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Development of a Competency-Based "Boot Camp" Curriculum for the PGY-1 Neurology Residents

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Development of a Competency-Based "Boot Camp" Curriculum for the PGY-1 Neurology Residents

by

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Abstract

Background: Boot camp training early in the curriculum has the potential to enhance residents' confidence, competency, and stress hardiness in managing their patients.

Goal: To develop a competency-based boot camp curriculum for PGY-1 neurology residents based on a targeted needs assessment.

Methods: A multi-modal approach has been used to assess both self-reported and objective learning needs including: ITER review, an online survey of the key stakeholders, and a consensus meeting at the University of Calgary.

Results: This study highlighted the need for the curriculum and the homogeneity between the self-reported learning needs by the learners and their observers as well as the objectively measured needs. Small group discussion, problem-based learning, simulation, and standardized patient encounter were the preferred methods of teaching. The preferred program length was three days.

Conclusion: Based on the results of this multi-modal targeted needs assessment, a neurology boot camp curriculum is needed, and a competency-based curriculum can be developed.

Keywords: boot camp, neurology, residents, competency-based, medical education, needs assessment, curriculum development.

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Dedication

I dedicate this research to my parents, Eman Halawani and Omar Makkawi, who gave all they could and have to raise my siblings and me to be valuable and respectful members of society.

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List of Symbols, Abbreviations and Nomenclature

Symbol	Definition
RCPSC	Royal College of Physicians and Surgeons of Canada
CBD	Competency by Design
IV	Intravenous
tPA	Tissue plasminogen activator
ED	Emergency Department
DTN	Door to Needle
MCQs	Multiple Choice Questions
PGY	Postgraduate Year
CNS	Central Nervous System
GQ	Graduation Questionnaire
EPA	Entrustable Professional Activity
AAMC	Association of American Medical Colleges
OSATS	Objective Structured Assessment of Technical Skills
ANRPC	Adult Neurology Residency Training Program Committee
ITER	In-Training Evaluation Report
SD	Standard Deviation
SE	Standard Error
ANOVA	Analysis of Variance
NIHSS	National Institutes of Health Stroke Scale
CSF	Cerebrospinal Fluid
EEG	Electroencephalography
MG	Myasthenia Gravis
AIDP	Acute Inflammatory Demyelinating Polyneuropathy
GBS	Guillain-Barré Syndrome
NCS	Nerve Conduction Study
EMG	Electromyography
CT	Computed Tomography
MRI	Magnetic Resonance Imaging
CBME	Competency-based medical education
CNSF	Canadian Neurological Sciences Federation

Chapter 1: Introduction

1.1 Background

There is significant stress and a sense of insecurity in the transition from being a medical student to a first-year resident (1). Once residency begins, the overwhelming number of responsibilities placed on residents often makes learning new knowledge and skills more difficult (2). "The July effect" refers to the increased risk of medical errors that occur in relation to the time of year when medical school graduates begin residency (3). The uneven baseline of residents' knowledge and procedural skills may contribute to this "July effect" (4). The use of simulation-based training with competency-based outcome measurement is one of the proposed solutions to mitigate the "July effect" (5). The shifting paradigm from the classic didactic lecture and the concept of "see-one-do-one" training to a self-directed learning and simulation-based education may improve competency and lead to practicing safer medicine (6). Informally, "boot camp" refers to military recruit training as an abrupt transition to a new way of life with a strict discipline and emphasis on hard work and physical training (7). Boot camp courses in medicine have been conducted in several fields: Surgery (2, 8-33), Orthopedic Surgery (34-37), Internal Medicine (5, 38-40), Obstetrics and Gynecology (6), Neurology (41-43), Neurological Surgery (44-50), Vascular Surgery (51), Cardiovascular/Cardiothoracic Surgery (21, 52-56), Plastic Surgery (57), Dental Surgery (58), Neonatal-Perinatal Medicine (59), Pediatrics (60), Pediatric Cardiology (61-65), Pediatric Trauma (66), Emergency Medicine (1, 67, 68), Radiology (69), Anatomic and Clinical Pathology (70), Radiation Oncology (71), Otolaryngology (72-80), Geriatric Medicine (81), Clinical Pharmacy (82), Palliative Care (83), Pediatric Anesthesia (84), Adult Anesthesia (85), Adult Critical Care (86, 87) and Pediatric Critical Care (88, 89). Taken together, they have shown that boot camp training early in the curriculum has the potential for

enhancing residents' confidence, competence, and stress hardiness in managing their patients. These findings have been confirmed by multiple recently published meta-analyses and systematic reviews (90-92).

Neurology has a reputation for being particularly difficult among medical specialties. This was described in the British Medical Journal in 1999 when the editor wrote, "the neurologist is one of the great archetypes: a brilliant, forgetful man with a bulging cranium.... who.... talks with ease about bits of the brain you'd forgotten existed, adores diagnosis and rare syndromes, and—most importantly—never bothers about treatment" (93). Neurophobia was first identified in 1994 as 'a fear of the neural sciences and clinical neurology' (94). It has been found to be endemic in medical students and junior doctors (95, 96). Several studies suggest that medical students and residents alike have difficulties in identifying and managing patients with neurological problems (97, 98). They express a lack of confidence and limited knowledge and skills to deal with patients with neurological complaints. Intimidation by the perceived complexity of neurosciences, inadequate exposure and poor teaching during medical school can explain this phobia (93, 98).

As of 2018, Neurology Residency programs in Canada are expected to work with the Royal College of Physicians and Surgeons of Canada (RCPSC) to prepare for implementation of Competency by Design (CBD); in 2020, neurology residents will enter into a CBD-based program and experience CBD-based learning and assessment (99). In CBD-based residency training, residents will begin with a "Transition to Discipline" stage of training (100). This stage is intended to 'level the playing field' by familiarizing residents who have different training backgrounds with local training expectations, fundamental skills of their discipline, and key tasks for functioning safely as a resident. Based on the known benefits of 'boot camps', a neurology

boot camp curriculum can be expected to serve as an excellent starting point for the 'Transition to Discipline' stage.

1.2 Literature Review

A PubMed search using the term "boot camp" retrieved 216 articles in total (up to February 12, 2018). Additionally, a few cited articles in the previously published reviews were used (90-92). Of the total articles found, 96 articles were relevant to boot camp training in postgraduate medical education.

There is only one recently published article related to conducting a boot camp curriculum in neurology, which was specifically done in the stroke field. Ruff and colleagues in 2017 developed and implemented a 3-hour case-based neurology resident educational stroke boot camp (41). They used a prospective database of 170 consecutive acute ischemic stroke patients treated with intravenous (IV) tissue plasminogen activator (tPA) in the emergency department (ED). They evaluated the effect of the intervention on the door to needle (DTN) time, which is a commonly used process measure in treating patients with acute stroke. The number of patients treated within 60 minutes of arrival to the ED tripled from 18.1% pre-intervention to 61.2% post-intervention with a concomitant reduction in DTN time. They concluded that stroke boot camp should be developed for neurology residents to improve rapid access to IV tPA at educational institutions.

Searching the gray literature (unpublished) using Google Scholar revealed another two poster presentations related to development of boot camp curricula in neurology.

