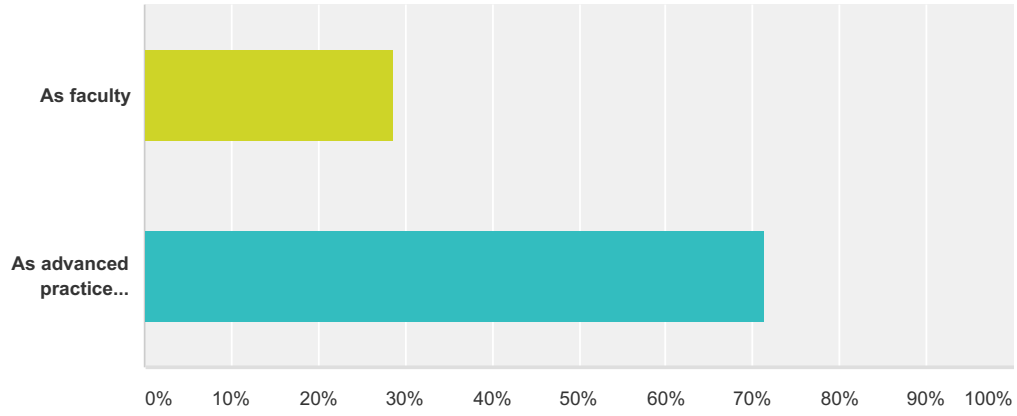
Answered: 29 Skipped: 4



Answer Choices	Responses	
Yes	**37.93%**	11
No	**62.07%**	18
Total		**29**

Q30 How are the neurocritical care fellows at your institution credentialed (mark all that apply)?

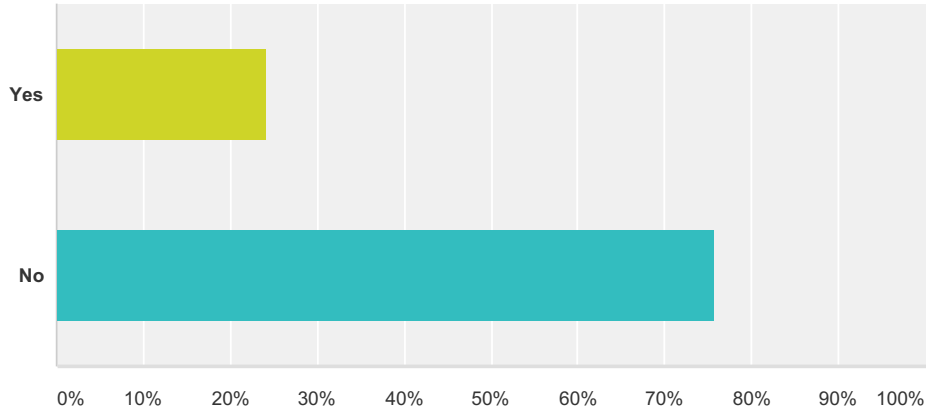
Answered: 28 Skipped: 5



Answer Choices	Responses	
As faculty	28.57%	8
As advanced practice trainees/ non - ACGME accredited post-graduate trainees through the GME office	71.43%	20
Total		28

Q31 Are your fellows currently allowed to independently bill for E/M services?

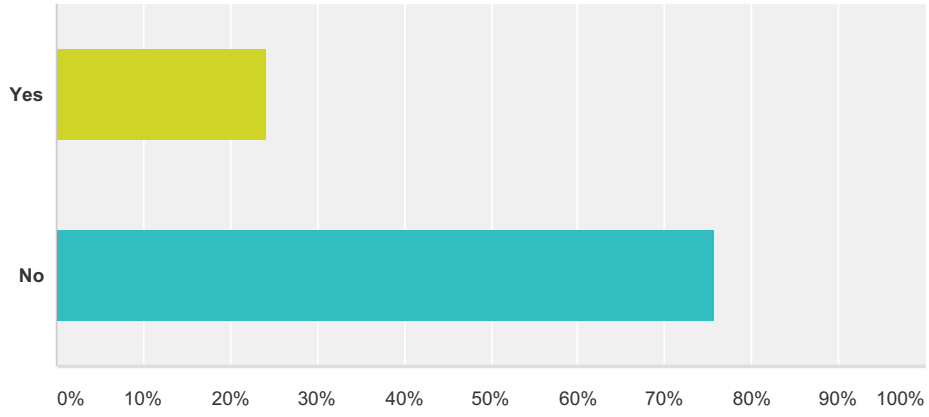
Answered: 29 Skipped: 4



Answer Choices	Responses	
Yes	**24.14%**	7
No	**75.86%**	22
Total		**29**

Q32 Are your fellows currently allowed to independently bill for procedures?

Answered: 29 Skipped: 4



Answer Choices	Responses	
Yes	**24.14%**	7
No	**75.86%**	22
Total		**29**

Q33 Does your neurocritical care program have required minimum volumes for procedural competency for fellows (fill in the required number of procedures; type "no minimum" or "not required" if there is no minimum or the procedure is not required, respectively)?

Answered: 25 Skipped: 8

Answer Choices	Responses	
Central venous line	100.00%	25
Arterial line	100.00%	25
Endotracheal intubation	96.00%	24
Thoracentesis	88.00%	22
Paracentesis	84.00%	21
Bronchoscopy	96.00%	24
Bedside tracheostomy	84.00%	21
Critical care ultrasound	84.00%	21
Transcranial Doppler	88.00%	22
Carotid ultrasound	80.00%	20
Lumbar puncture	96.00%	24
Lumbar drain	84.00%	21
Intracranial pressure monitor	84.00%	21
Pulmonary artery catheter	84.00%	21

#	Central venous line	Date
1	10	7/22/2016 1:06 PM
2	No minimum	7/22/2016 10:42 AM
3	at least 10 independent per year	7/22/2016 8:20 AM
4	4	7/21/2016 9:20 AM
5	10	7/21/2016 3:55 AM
6	No minimim	7/20/2016 5:14 PM
7	10	7/20/2016 3:39 PM
8	20	7/20/2016 3:17 PM
9	10	7/20/2016 2:37 PM
10	30	7/20/2016 1:25 PM
11	10	7/20/2016 9:41 AM
12	Fellow has to do 5 supervised before able to do on own)	7/15/2016 6:22 PM

13	10	7/15/2016 7:03 AM
14	10	7/14/2016 3:46 PM
15	10	7/14/2016 11:10 AM
16	15 (5 IJ, 5 SC, 5 fem)	7/13/2016 10:11 PM
17	15	7/13/2016 8:11 PM
18	No minimum	7/13/2016 6:04 PM
19	5	7/13/2016 5:55 PM
20	10	7/13/2016 5:26 PM
21	3	7/13/2016 5:22 PM
22	no minimum	7/13/2016 5:03 PM
23	5	7/13/2016 4:40 PM
24	no minimum	7/13/2016 4:32 PM
25	20	6/22/2016 11:21 AM
#	**Arterial line**	**Date**
1	5	7/22/2016 1:06 PM
2	No minimum	7/22/2016 10:42 AM
3	at least 10 independent per year	7/22/2016 8:20 AM
4	4	7/21/2016 9:20 AM
5	10	7/21/2016 3:55 AM
6	No minimim	7/20/2016 5:14 PM
7	10	7/20/2016 3:39 PM
8	20	7/20/2016 3:17 PM
9	10	7/20/2016 2:37 PM
10	30	7/20/2016 1:25 PM
11	10	7/20/2016 9:41 AM
12	same as above	7/15/2016 6:22 PM
13	5	7/15/2016 7:03 AM
14	10	7/14/2016 3:46 PM
15	30	7/14/2016 11:10 AM
16	10	7/13/2016 10:11 PM
17	5	7/13/2016 8:11 PM
18	No minimum	7/13/2016 6:04 PM
19	5	7/13/2016 5:55 PM
20	10	7/13/2016 5:26 PM
21	3	7/13/2016 5:22 PM
22	no minimum	7/13/2016 5:03 PM
23	No	7/13/2016 4:40 PM
24	no minimum	7/13/2016 4:32 PM
25	10	6/22/2016 11:21 AM
#	**Endotracheal intubation**	**Date**
1	20	7/22/2016 1:06 PM

2	40	7/22/2016 10:42 AM
3	15 per year	7/22/2016 8:20 AM
4	4	7/21/2016 9:20 AM
5	20	7/21/2016 3:55 AM
6	not required	7/20/2016 3:39 PM
7	20	7/20/2016 3:17 PM
8	10	7/20/2016 2:37 PM
9	30	7/20/2016 1:25 PM
10	15	7/20/2016 9:41 AM
11	Fellow has to do 20 supervised before able to do on own)	7/15/2016 6:22 PM
12	10	7/15/2016 7:03 AM
13	25	7/14/2016 3:46 PM
14	30	7/14/2016 11:10 AM
15	15	7/13/2016 10:11 PM
16	not required	7/13/2016 8:11 PM
17	No minimum	7/13/2016 6:04 PM
18	10	7/13/2016 5:55 PM
19	20	7/13/2016 5:26 PM
20	10	7/13/2016 5:22 PM
21	no minimum	7/13/2016 5:03 PM
22	5	7/13/2016 4:40 PM
23	no minimum	7/13/2016 4:32 PM
24	50	6/22/2016 11:21 AM

#	Thoracentesis	Date
1	no minimum	7/22/2016 1:06 PM
2	no minimum	7/22/2016 8:20 AM
3	4	7/21/2016 9:20 AM
4	5	7/21/2016 3:55 AM
5	not required	7/20/2016 3:39 PM
6	5	7/20/2016 3:17 PM
7	no minimum	7/20/2016 2:37 PM
8	10	7/20/2016 9:41 AM
9	no minimum	7/15/2016 6:22 PM
10	5	7/15/2016 7:03 AM
11	10	7/14/2016 3:46 PM
12	no minimum	7/14/2016 11:10 AM
13	5	7/13/2016 10:11 PM
14	5	7/13/2016 8:11 PM
15	No minimum	7/13/2016 6:04 PM
16	Not required	7/13/2016 5:55 PM
17	10	7/13/2016 5:26 PM