Mohamed and colleagues in 2012 presented a poster presentation at the 37th Annual Meeting of the American Neurological Association (43). They developed a 4-day boot camp for incoming residents in July to deal with neurological emergencies including training in acute stroke

management. Residents took a pre-test, post-test, and an 8-month post-test and the authors asked them to complete an anonymous post-course survey. They found significant improvement between the pre-test and post-test; the pre-test and 8-month post-test; the post-test and eight month post-test. Most of the residents agreed that the boot camp helped them to prepare for emergency situations. The authors concluded that the boot camp could help the residents to deal with neurological emergencies.

Tariq and colleagues in 2014 presented a poster presentation at the 66th Annual Meeting of the American Academy of Neurology 2014 (42). They developed a 2-day high fidelity simulation boot camp for 13 neurology residents. They organized four simulation-based stations with a focus on emergency neurology: two stroke code scenarios (tPA and non-tPA cases), herniation with brain-death exam, and management of refractory status epilepticus. Residents filled pre- and post-simulation multiple-choice questions (MCQs) and attended debriefing sessions for formative feedback following each scenario. Most of the residents agreed that these simulation sessions met the stated clinical objectives, and they felt better in managing future similar clinical situations. Also, most of the residents found this course more useful than reading a chapter or attending a lecture on the designated topics. Additionally, there was a significant improvement in feeling comfortable running a stroke code as a first responder from neurology service between pre- and post-simulation. The authors concluded that the high fidelity simulations allowed the neurology residents to manage neurological emergencies in a safe and standardized environment.

In order to establish the current state of the field, the relevant work that has been done regarding boot camp curricula in postgraduate medical education will be reviewed. (Appendix A for summary of the boot camp articles).

1.2.1 Boot Camp Studies Reporting the Use of a Needs Assessment

Most of the retrieved articles focused on the evaluation and feedback phases of curriculum development and only seven of them reported the results of targeted needs assessment:

Blackmore and colleagues in 2015 conducted a targeted needs assessment to determine the best content and format of a pediatric surgery boot camp (101). They developed a needs assessment survey that was distributed to pediatric surgery staff and residents across the United Sates and Canada. Participants were asked to evaluate the preferred boot camp format; and to rank the top pediatric surgical diagnoses, skills, and physiological topics on frequency and importance. They found no significant differences between staff and residents in their responses. They also identified the top five topics for inclusion in a boot camp. The preferred format for the boot camp was 3–4 days in duration using multiple educational methods: problem-based learning, e-learning, small group teaching, high-fidelity simulation, and didactic lectures. The authors concluded that a novel pediatric surgery boot camp curriculum can be developed based on this needs assessment. The major limitation of their study was the low responses rate -- only 12 residents and 23 staff completed the survey (18%).

Brandman and colleagues in 2015 conducted a targeted needs assessment to identify the foundational skills required for neurosurgical residents as they transition from medical school to residency (44). They distributed a web-based survey to all Canadian academic neurosurgical centers, targeting the incoming and current postgraduate year 1 (PGY-1) neurosurgical residents as well as program directors. They used the CanMEDS competency framework for developing their survey. They asked participants to rate the importance of various cognitive, technical, and behavioral skills required for a PGY-1 neurosurgical resident (Table 1). The participants emphasized the importance of several operative, clinical, management, and technical skills. The

response rate was 73% (71% for program directors, 58% for current PGY-1 residents and 89% for incoming PGY-1 residents).

Table 1: The Surveyed Domains with the Highest Rated Skills (44)

Domain	Highest Rated Skills
Operating room knowledge and skills	Principles of draping / sterile technique Patient positioning for various craniotomy incisions
Basic anatomical and clinical principles	Taking a neurological history and performing a neurological exam in an awake and comatose patient Basic interpretation of radiographic images of the central nervous system (CNS) Identifying the location and differential diagnosis of a neurological condition based on a case history Localization of lesions based on symptoms and signs
Basic anatomical, physiological and pathological principles	Overview of hydrocephalus Overview of back/neck pain, radiculopathies and cauda equina Overview of hyponatremia and other electrolyte abnormalities
Management principles	Management of raised intracranial pressure Management of the seizing patient and status epilepticus Management of the comatose patient
Technical operative skills	Performing a lumbar puncture/inserting a lumbar drain Establishing hemostasis (e.g. using cautery, compression, etc.)
Behavioral and communication skills	Communicating with patients to obtain informed consent for basic neurosurgical procedures Communication with ward nursing staff around post-op patient care
Inter-professional communication skills	Communicating appropriate red-flags to nursing staff regarding management of post-operative craniotomies Communicating appropriate red-flags to nursing staff regarding management of post-operative spinal surgeries

Singh and colleagues in 2015 performed a needs analysis based on systematic review of the published literature on surgical boot camps (91). They analyzed 18 relevant articles on development, implementation, or evaluation of 'boot camp' curricula. They found that most of these studies' primary outcome was self-assessed confidence. The most valuable components of the courses were the 'hands-on' experiences, and the weakest parts were the didactic lectures. Some of the studies demonstrated evidence of benefits to technical skills and knowledge. Based on their systematic review, the authors proposed a framework for an intensive 1-week simulation-based course to transition graduating medical students to junior surgical residents.

Bontempo and colleagues in 2016 conducted a targeted needs assessment to determine the best timing and structure of a specialty-neutral Internship Preparation Camp (102). They surveyed 166 senior medical students using a web-based survey tool about their preferences in the Preparation Camp. Also, they used the Graduation Questionnaire (GQ) published by the Association of American Medical Colleges. Finally, they analyzed the results of the survey and the GQ and used the work group's collective experience to ensure all essential topics were covered.

Castro and colleagues in 2016 performed a needs assessment, using the triangulation method, to develop a three-day Pediatric Critical Care Boot Camp (88). They used multiple needs assessment methods including environmental scans and questionnaires to faculty, fellows, and participants. Based on the needs assessment, they created the program goals and objectives and prioritized the program content, which included procedural skills and team training skills.

Lamba and colleagues in 2016 performed a needs assessment to inform the design of their emergency medicine boot camp curriculum (67). They identified the gaps between the core Entrustable Professional Activities (EPAs) for entering residency by the Association of American Medical Colleges (AAMC) and Emergency Medicine Milestones (Level 1). Also, they determined the essential and supplemental competencies and skills for the incoming emergency medicine residents. From this, they developed a one-day emergency medicine boot camp.

Rábago and colleagues in 2017 used a modified Delphi technique to establish their simulation-based introductory course to anesthesia (85). They obtained consensus by a group of nine experts on the most commonly performed procedures by anesthesia residents in their first few weeks of residency through two rounds of sequential questionnaires.

1.2.2 Boot Camp Studies by Focus of Training

1.2.2.1 Clinical emergencies

Many of the retrieved articles emphasized preparation of new residents to deal with clinical emergencies in their particular fields. Pliego and colleagues in 2008 conducted a prospective pilot study of 23 residents to assess the effectiveness of an obstetrical and gynecologic boot camp course (6). The residents participated in several clinical simulations of common obstetrical emergencies. Post-training, residents completed a survey on their perceptions of the effects of the course on their technical skills, self-confidence, and stress hardiness. The authors found significant improvement in all of these measures. Malekzadeh and colleagues in 2011 developed a one-day intensive simulation-based otolaryngology emergency boot camp for 30 otolaryngology residents (77). Residents completed questionnaires before, immediately after, and six months following course completion. The authors found that the majority of participants agreed or strongly agreed that the intervention was helpful in improving their knowledge, technical skills, self-confidence, and clinical performance. In both studies (6, 77) and several others, (14, 18, 29, 42, 68, 72, 73, 79, 86, 88, 89, 103-105) the authors concluded that emergency-based boot camps early in training have the potential for enhancing residents' self-confidence.