18	3	7/13/2016 5:22 PM
19	no minimum	7/13/2016 5:03 PM
20	5	7/13/2016 4:40 PM
21	no minimum	7/13/2016 4:32 PM
22	N/A	6/22/2016 11:21 AM
#	**Paracentesis**	**Date**
1	no minimum	7/22/2016 1:06 PM
2	no minimum	7/22/2016 8:20 AM
3	4	7/21/2016 9:20 AM
4	no minimum	7/21/2016 3:55 AM
5	not required	7/20/2016 3:39 PM
6	no minimum	7/20/2016 2:37 PM
7	10	7/20/2016 9:41 AM
8	no minimum	7/15/2016 6:22 PM
9	5	7/15/2016 7:03 AM
10	10	7/14/2016 3:46 PM
11	no minimum	7/14/2016 11:10 AM
12	3	7/13/2016 10:11 PM
13	5	7/13/2016 8:11 PM
14	No minimum	7/13/2016 6:04 PM
15	Not required	7/13/2016 5:55 PM
16	10	7/13/2016 5:26 PM
17	3	7/13/2016 5:22 PM
18	no minimum	7/13/2016 5:03 PM
19	5	7/13/2016 4:40 PM
20	no minimum	7/13/2016 4:32 PM
21	N/A	6/22/2016 11:21 AM
#	**Bronchoscopy**	**Date**
1	not required	7/22/2016 1:06 PM
2	No minimum	7/22/2016 10:42 AM
3	no minimum	7/22/2016 8:20 AM
4	not required	7/21/2016 9:20 AM
5	10	7/21/2016 3:55 AM
6	10	7/20/2016 3:39 PM
7	10	7/20/2016 3:17 PM
8	10	7/20/2016 2:37 PM
9	10	7/20/2016 1:25 PM
10	10	7/20/2016 9:41 AM
11	Fellow has to do 10 supervised before able to do on own	7/15/2016 6:22 PM
12	not required	7/15/2016 7:03 AM
13	20	7/14/2016 3:46 PM

14	no minimum	7/14/2016 11:10 AM
15	10	7/13/2016 10:11 PM
16	5	7/13/2016 8:11 PM
17	No minimum	7/13/2016 6:04 PM
18	Not required	7/13/2016 5:55 PM
19	20	7/13/2016 5:26 PM
20	5	7/13/2016 5:22 PM
21	no minimum	7/13/2016 5:03 PM
22	to be determined	7/13/2016 4:40 PM
23	no minimum	7/13/2016 4:32 PM
24	20	6/22/2016 11:21 AM
#	**Bedside tracheostomy**	**Date**
1	not required	7/22/2016 1:06 PM
2	do not do	7/22/2016 8:20 AM
3	not required	7/21/2016 9:20 AM
4	20	7/21/2016 3:55 AM
5	not required	7/20/2016 3:39 PM
6	not required	7/20/2016 2:37 PM
7	20	7/20/2016 9:41 AM
8	no minimum	7/15/2016 6:22 PM
9	not required	7/15/2016 7:03 AM
10	na	7/14/2016 3:46 PM
11	no minimum	7/14/2016 11:10 AM
12	not required	7/13/2016 10:11 PM
13	not required	7/13/2016 8:11 PM
14	No minimum	7/13/2016 6:04 PM
15	Not required	7/13/2016 5:55 PM
16	20	7/13/2016 5:26 PM
17	25	7/13/2016 5:22 PM
18	not required	7/13/2016 5:03 PM
19	not required	7/13/2016 4:40 PM
20	no minimum	7/13/2016 4:32 PM
21	N/A	6/22/2016 11:21 AM
#	**Critical care ultrasound**	**Date**
1	no minimum	7/22/2016 1:06 PM
2	at least 15 per year	7/22/2016 8:20 AM
3	not required	7/21/2016 9:20 AM
4	20	7/21/2016 3:55 AM
5	no minimum	7/20/2016 3:39 PM
6	no minimum	7/20/2016 2:37 PM
7	10	7/20/2016 9:41 AM

8	we are working on minimum for this	7/15/2016 6:22 PM
9	5	7/15/2016 7:03 AM
10	na	7/14/2016 3:46 PM
11	no minimum	7/14/2016 11:10 AM
12	50	7/13/2016 10:11 PM
13	not required	7/13/2016 8:11 PM
14	No minimum	7/13/2016 6:04 PM
15	Not required	7/13/2016 5:55 PM
16	20	7/13/2016 5:26 PM
17	no min	7/13/2016 5:22 PM
18	no minimum	7/13/2016 5:03 PM
19	to be determined	7/13/2016 4:40 PM
20	no minimum	7/13/2016 4:32 PM
21	N/A	6/22/2016 11:21 AM
#	**Transcranial Doppler**	**Date**
1	not required	7/22/2016 1:06 PM
2	perform 50; read 100	7/22/2016 8:20 AM
3	not required	7/21/2016 9:20 AM
4	100	7/21/2016 3:55 AM
5	100	7/20/2016 3:39 PM
6	20	7/20/2016 3:17 PM
7	no minimum	7/20/2016 2:37 PM
8	100 - for credentialing	7/20/2016 9:41 AM
9	we are working on minimum for this	7/15/2016 6:22 PM
10	not required	7/15/2016 7:03 AM
11	100	7/14/2016 3:46 PM
12	no minimum	7/14/2016 11:10 AM
13	no minimum	7/13/2016 10:11 PM
14	not required	7/13/2016 8:11 PM
15	No minimum	7/13/2016 6:04 PM
16	As per certification requirements	7/13/2016 5:55 PM
17	100	7/13/2016 5:26 PM
18	no min	7/13/2016 5:22 PM
19	no minimum	7/13/2016 5:03 PM
20	to be determined	7/13/2016 4:40 PM
21	no minimum	7/13/2016 4:32 PM
22	50	6/22/2016 11:21 AM
#	**Carotid ultrasound**	**Date**
1	not required	7/22/2016 1:06 PM
2	do not do	7/22/2016 8:20 AM
3	not required	7/21/2016 9:20 AM

4	no minimum	7/21/2016 3:55 AM
5	100	7/20/2016 3:39 PM
6	not required	7/20/2016 2:37 PM
7	100 - for credentialing	7/20/2016 9:41 AM
8	no minimum	7/15/2016 6:22 PM
9	not required	7/15/2016 7:03 AM
10	100	7/14/2016 3:46 PM
11	no minimum	7/14/2016 11:10 AM
12	not required	7/13/2016 10:11 PM
13	not required	7/13/2016 8:11 PM
14	No minimum	7/13/2016 6:04 PM
15	Not required	7/13/2016 5:55 PM
16	no min	7/13/2016 5:22 PM
17	no minimum	7/13/2016 5:03 PM
18	not required	7/13/2016 4:40 PM
19	no minimum	7/13/2016 4:32 PM
20	25	6/22/2016 11:21 AM

#	Lumbar puncture	Date
1	no minimum	7/22/2016 1:06 PM
2	No minimum	7/22/2016 10:42 AM
3	no minimum	7/22/2016 8:20 AM
4	4	7/21/2016 9:20 AM
5	no minimum	7/21/2016 3:55 AM
6	no minimum	7/20/2016 3:39 PM
7	10	7/20/2016 3:17 PM
8	10	7/20/2016 2:37 PM
9	10	7/20/2016 1:25 PM
10	10	7/20/2016 9:41 AM
11	no minimum	7/15/2016 6:22 PM
12	no minimum	7/15/2016 7:03 AM
13	NA	7/14/2016 3:46 PM
14	5	7/14/2016 11:10 AM
15	3	7/13/2016 10:11 PM
16	5	7/13/2016 8:11 PM
17	No minimum	7/13/2016 6:04 PM
18	If no neurology 5	7/13/2016 5:55 PM
19	5	7/13/2016 5:26 PM
20	3	7/13/2016 5:22 PM
21	no minimum	7/13/2016 5:03 PM
22	NO	7/13/2016 4:40 PM
23	no minimum	7/13/2016 4:32 PM

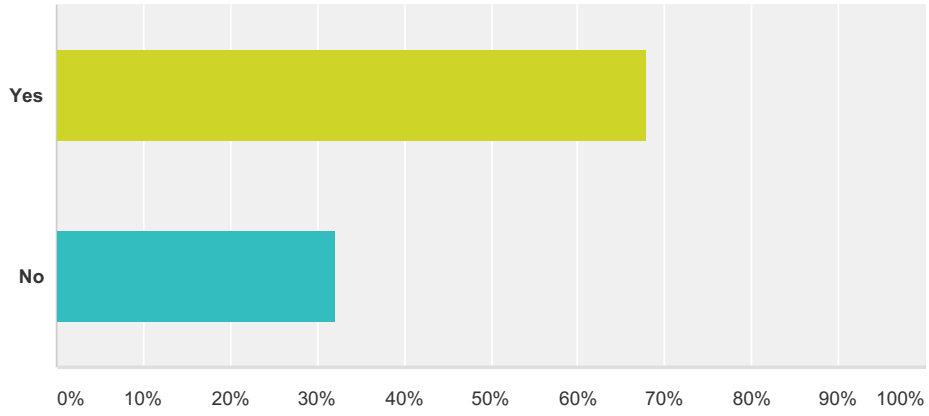
24	N/A	6/22/2016 11:21 AM
#	**Lumbar drain**	**Date**
1	not required	7/22/2016 1:06 PM
2	no minimum	7/22/2016 8:20 AM
3	not required	7/21/2016 9:20 AM
4	10	7/21/2016 3:55 AM
5	not required	7/20/2016 3:39 PM
6	not required	7/20/2016 2:37 PM
7	15	7/20/2016 9:41 AM
8	no minimum	7/15/2016 6:22 PM
9	5	7/15/2016 7:03 AM
10	NA	7/14/2016 3:46 PM
11	no minimum	7/14/2016 11:10 AM
12	not required	7/13/2016 10:11 PM
13	not required	7/13/2016 8:11 PM
14	No minimum	7/13/2016 6:04 PM
15	Not required	7/13/2016 5:55 PM
16	5	7/13/2016 5:26 PM
17	3	7/13/2016 5:22 PM
18	no minimum	7/13/2016 5:03 PM
19	not required	7/13/2016 4:40 PM
20	no minimum	7/13/2016 4:32 PM
21	N/A	6/22/2016 11:21 AM
#	**Intracranial pressure monitor**	**Date**
1	not required	7/22/2016 1:06 PM
2	no minimum	7/22/2016 8:20 AM
3	not required	7/21/2016 9:20 AM
4	no minimum	7/21/2016 3:55 AM
5	not required	7/20/2016 3:39 PM
6	not required	7/20/2016 2:37 PM
7	15	7/20/2016 9:41 AM
8	no minimum	7/15/2016 6:22 PM
9	not required	7/15/2016 7:03 AM
10	NA	7/14/2016 3:46 PM
11	no minimum	7/14/2016 11:10 AM
12	not required	7/13/2016 10:11 PM
13	not required	7/13/2016 8:11 PM
14	No minimum	7/13/2016 6:04 PM
15	Not required	7/13/2016 5:55 PM
16	20	7/13/2016 5:26 PM
17	10	7/13/2016 5:22 PM

18	no minimum	7/13/2016 5:03 PM
19	to be determined	7/13/2016 4:40 PM
20	no minimum	7/13/2016 4:32 PM
21	N/A	6/22/2016 11:21 AM