1.2.2.2 Procedural skills

Most of the retrieved studies were aimed at helping the new residents improve their procedural skills required early in their training. Parent and colleagues in 2008 designed a three-day intensive skills boot camp with simulation-based training on ten topics (22). They randomized first year residents to an intervention group (boot camp) or a control group (no boot

camp). Both groups completed a survey and a clinical skills assessment. Fifteen participants were in the intervention group, and 13 were in the control group. The authors measured the effects of the boot camp on objective structured assessments of technical skills (OSATS). These assessments were done immediately after the course, intermediately at one month, and later at six months. They found the residents' competence in several procedural skills was higher for the intervention boot camp group at months 0 and 1, although much of this difference disappeared by month 6. Sonnadara and colleagues in 2011 examined the effectiveness of orthopedic intensive surgical skills boot camp on residents' surgical skills (35-37). Six residents assessed for core surgical skills using an OSATS procedure before and after the boot camp were compared to 16 residents who did not attend boot camp training: the boot camp group performed significantly better on both the checklists and global rating scores of the assessment. In addition, the boot camp participants had excellent retention rates after six months which was similar to the control group. In these articles (22, 35-37) and several others (9, 14-16, 18, 20, 28, 30-32, 34, 52, 54-56, 60, 64, 65, 84, 85, 88), the authors concluded that the procedural skills boot camp could accelerate the learning curve for new residents to acquire the essential technical skills and augments classical training.

1.2.2.3 Communication skills

Few of the retrieved articles were specifically designed to improve new residents' communication skills. Williams and colleagues in 2010 piloted a three-hour palliative care boot camp course to instruct 17 fourth-year medical students on death assessment, death notification, and running "goals of care" discussions with families (83). Standardized patient encounters were used. Students were asked to reflect on these scenarios via written and verbal feedback and

compare them to any previous exposure. They found that the students believed all scenarios improved readiness to begin internship and provided principles to engage in palliative care conversations. The authors concluded that graduating medical students perceived the communication-based palliative care boot camp course as valuable in preparing them for residency.

1.2.2.4 Multiple Competency Domains

Several of the retrieved articles were designed to enhance new residents' performance on multiple competency domains. Laack and colleagues in 2010 conducted an intensive one-week simulated boot camp course to help prepare medical students for transition to residency (103). In this boot camp, they used high-fidelity simulation, problem-based learning, standardized patients, and procedural task trainers to address several competency domains (Table 2). Twelve final year medical students participated in this elective course compared to 28 students who did not participate. An anonymous survey was conducted 5 to 7 months after completion of the boot camp course for both groups about their preparation for residency. They found that most of the responders to an open-ended question listed the boot camp as one of the best preparatory activities in transitioning to residency. The authors concluded that the boot camp was a unique learning environment recalled by medical students as a helpful component in preparation for residency. Several other articles demonstrate feasibility and efficacy of multiple domain competency-based boot camp courses in preparing medical students for residency training (5, 10, 13, 19, 30, 32, 33, 40, 45, 66, 68, 69, 79, 87, 105, 106).

Table 2: Addressed Competency Domains and Possible Problems During Boot Camp (103)

Domain	Examples
Acute Emergencies	Shock, shortness of breath, pregnancy-related emergencies, mental status changes
Safety	Approach to the aggressive patient, use of patient restraints, patient falls, interpretation of monitor data
Communication	Patient handoffs, language barriers and translator use, breaking bad news, discharge summaries
Legal/Ethical	Code status dilemmas, child abuse, informed consent, dealing with medical errors
Data Interpretation	Addressing electrolyte abnormalities, anticoagulation challenges, approaching anemia, acute hypertension

1.2.3 Boot Camp Studies by Educational Strategy

1.2.3.1 Simulation

Almost all the studies reviewed used some form of simulation-based education to facilitate the transition of medical students to residency training. This ranged from low-fidelity (2, 22) to high-fidelity simulation (6, 16, 18, 29, 45, 51-56, 58, 60, 66, 68, 72, 73, 75-79, 86, 87, 89, 103-105, 107). The use of the simulation-based training has been successfully implemented in both surgical (2, 6, 11, 16-19, 21, 22, 24, 26, 27, 29, 32, 34-37, 45-58, 66, 72-79) and non-surgical specialties (1, 5, 38, 40, 42, 59-63, 67-69, 84-89, 102-107). Fernandez and colleagues in 2012 reported the educational outcomes after four successive years of boot camp simulation-based training at the onset of surgical residency (17). They developed an intensive preparatory training curriculum inclusive of cognitive and procedural skills that are considered essential for early PGY-1 training. Over a four-year period, 30 PGY-1 surgical residents underwent a specific boot camp course over a nine-week period. This course consisted of weekly one-hour and three-hour sessions in a simulation center. Training occurred in procedural skills areas and simulated patient care using a variety of high- and low-fidelity simulations. They assessed the baseline and post-boot camp cognitive skills through written tests on basic patient management, and evaluated

technical skills with a variety of task-specific instruments. They found that the residents' performance improved between the pre- and post-test after the boot camp course. Cohen and colleagues in 2013 conducted a cohort study to evaluate the effect of a simulation-based boot camp on internal medicine residents' clinical skills (5). They compared the performance of 47 boot camp trained residents and 109 historical controls on five parts of a clinical skills examination. Boot camp trained residents participated in three days of simulation training, small-group teaching sessions, deliberate practice, and individualized feedback. Boot camp trained residents performed significantly better than historical control residents in all skills. Both authors (5, 17) concluded that the individualized simulation-based boot camp, in surgical or non-surgical disciplines, could improve the PGY-1 residents' performance in cognitive and procedural skills.

1.2.3.2 Didactic lectures

Most of the studies reviewed used some form of didactic teaching as part of their boot camp curriculum to enrich the participants' knowledge prior to starting their residency training (1, 2, 5, 8-10, 12, 16-23, 25, 28-32, 35-37, 39, 45-50, 53, 56, 57, 61-65, 69-72, 81, 87, 89, 102-105, 107). This teaching strategy was never used alone and was usually perceived as the "least valuable" part of the curriculum (2, 47, 91). Esterl and colleagues in 2006 conducted a boot camp for 16 fourth-year medical students over a four-week elective that included a series of clinical and didactic sessions (2). They conducted a pre- and post-survey to evaluate the effectiveness of the elective. They focused on the participants' confidence levels in four areas: patient management, technical skills, anatomic dissection, and administrative skills. Also, they conducted a focus group session to identify the strengths and weaknesses of the elective. Students post-boot camp training rated themselves more confident in all categories on the survey.