#	Pulmonary artery catheter	Date
1	no minimum	7/22/2016 1:06 PM
2	no minimum	7/22/2016 8:20 AM
3	4	7/21/2016 9:20 AM
4	no minimum	7/21/2016 3:55 AM
5	10	7/20/2016 3:39 PM
6	no minimum	7/20/2016 2:37 PM
7	10	7/20/2016 9:41 AM
8	no minimum	7/15/2016 6:22 PM
9	not required	7/15/2016 7:03 AM
10	10	7/14/2016 3:46 PM
11	no minimum	7/14/2016 11:10 AM
12	2	7/13/2016 10:11 PM
13	not required	7/13/2016 8:11 PM
14	No minimum	7/13/2016 6:04 PM
15	5	7/13/2016 5:55 PM
16	10	7/13/2016 5:26 PM
17	3	7/13/2016 5:22 PM
18	no minimum	7/13/2016 5:03 PM
19	to be determined	7/13/2016 4:40 PM
20	no minimum	7/13/2016 4:32 PM
21	N/A	6/22/2016 11:21 AM

Q34 Should procedural volumes be mandated for all neurocritical care training fellowships?

Answered: 28 Skipped: 5



Answer Choices	Responses	
Yes	**67.86%**	19
No	**32.14%**	9
Total		**28**

Q35 How many faculty are there in your neurocritical care fellowship program?

Answered: 28 Skipped: 5

#	Responses	Date
1	~ 50 critical care faculty	7/22/2016 3:04 PM
2	5	7/22/2016 1:06 PM
3	8	7/22/2016 10:42 AM
4	4	7/22/2016 8:20 AM
5	4	7/21/2016 12:49 PM
6	4	7/21/2016 9:20 AM
7	5	7/21/2016 3:55 AM
8	5	7/20/2016 5:14 PM
9	8	7/20/2016 3:39 PM
10	3	7/20/2016 3:17 PM
11	3	7/20/2016 2:37 PM
12	7	7/20/2016 1:25 PM
13	8	7/20/2016 9:41 AM
14	6	7/15/2016 6:22 PM
15	3	7/15/2016 7:03 AM
16	8	7/14/2016 3:46 PM
17	13	7/14/2016 11:10 AM
18	12	7/13/2016 10:11 PM
19	15	7/13/2016 9:45 PM
20	10	7/13/2016 8:11 PM
21	5	7/13/2016 6:04 PM
22	4	7/13/2016 5:55 PM
23	5	7/13/2016 5:26 PM
24	5	7/13/2016 5:22 PM
25	4	7/13/2016 5:03 PM
26	four	7/13/2016 4:40 PM
27	6	7/13/2016 4:32 PM
28	8	6/22/2016 11:21 AM

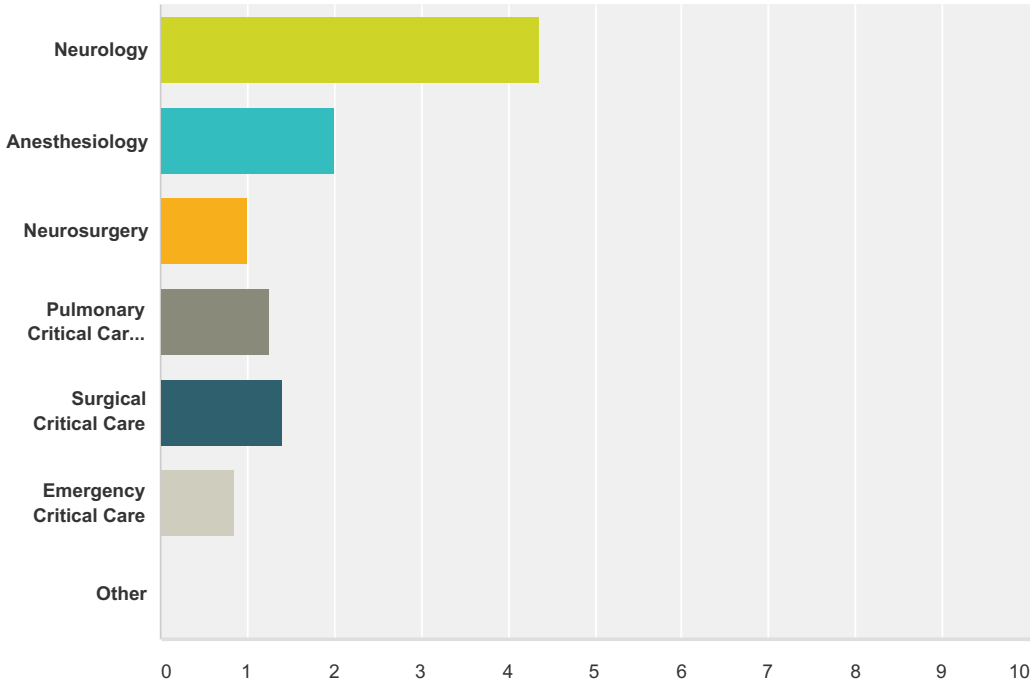
Q36 Of the faculty in your neurocritical care fellowship training program, how many are UCNS - certified (please write in)?

Answered: 28 Skipped: 5

#	Responses	Date
1	5	7/22/2016 3:04 PM
2	4	7/22/2016 1:06 PM
3	6	7/22/2016 10:42 AM
4	4	7/22/2016 8:20 AM
5	2	7/21/2016 12:49 PM
6	3	7/21/2016 9:20 AM
7	5	7/21/2016 3:55 AM
8	5	7/20/2016 5:14 PM
9	8	7/20/2016 3:39 PM
10	2	7/20/2016 3:17 PM
11	3	7/20/2016 2:37 PM
12	6	7/20/2016 1:25 PM
13	6	7/20/2016 9:41 AM
14	6	7/15/2016 6:22 PM
15	3	7/15/2016 7:03 AM
16	all	7/14/2016 3:46 PM
17	4	7/14/2016 11:10 AM
18	8	7/13/2016 10:11 PM
19	15	7/13/2016 9:45 PM
20	10	7/13/2016 8:11 PM
21	4	7/13/2016 6:04 PM
22	All 4/4	7/13/2016 5:55 PM
23	5	7/13/2016 5:26 PM
24	3	7/13/2016 5:22 PM
25	3	7/13/2016 5:03 PM
26	all	7/13/2016 4:40 PM
27	5	7/13/2016 4:32 PM
28	8	6/22/2016 11:21 AM

Q37 Of the faculty in your neurocritical care fellowship program, how many are from the following subspecialties (please write in the number; leave blank if not applicable)?

Answered: 27 Skipped: 6



Answer Choices	Average Number	Total Number	Responses
Neurology	4	118	27
Anesthesiology	2	26	13
Neurosurgery	1	6	6
Pulmonary Critical Care / Internal Medicine	1	10	8
Surgical Critical Care	1	7	5
Emergency Critical Care	1	6	7
Other	0	0	1
Total Respondents: 27			

Q38 At your institution, how many intensive care units do the neurocritical care faculty and fellows cover?

Answered: 28 Skipped: 5

#	Responses	Date
1	1	7/22/2016 1:06 PM
2	2	7/22/2016 10:43 AM
3	1	7/22/2016 8:22 AM
4	1	7/21/2016 12:50 PM
5	1	7/21/2016 9:21 AM
6	2	7/21/2016 3:56 AM
7	1	7/20/2016 5:14 PM
8	1	7/20/2016 3:42 PM
9	2	7/20/2016 3:18 PM
10	1	7/20/2016 2:40 PM
11	1	7/20/2016 1:26 PM
12	2	7/20/2016 9:42 AM
13	3	7/19/2016 1:02 PM
14	1	7/15/2016 6:23 PM
15	1	7/15/2016 7:03 AM
16	1	7/14/2016 3:47 PM
17	1	7/14/2016 11:10 AM
18	2	7/13/2016 10:14 PM
19	2	7/13/2016 9:48 PM
20	2	7/13/2016 8:12 PM
21	1	7/13/2016 6:05 PM
22	2	7/13/2016 5:57 PM
23	5	7/13/2016 5:26 PM
24	1	7/13/2016 5:23 PM
25	7	7/13/2016 5:05 PM
26	1	7/13/2016 4:41 PM
27	2	7/13/2016 4:33 PM
28	2	6/22/2016 11:22 AM

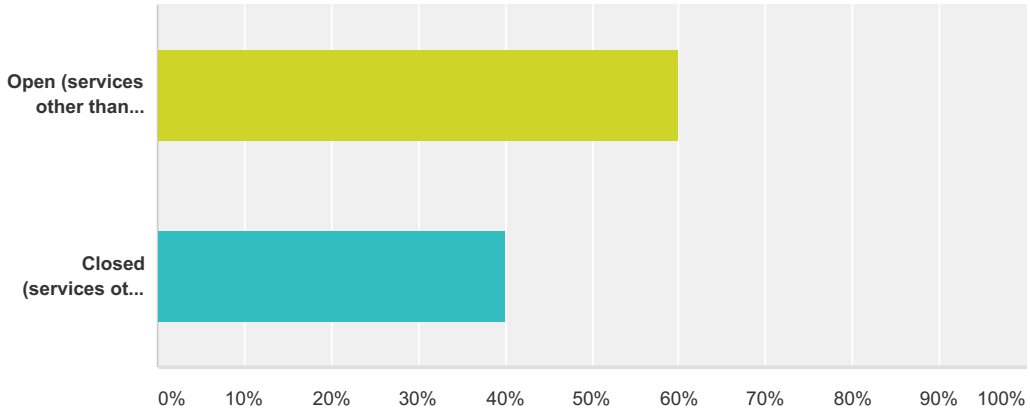
Q39 At your institution, how many total beds do the neurocritical care faculty and fellows cover (please write in)?

Answered: 28 Skipped: 5

#	Responses	Date
1	20	7/22/2016 1:06 PM
2	36	7/22/2016 10:43 AM
3	12 with overflow capacity	7/22/2016 8:22 AM
4	16	7/21/2016 12:50 PM
5	14	7/21/2016 9:21 AM
6	20	7/21/2016 3:56 AM
7	23	7/20/2016 5:14 PM
8	23	7/20/2016 3:42 PM
9	22	7/20/2016 3:18 PM
10	16+ (flow over to other units)	7/20/2016 2:40 PM
11	17-28	7/20/2016 1:26 PM
12	32	7/20/2016 9:42 AM
13	64	7/19/2016 1:02 PM
14	14-28	7/15/2016 6:23 PM
15	8	7/15/2016 7:03 AM
16	24	7/14/2016 3:47 PM
17	20	7/14/2016 11:10 AM
18	30	7/13/2016 10:14 PM
19	36	7/13/2016 9:48 PM
20	32	7/13/2016 8:12 PM
21	15	7/13/2016 6:05 PM
22	32	7/13/2016 5:57 PM
23	54	7/13/2016 5:26 PM
24	16	7/13/2016 5:23 PM
25	20	7/13/2016 5:05 PM
26	13	7/13/2016 4:41 PM
27	20	7/13/2016 4:33 PM
28	32	6/22/2016 11:22 AM

Q40 Are the units considered "open" or "closed"? In the "Other" box, please describe the structure if neither "open" nor "closed" as defined below applies.