In the focus group sessions, the students overwhelmingly requested more "hands-on" training sessions. The authors concluded that the boot camp could result in increased self-confidence before starting surgical residency. Similarly, Selden and colleagues in 2011 reported the result of a two-day boot camp course to introduce 18 first year neurosurgical trainees to various fundamental cognitive and practical skills (47). This course consisted of didactic lectures and hands-on simulation sessions. They conducted an online survey to evaluate the relevance and the quality of each didactic and hands-on course component. All the trainees believed that the course reached its goals and provided relevant and valuable information and experience. In particular, the hands-on component of the course was highly valued by the participants. The authors concluded that the fundamental skills boot camp course seemed valuable to introduce medical school graduates to neurosurgical training.

1.2.3.3 Problem-based learning / Small group teaching

Many of the retrieved articles used problem-based learning and small group teaching strategies as part of their boot camp curriculum to enhance new residents' clinical knowledge and skills (2, 5, 18, 23, 24, 41, 45, 50, 71, 81, 89, 103). In most of the cases, these educational strategies were used to complement the knowledge aspect of the simulation-based training. Nishisaki and colleagues in 2009 conducted a multicenter simulation-based orientation training boot camp for 22 first year pediatric critical care fellows (89). This course was carried over two and a half days to cover common pediatric critical care crises and consisted of small group interactive sessions, high-fidelity simulation, and didactic lectures. They conducted immediate post-training and 6-month follow-up surveys to evaluate the effectiveness of the course. They found that participants rated each training session highly and felt that this training was highly

effective in improving their clinical performance and self-confidence. The authors concluded that the pediatric critical care boot camp training integrated with simulation was effective and logistically feasible.

1.2.3.4 Multiple teaching strategies

Many of the retrieved articles used multiple teaching strategies to provide new residents with the necessary clinical knowledge and skills in a boot camp curriculum. Krajewski and colleagues in 2013 implemented a boot camp curriculum to address clinical competencies (16). All new residents at the authors' institution completed a two-month boot camp course consisting of knowledge-based and procedural skills didactic sessions, web-based self-study modules, and standardized patient clinical skills assessment. Several assessment tools were used including survey, knowledge-based tests, and clinical skills assessments. The results suggested the usefulness and relevance of the boot camp. The authors concluded that a boot camp curriculum with multiple teaching strategies could provide new residents with the necessary knowledge and practical skills to attain clinical competence. Several other articles reached a similar conclusion about incorporating multiple teaching strategies into their boot camp curricula (5, 12, 14, 16, 18, 19, 23, 25, 30, 40, 45, 49, 50, 58, 64, 66-69, 81, 87, 88, 102, 103, 105).

1.2.4 Boot Camp Studies by Measurement Method

The authors of the retrieved articles used either self-reported or objectively measured outcomes to determine the efficacy of their curriculum (Table 3). Most of them compared the results of pre- to post-boot camp surveys or testes to draw their conclusions (2, 6, 10, 12, 14-22, 24-37, 39, 41-43, 45-48, 50-52, 55-58, 60-68, 70-73, 75-79, 81, 86, 88, 91, 104, 105). A few

compared their results with a control group (5, 21, 22, 34-37, 40, 41, 61, 64, 103) in order to avoid the maturation effect of residency training. Others compared their results with a delayed follow-up to examine the retention rate (21, 22, 35-37, 43, 45-48, 55, 57, 61, 69, 73, 75-78, 87, 89, 102, 103, 106).

Table 3: Measurement Methods and Outcome in Boot Camp Curriculum

Outcome	Measurement	Outcome	Reference
Self-reported	Survey	Self confidence Clinical skills / performance Stress hardiness Technical skills Level of preparation Satisfaction level Knowledge level	(1, 2, 5, 6, 8, 10, 12-16, 18-33, 39, 40, 43, 45-51, 53-58, 60-70, 72, 73, 75-79, 81, 82, 84-86, 88, 89, 102-106)
	Interview	Level of preparation Satisfaction level Self confidence Faculty motivation Socio-cultural complexity	(2, 11, 38, 42, 70, 74, 79, 83)
Objectively Measured	Skills Test (OSCE, OSAT)	Clinical skills Technical skills	(5, 9, 14, 16-18, 20, 28, 30, 31, 34-37, 40, 43, 52, 55, 56, 64-67, 85-88, 105, 107)
	Knowledge Test (MCQs, Short Answer Questions)	Knowledge level	(9, 14-19, 25, 29, 31, 39, 41-43, 45, 54, 61, 62, 64-66, 70-72, 86, 107)

1.2.5 Boot Camp Studies by Length of Course and Sampling

There is significant heterogeneity in published boot camp studies in regard to the length of the course, setting, context, and sampling. Most of the courses were conducted over 2 to 7 days (1, 5, 10, 11, 14, 15, 19, 21-24, 39, 40, 42, 43, 45-51, 53, 57-59, 61, 62, 64-66, 68, 71, 82, 85-89, 103, 105-107) but the range was from one hour (81) to three months (6, 20, 70). Many of the longer courses (≥ 3weeks) were carried out over several weekends or half days and incorporated into the regular curriculum (2, 6, 12, 16-18, 20, 25, 27-37, 47, 56, 63, 70). Also, the number of participants was highly variable with a range of 6 (58, 69) to 4172 (106) residents recruited into single or multicenter boot camp courses.

In summary, the literature on boot camp curricula for postgraduate training provides overwhelming evidence of the boot camp effectiveness on new residents' self-confidence, clinical and technical skills, and competency but there was a significant variation in course development, implementation, evaluation, and outcomes. Additionally, targeted needs assessment has rarely been used despite its crucial role in curriculum development.

1.3 Knowledge Gaps and Significance

The effectiveness of boot camp training has been clearly documented in the literature. It has the potential to improve new residents' self-confidence, clinical and technical skills, and competency. In order to develop a successful curriculum, the first step after problem identification and general needs assessment is performing a targeted needs assessment (108). Using an approach to discover self-reported and objective learning needs can further optimize the curriculum development (109, 110). However, to this author's knowledge, no such curriculum based on a targeted needs assessment has been developed for neurology residents to enhance their self-confidence and competence in managing their patients. This study used a multi-modal approach to conduct a needs assessment (including measuring the self-reported and objective learning needs) to develop a competency-based boot camp curriculum for PGY-1 neurology residents. In this project, the boot camp curriculum is specifically designed to target the needs identified by the key stakeholders (i.e. residents, staff, and nurses). Elements of the CanMEDs 2015 physician competency framework thought to be most relevant to PGY-1 neurology residents were incorporated into the targeted needs assessment (111). It is anticipated that this curriculum will be helpful in the implementation of the Royal College of Physicians and Surgeons of Canada's Competency by Design (CBD) project starting in 2018 by supporting the "Transition to Discipline" stage of training. Successful implementation of this curriculum will potentially improve new residents' self-confidence, clinical and technical skills, and competence. Ultimately, it is expected that patient care will be improved by minimizing the "July effect" through this educational effort.

Chapter 2: Goal, Objectives, and Questions

Guided by the preceding discussion, the following research goal, objectives, and specific research questions were identified:

2.1 Goal

The goal of this study is to develop a competency-based boot camp curriculum for PGY-1 neurology residents based on a multi-modal targeted needs assessment.