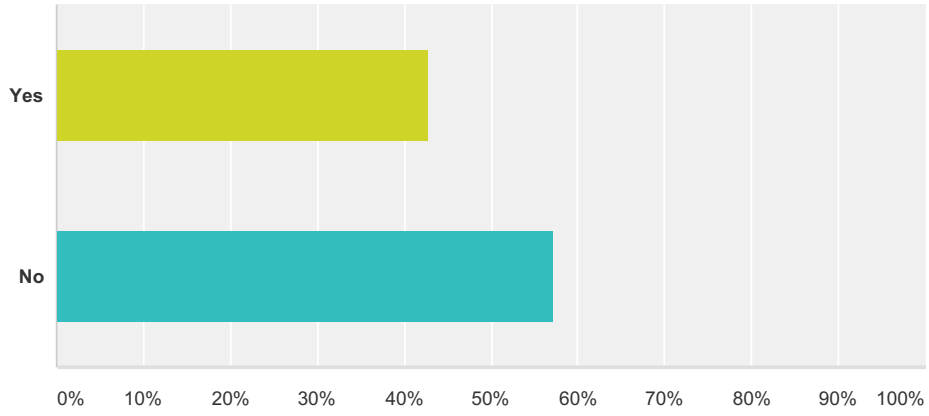
Answered: 25 Skipped: 8



Answer Choices	Responses	
Open (services other than Neurocritical Care can admit patients and enter orders)	**60.00%**	15
Closed (services other than Neurocritical Care can NOT admit patients and enter orders)	**40.00%**	10
Total		**25**

Q41 Is there a "step-down" unit at your institution where the neurocritical care faculty and fellows care for patients?

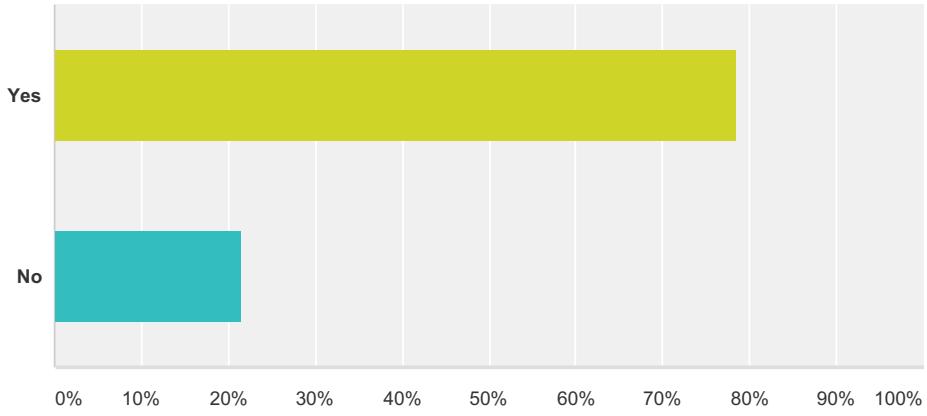
Answered: 28 Skipped: 5



Answer Choices	Responses	
Yes	**42.86%**	12
No	**57.14%**	16
Total		**28**

Q42 Do the neurocritical care faculty and fellows provide consultations on other units in your institution?

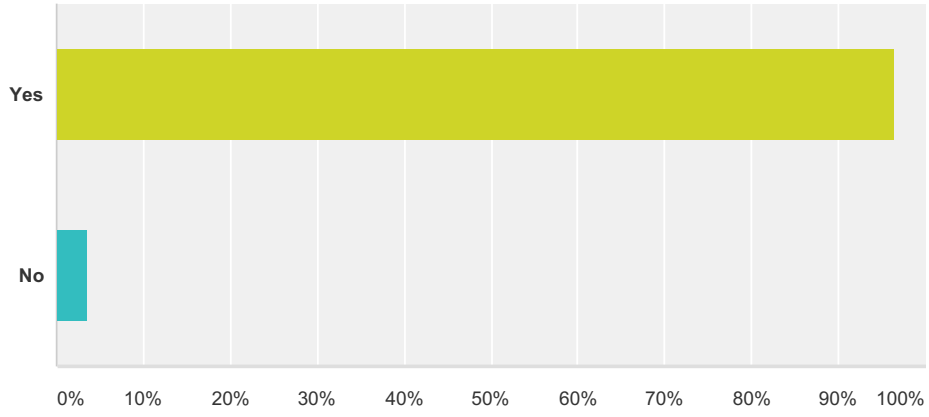
Answered: 28 Skipped: 5



Answer Choices	Responses	
Yes	**78.57%**	22
No	**21.43%**	6
Total		**28**

Q43 Do residents provide coverage in your ICU(s)?