2.2 Objectives

The objectives are: i) to determine the self-reported learning needs for a boot camp curriculum for PGY-1 neurology residents by conducting a needs assessment survey of the learners (i.e. neurology residents) and the learners' observers (i.e. staff neurologists and nurse leaders/ educators); ii) to determine the objective learning needs for the boot camp curriculum for the PGY-1 neurology residents by reviewing in-training evaluation reports (ITERs) of neurology rotations for PGY-1 neurology residents at the University of Calgary over the last five years; iii) to determine the differences of the self-reported learning needs in the boot camp curriculum between the residents and the observed learning needs reported by staff neurologists; and iv) to integrate the self-reported and objective learning needs to build consensus on the content and structure of a boot camp curriculum for PGY-1 neurology residents by conducting a consensus meeting with the University of Calgary Adult Neurology Residency Training Program Committee (ANRPC).

2.3 Questions

The study questions are:

1) What do the neurology residents, staff neurologists, and nurse leaders/ educators at the University of Calgary believe should be included in a boot camp curriculum for PGY-1 neurology residents?

2) What are the strengths and weaknesses of the neurology residents at the University of Calgary in their first year of training?

3) What are the differences between the learning needs perceived by the neurology residents and staff neurologists at the University of Calgary?

4) What are the preferred duration, teaching strategies, and main topics that should be included in a boot camp curriculum for PGY-1 neurology residents based on the self-reported and objective learning needs?

Chapter 3: Research Methodology

3.1 Setting, Context, Population

This study was carried out at the University of Calgary. The adult neurology residency-training program at the University of Calgary is one of the 16 adult neurology residency-training programs in Canada and considered a medium-sized program. There are 18 adult neurology residents at the University of Calgary; three PGY-1, four PGY-2, four PGY-3, four PGY-4 and three PGY-5. There are 70 staff neurologists working at the University of Calgary; including nine clinical fellows who recently graduated from Canadian universities. There are about 150 nurses working in clinical neurosciences units (Units 100, 111, and 112) at the Foothills Medical Centre in Calgary; 10 of them are in administrative or educational positions. Additionally, there are two nurse practitioners working in the inpatient neurosciences wards at the University of Calgary. The ANRPC has 13 members: four residents and nine neurologists. In the first two years of training in adult neurology, the Royal College of Physicians and Surgeons of Canada mandates a minimum of two months and a maximum of eight months in clinical neurology (112). At the University of Calgary, the first-year adult neurology residents spend four months in clinical neurology. The ITERs of PGY-1 residents at the University of Calgary during their rotations in neurology from July 2012 to June 2017 were reviewed. This starting date was chosen because of the significant changes in the evaluation forms at that time. A total of 204 ITERs were reviewed. The needs assessment survey was distributed to all 18 neurology residents, 70 staff neurologists and 12 nurse leaders/ educators in the clinical neurosciences units. This group was identified as the key informants because of their current or previous experience as first year residents (i.e. neurology residents) or their daily direct encounters with the first year neurology

residents (i.e. staff neurologists and nurse leaders/ educators). All the participants work at the University of Calgary. The consensus meeting to validate the content and structure of the curriculum by integrating the self-reported and objective learning needs was conducted with the members of the ANRPC, which includes the program director, the head of the Division of Neurology, another seven staff neurologist and four resident members.

3.2 Data Collection (Figure 1)

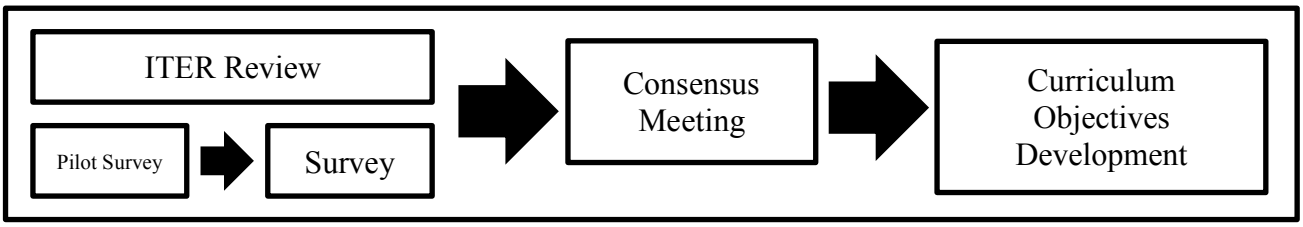

Figure 1: Summary of the Data Collection Steps

3.2.1 ITER Review

The PGY-1 adult neurology residents at the University of Calgary spend four months in clinical neurology. These four months could be in any of the following rotations: Neurology Consults, Neurology Inpatient, Mixed Ambulatory Neurology Clinics, Stroke Unit or Stroke Night Float. The residents are evaluated in these rotations by ITER through the One45 system (Appendix B). The ITERs of the PGY-1 residents at the University of Calgary during their rotation in neurology over the last five years were reviewed to identify the objective learning needs. The program director and chair of the ANRPC, generated an anonymized aggregate report of each rotation through the One45 system. These ITERs are divided into two sections: scoring and free-text comments. The scoring section is based on the CanMEDs physician competency

framework, which include: Medical Expert, Communicator, Collaborator, Manager/ Leader, Health Advocate, Scholar, and Professional. It is scored on a rating scale of 1 to 5 as the following: "N/A = not assessed, 1 = completely fails to meet objective for PGY-level, 2 = fails to meet objective for level but does meet in part, 3 = meets objective for PGY-level, 4 = exceeds objective for PGY-level, and 5 = exceeds objective routinely and consistently performs at consultant level". Both scoring and free-text comment sections were used to measure the strengths and weaknesses of the neurology residents at the University of Calgary in their first year of training, to identify evidence of their objective learning needs. The process of analyzing the ITERs is described under data analysis.

3.2.2 Survey

3.2.2.1 Survey design

The survey was created to measure the self-reported targeted learning needs for the boot camp curriculum for the PGY-1 neurology residents. Also, it was used to find out the differences in the self-reported learning needs in the boot camp curriculum between the residents and the staff neurologists. A preliminary survey (unpublished) regarding a possible neuroscience boot camp conducted at the University of Calgary in 2012 was used to hone the survey questions. The investigator surveyed 25 residents in the Department of Clinical Neurosciences. All the participants in the preliminary survey indicated that training in performing a detailed neurological examination is required in boot camp training in the first year of residency. An approach to common neurological emergencies, and an approach to interpreting CT scans and MRIs of the brain and spine was identified as important by 95% and 87% of respondents, respectively. Additionally, the literature review and expert opinion (medical education and

neurology) was also used to enhance the survey questionnaire. Elements of the CanMEDs physician competency framework, thought to be most relevant to first year neurology residents by neurology experts, were incorporated into the survey. These elements grouped into the following: approach to neurological emergencies, clinical and procedural skills, and communication and interpersonal skills. The participants were asked to rate their perception of the importance and frequency of each item on a 5-point Likert scale. Higher ratings of the item indicate higher importance and higher frequency. Respondents were also asked to determine the most appropriate length of the program and about preferred teaching strategies. Choices of teaching strategies included simulation, problem-based learning, e-learning, small group teaching, standardized patient encounter, and/or didactic lecture (Appendix C). To ensure the clarity of the survey questions, the survey was piloted with one resident and two neurologists. Informal discussions about clarity and appropriateness of the survey questions were conducted. Finally, an online survey was created using SurveyMonkey (SurveyMonkey Inc., Palo Alto, California, USA).

3.2.2.2 Survey distribution

The survey was distributed to all 18 neurology residents, 70 staff neurologists (including Canadian-trained neurology subspecialty fellows), and 12 nurse leaders/ educators in the clinical neurosciences units at the University of Calgary. The participants were recruited by sending out the online survey via an e-mailed electronic link. To improve the response rate, the same survey was distributed by a USB flash drive with a link to the online survey (Figure 2). An explanatory and support letter was attached. The research supervisor, who is a neurologist and medical educator at the University of Calgary, and the Program Director of ANRPC co-signed this letter

(Appendix D). The online survey had a four-week deadline. Three e-mail reminders were sent out to the participants: the first reminder after two weeks, the second reminder one week prior to the deadline, and the final reminder two days prior to the deadline.

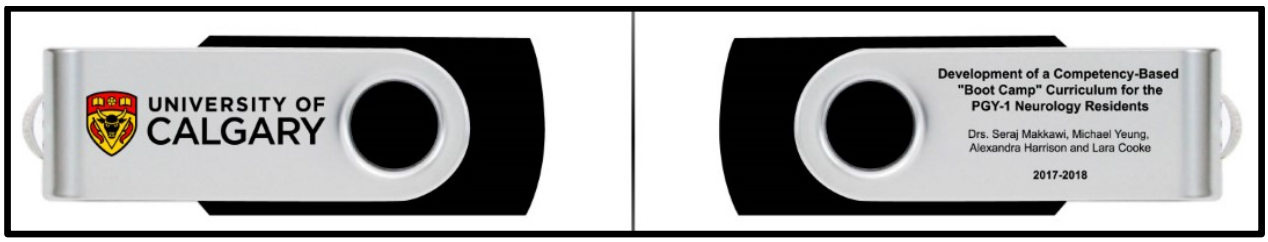

Figure 2: Illustration of the Distributed USB Flash Drive

3.2.3 Consensus Meeting

Finally, a consensus meeting was conducted with the members of the ANRPC during one of their scheduled meetings. The chair of ANRPC sent an invitation letter to the committee members through e-mail to participate in this voluntary consensus meeting (Appendix E). At the beginning of the meeting, the results of the ITER review and the surveys were presented, including the suggested duration, format, teaching methods, and the highest ranked topics, with the proposed curriculum agenda. Based on this provided information, the committee members were asked to identify any major gaps and to validate the structure and content of boot camp curriculum for PGY-1 neurology residents based on the self-reported and objective learning needs. At the end of the meeting, the ANRPC committee reached a consensus on the final agenda of the boot camp curriculum for PGY-1 neurology residents. The author used this final agenda to write the specific objectives for each session.

3.3 Data Handling Procedures

The confidentiality and anonymity of participants were maintained. The program director of ANRPC generated the ITERs reports in aggregated anonymous form for each rotation. The free-text comment section was collated into a single document with identifying information redacted. He anonymized the reports before they were made available to the researchers by removing names and any descriptors that might identify the learner (e.g., comments about accents, English proficiency, gender, origin, prior training, etc.). The free text comment section in any evaluation was omitted if the anonymization process was not possible. For the electronic survey, a new account in SurveyMonkey (SurveyMonkey Inc., Palo Alto, California, USA) was created. E-mails were sent to key stakeholders with the invitation letter to participate in the study and the link to the survey. The same survey was distributed by a USB flash drive with a link to the online survey. The first page of the survey had a brief introduction regarding the study and an electronic consent form (Appendix F). To avoid duplication, there were self-generated anonymized identification questions (birthday and first and second letters of the following: birthplace, mother's first name, and father's first name) (113). Also, the participating members of the ANRPC in the consensus meeting signed formal informed consent (Appendix G). Finally, the data was stored in a password-protected computer, and all the communications regarding the project were made through a University of Calgary e-mail account. The University of Calgary Conjoint Health Research Ethics Board approved this research study (Ethics ID: REB14-1835).

3.4 Data Analysis

3.4.1 ITER Review

Analysis of scoring section

Descriptive statistics were used to describe the mean, standard deviation and range of each item of the reviewed ITERs. Each rotation (Neurology Consults, Neurology Inpatient, Mixed Ambulatory Neurology Clinics, Stroke Unit or Stroke Night Float) was analyzed separately to identify the strengths and weaknesses of the neurology residents in their first year of training. Because the majority of ratings were in the 4 to 5 range, items with a mean score below 4.00 were considered as possible areas for improvement.

Analysis of free text ITER comments

The free text comment section was analyzed using the framework method (114). The CanMEDs physician competency framework was used as the analytical framework. This method of analysis has been chosen, as the purpose of the study is to determine the residents' strengths and areas for improvement within the current national standards for residents' evaluation, which is the CanMEDs physician competency framework. A more robust qualitative approach such as grounded theory was not considered for this part of the analysis because of the nature of the 'qualitative data' being used; free-text comments from a survey, questionnaire or evaluation would not supply appropriate raw material for a full qualitative analysis. The free text comments were read through once to gather an overall picture of common themes in the ITERs. Next, they were reviewed using a coding structure based upon the CanMEDS framework, assigning free-text comments to categories according to the CanMEDS roles/ competencies. Comments then were attributed to subtheme of strength or area for improvement. Finally, the subtheme 'nuances'

(for example, improvements in localization under the medical expert role) were extracted from the comments within each subtheme (strength or area for improvement) in the CanMEDS framework. Comments under a given role were considered to be “common” if noted three times or more by evaluators and “less common” if mentioned less than three times.

3.4.2 Survey

Descriptive statistics were used to describe the mean, median, standard deviation (SD), and standard error (SE) for importance and frequency of each item of the surveys for all residents, staff, and nurse leaders/ educators respondents (115). One-way analysis of variance (ANOVA) was applied to compare residents’ and staff neurologists’ perception on the level of importance or frequency of the possible topics for the boot camp curriculum for the PGY-1 neurology residents. Levene's test was used to test for the homogeneity of variance. If the homogeneity of variance was violated (Levene's test is significant) then the data was interpreted with caution using the Brown-Forsythe F-ratio. The data were analyzed using SPSS version 22. *P*-values <0.05 was considered statistically significant. The open-ended questions were analyzed thematically. The reliability of the needs assessment forms was assessed using Cronbach’s alpha.

The study used four of the five methods approach to needs assessment described by Smith and Beran (116), excluding the Rasch model which requires a larger sample size (117), to develop rank order lists for clinical presentations (Table 4). This approach was also used by Blackmore in his recent targeted needs assessment for a boot camp curriculum for pediatric surgery residents (101).