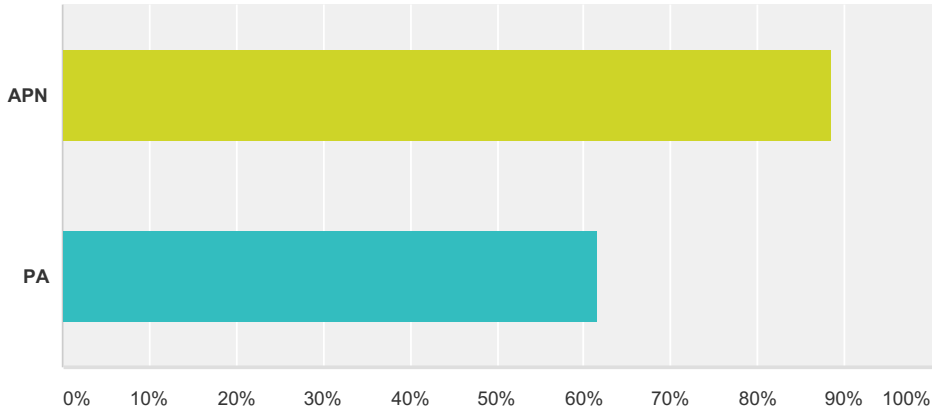
Answered: 28 Skipped: 5



Answer Choices	Responses	
Yes	**96.43%**	27
No	**3.57%**	1
Total		**28**

Q44 Do advanced practice nurses (APN) or physician assistants (PA) provide coverage in your ICU(s)?

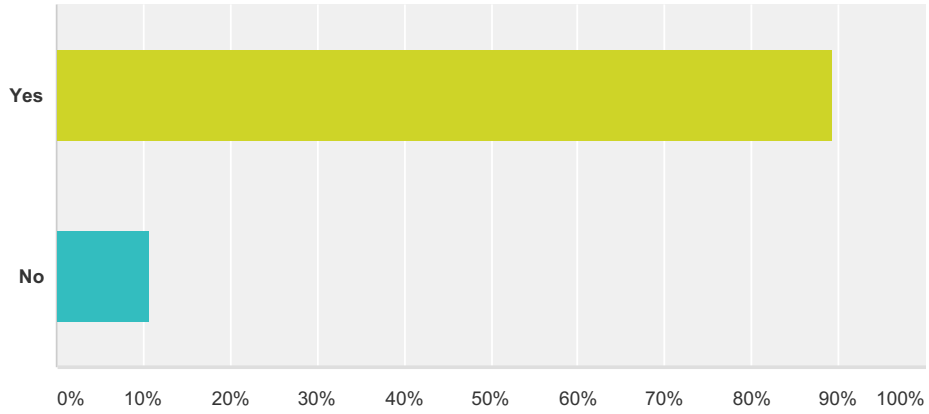
Answered: 26 Skipped: 7



Answer Choices	Responses	
APN	**88.46%**	23
PA	**61.54%**	16
Total Respondents: 26		

Q45 With respect to staffing, is there 24/7 in-hospital physician or advanced practice provider coverage dedicated to your ICU(s)?

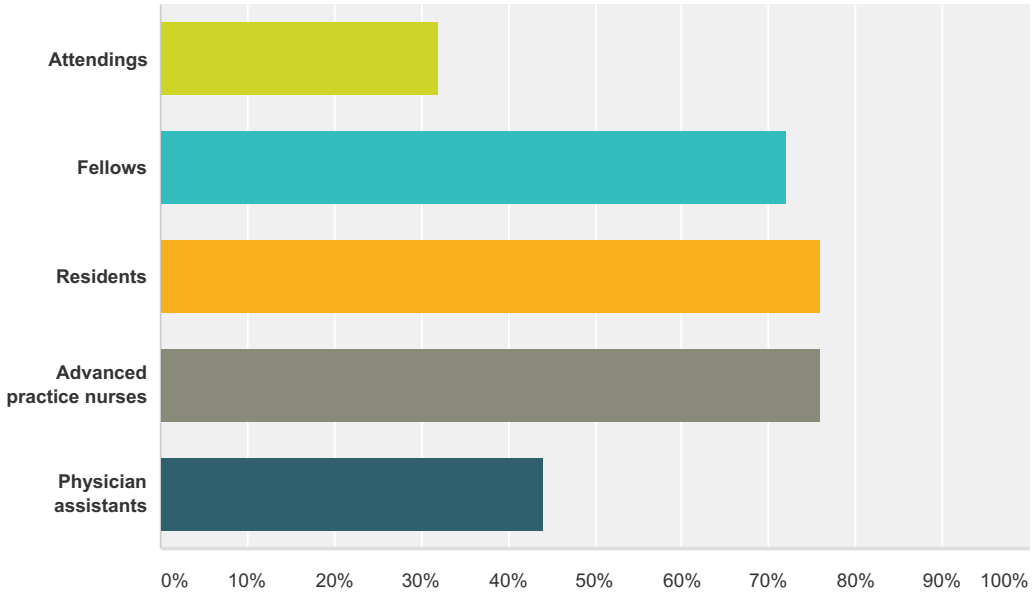
Answered: 28 Skipped: 5



Answer Choices	Responses	
Yes	**89.29%**	25
No	**10.71%**	3
Total		**28**

Q46 If there is dedicated 24/7 provider coverage in your ICU, who are the providers involved in night-time in-hospital coverage (please check ll that apply)?

Answered: 25 Skipped: 8



Answer Choices	Responses	
Attendings	**32.00%**	8
Fellows	**72.00%**	18
Residents	**76.00%**	19
Advanced practice nurses	**76.00%**	19
Physician assistants	**44.00%**	11
Total Respondents: 25		