Table 4: Five Methods to rank ordering learning needs described by Smith and Beran (44)

Method	Description
Frequency Mean	Based only on "frequency" ratings
Importance Mean	Based only on "importance" ratings
Multiplicative Model	Multiplying the "frequency" and "importance" rating to obtain a composite score, which offers equal weighting to both ratings
Three-step Model	Assigning weights on both frequency and importance (items ranked highly on both scales received higher weighting than items ranked highly on a single rating)
Rasch Model	Calculated by specific formula using Facets 3.66.1 software program

These four ranking methods were used determine the highest ranked topics; the number of topics to include in the curriculum was determined based upon the preferred boot camp length as determined by the survey. Spearman correlation was conducted among the four methods to determine the most appropriate method for the final curriculum as well as to determine the correlation among the participant groups (residents, nurses, staff neurologists).

Additionally, the Safety Risk Assessment Matrix method was used to prioritize neurological emergencies for the boot camp curriculum (118). This method has been used extensively in the field of patient safety to calculate the assessed risk index and determine the highest priority hazards (118-120). This method adds the additional element to the other ranking methods of incorporating a higher weight for items with the highest level of importance or frequency (median score of 5 on a 5-point Likert scale) in order to attend to patient safety issues, which are particularly relevant for neurological emergencies that may be encountered by residents in July of their first year. Therefore, this study also used this method to analyze the results, given the potential risk of inexperienced PGY-1 neurology residents who must deal with these neurological emergency situations. The median scores for importance and frequency of

each neurological emergency in the survey were calculated and used to determine the assessed risk index (Figure 3). Items in the intolerable risk region (score 5A, 5B, 5C, 4A, 4B, and 3A) were considered to be the highest priority neurological emergencies that need to be mastered by PGY-1 neurology residents to minimize the potential "July Effect".

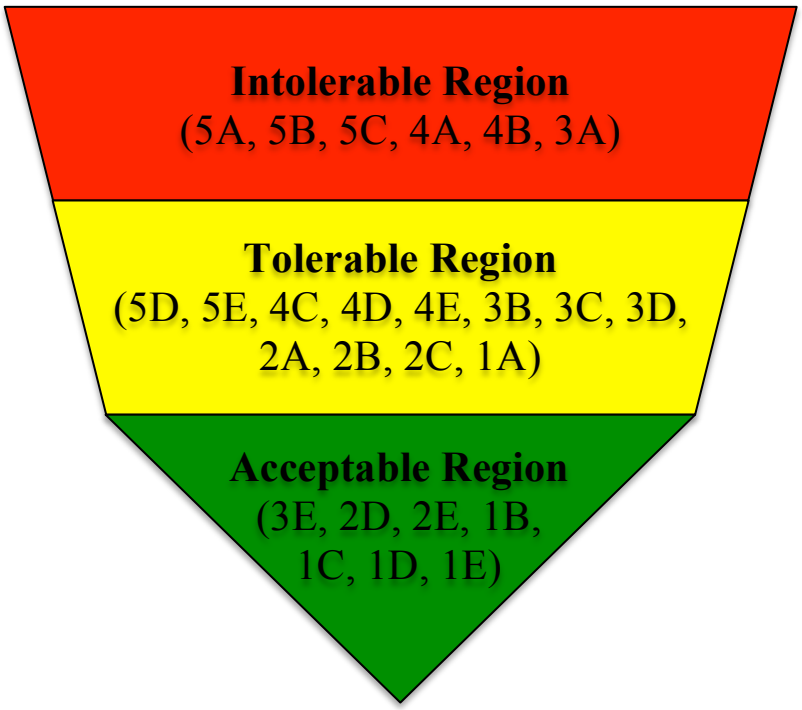

Figure 3: Safety Risk Tolerability Matrix

Chapter 4: Results

4.1 ITER Review

4.1.1 Participants

In total 204 ITERs for PGY-1 adult neurology residents at the University of Calgary during their rotation in neurology over the last five years (July 2012 to June 2017) were reviewed. Most of these ITERs (36.76%) evaluated the residents during their rotations in the inpatient neurology service (Table 5).

Table 5: Distribution of ITERs by Rotation

Rotation		Number of ITERs	Percentage
Neurology Inpatient		75	36.76%
Neurology Consults		45	22.06%
Stroke	Stroke Unit	16	13.73%
	Stroke Night Float	12	
Mixed Ambulatory Neurology Clinics	Mixed Ambulatory Form	8	27.45%
	Daily Encounter Form	48	

4.1.2 Scoring Section

4.1.2.1 Scores by rotation

The mean scores of the items in the ITERs ranged from 3.83 to 4.45 in neurology inpatient rotation, 4.02 to 4.50 in neurology consult rotation, 4.00 to 4.33 in stroke rotations, and 4.00 to 4.51 in mixed ambulatory clinic rotation (Table 6 and Appendix H).

Only seven items had a mean score less 4.00, which were identified as potential areas for improvement. All of these items were identified from evaluations of residents on the neurology inpatient rotation (Table 7). The mean overall performance scores in the ITERs were 4.18 for neurology inpatient rotations, 4.20 on neurology consult rotations, 4.26 on stroke rotations, 4.25 on mixed ambulatory clinic rotations, and 4.20 in all PGY-1 neurology rotations (Table 8).

Table 6: Neurology Inpatient ITERs in Ascending Order By Mean Score

Order	Item	N	Min	Max	Mean (SD)
1	Describe the fundamental physiology for common neurological conditions.	69	2	5	3.83 (0.73)
2	Order appropriate tests and understand the findings.	74	3	5	3.93 (0.60)
3	List indications and contraindications for common ancillary tests including CT or MRI head with and without contrast, lumbar puncture, EEG, EMG/NCS.	70	3	5	3.94 (0.61)
4	Identify first line treatments for most common neurological conditions encountered on the inpatient service	74	3	5	3.95 (0.59)
5	Make decisions promptly, showing good judgment, based on logical reasoning.	74	3	5	3.97 (0.64)
6	Localize symptoms and signs correctly most of the time	75	3	5	3.97 (0.61)
7	Appropriately allocate finite resources, such as urgent MRI slots or EMG/NCS.	68	3	5	3.99 (0.68)
8	Identify relevant community resources for neurology to assist in discharging patients.	62	3	5	4.02 (0.64)
9	List risk factors and prevention strategies for common neurological conditions.	65	3	5	4.06 (0.63)
10	Recognize patients in need of emergent action.	65	3	5	4.08 (0.65)
11	Conduct a complete and systematic neurological examination, recognizing significant findings most of the time.	75	3	5	4.08 (0.65)
12	Make an effort to teach medical students and junior learners on the team	62	2	5	4.08 (0.78)
13	Often read articles pertaining to patient care questions.	64	3	5	4.09 (0.66)
14	Make accurate, legible, inclusive chart notes to document clinical encounters.	75	3	5	4.12 (0.64)
15	Provide information in concise, understandable, lay terms to patients and families.	74	3	5	4.12 (0.64)
16	Call for help in cases of patients in need of emergent action and sometimes initiate care in such patients.	59	3	5	4.14 (0.71)
17	Manage time appropriately such that a new consultation is completed in less than 90 minutes.	75	3	5	4.16 (0.66)
18	Describe the method and risks of performing a lumbar puncture	50	3	5	4.16 (0.68)

19	Complete discharge summaries and contact primary care givers in the management of transition out of hospital.	74	3	5	4.18 (0.65)
20	Perform a lumbar puncture on an average patient	41	3	5	4.20 (0.75)
21	Make an organized, well-conceived case presentation at academic rounds.	58	3	5	4.21 (0.72)
22	Clearly communicate issues in a concise manner to other health care professionals who are asked to become involved in the care of individual patients.	73	3	5	4.22 (0.63)
23	Contribute to daily discussion of the inpatients by the team, incorporating input from nurses, social work, and rehab team as appropriate.	75	3	5	4.23 (0.63)
24	Demonstrate empathy for patients and families.	75	3	5	4.24 (0.63)
25	Efficiently elicit accurate histories from patients and families, including patient perspective and context.	75	3	5	4.24 (0.63)
26	Participate in team/family meetings, where appropriate, providing input on medical issues, and incorporating the recommendations of others	70	3	5	4.24 (0.60)
27	Prioritize urgent and non-urgent tasks.	74	3	5	4.24 (0.68)
28	Recruit appropriate health care professionals needed in arranging disposition/discharge of patients.	73	3	5	4.25 (0.64)
29	Recognize personal limitations and ask for help when appropriate.	73	3	5	4.25 (0.70)
30	Effectively establish therapeutic relationship with patients.	75	3	5	4.31 (0.66)
31	Demonstrate punctuality and attendance at all academic rounds and ward rounds.	75	3	5	4.33 (0.68)
32	Contribute to the team by managing at least 2-4 in-patients.	74	3	5	4.34 (0.65)
33	Demonstrate professional behaviour: Seeks out new learning	75	3	5	4.35 (0.67)
34	Demonstrate professional behaviour: Punctual	75	3	5	4.36 (0.69)
35	Demonstrate professional behaviour: Honest, and shows integrity.	75	3	5	4.43 (0.64)
36	Always demonstrate respectful behavior to all health care providers on the team.	75	3	5	4.43 (0.64)
37	Demonstrate professional behaviour: Polite and respectful of patients and staff	75	3	5	4.45 (0.64)

Table 7: Summary Table of Items that had Mean Score less than 4 on ITERs

Identified Areas for Improvement	CanMEDs Role
1. Describe the fundamental physiology for common neurological conditions.	Medical Expert
2. Order appropriate tests and understand the findings.	Medical Expert
3. List indications and contraindications for common ancillary tests including CT or MRI head with and without contrast, lumbar puncture, EEG, EMG/NCS.	Medical Expert
4. Identify first line treatments for most common neurological conditions encountered on the inpatient service	Medical Expert
5. Make decisions promptly, showing good judgment, based on logical reasoning.	Medical Expert
6. Localize symptoms and signs correctly most of the time	Medical Expert
7. Appropriately allocate finite resources, such as urgent MRI slots or EMG/NCS.	Health Advocate

Table 8: Overall Performance

Rotation		N	Min	Max	Mean (SD)
Neurology Inpatient		74	3.00	5.00	4.18 (0.58)
Neurology Consults		44	3.00	5.00	4.20 (0.55)
Stroke	**Stroke Unit**	27	3.00	5.00	4.26 (0.66)
	Stroke Night Float				
Mixed Ambulatory Neurology Clinics	**Mixed Ambulatory Form**	8	4.00	5.00	4.25 (0.46)
	Daily Encounter Form*				
Total		153	3.00	5.00	4.20 (0.58)
Missing		51			

* No overall score in the form

4.1.2.2 Scores by CanMEDs Roles

The lowest CanMEDs Role mean score was related to medical expert in neurology inpatient and mixed ambulatory clinic rotations, and health advocate role in neurology consult and stoke rotations. The highest CanMEDs Role mean score was related to the professionalism in neurology inpatient and neurology consult rotations and collaboration in stoke and mixed ambulatory clinic rotations. Overall professionalism and collaboration were considered as strengths, and medical expert and health advocacy were considered as potential areas for improvement (Table 9 and 10).

Table 9: CanMEDs Roles in ITERs by Rotation

Rotation		ME	S	CM	HA	P	CL	L
Neurology Inpatient	N	75	73	75	75	75	75	75
	Mean	4.00	4.08	4.20	4.06	4.37	4.28	4.27
	SD	0.56	0.65	0.58	0.62	0.61	0.58	0.61
Neurology Consults	N	45	45	45	45	45	45	45
	Mean	4.12	4.19	4.16	4.07	4.31	4.17	4.10
	SD	0.50	0.54	0.49	0.56	0.44	0.54	0.56
Stroke	N	28	28	28	27	25	28	28
	Mean	4.16	4.25	4.17	4.07	4.20	4.26	4.20
	SD	0.60	0.60	0.64	0.62	0.69	0.63	0.66
Mixed Ambulatory Neurology Clinics	N	55	8	42	54	56	44	53
	Mean	4.17	4.45	4.26	4.27	4.35	4.48	4.34
	SD	0.59	0.50	0.63	0.56	0.56	0.59	0.58

ME: Medical Expert, S: Scholar, CM: Communicator, HA: Health Advocate, P: Professional CL: Collaborator, L: Leader (Manager)

Table 10: CanMEDs Roles in ITERs (Overall)

Order (Ascending)	Role	N	Mean (SD)
1	Medical Expert	203	4.10 (0.56)
2	Health Advocate	190	4.12 (0.61)
3	Scholar	199	4.16 (0.60)
4	Communicator	156	4.21 (0.55)
5	Leader (Manager)	201	4.24 (0.60)
6	Collaborator	192	4.30 (0.59)
7	Professional	201	4.33 (0.57)

4.1.3 Free Text Comment Section

4.1.3.1 Confidence level

Several evaluators commented on the lack of confidence of PGY-1 neurology residents during their rotation in neurology. In the neurology inpatient rotation, one of the evaluators mentioned, “Sometime … lacks self-confidence but I think that improve as … gains more experience” and another staff wrote “encouraged … to feel more confident and assert … a little more, there's no reason to feel uncomfortable if you're wrong”. In the neurology consult rotation,

one of the evaluators noted, “Lacks confidence, but this should improve with maturity and experience.” Rarely, the resident appeared overconfident as stated by one the evaluator in the neurology inpatient rotation, “tends to be overconfident and overestimates … own neurological knowledge.”

4.1.3.2 CanMEDs roles

The CanMEDs physician competency framework was used as the analytical framework to determine the residents’ strengths and areas for improvement from the free-text comments. Comments under a given role were considered to be “common” if noted three times or more by evaluators and “less common” if noted less than three times.

Interestingly, several points were identified commonly as residents’ strengths as well areas for improvement for others, e.g., in basic clinical skills, clinical knowledge, differential diagnosis, and neurological localization in the medical expert role. Similarly, case presentation to the attending staff and writing a consultation/ progress note in communicator roles as well time management and triaging skills in the manager/ leader role. Indeed, other sub-categories were identified and listed as “subtheme nuances” in Table 11. The commonly identified areas for improvement were summarized in Table 12.

Table 11: Framework Analysis of CanMEDs Roles in Comments Section of the ITERs

Theme	Subtheme	Sub-theme Nuances	Representative Quotation	Rotation
Medical Expert	Strengths	Basic clinical skills (common)	"Excellent history taking and consistent examination skills"	Consult
		Clinical knowledge (common)	"Knowledge is impressive for a resident at such an early level of training"	Inpatient
		Differential diagnosis (common)	"Able to give good differential for most conditions"	Inpatient
		Localization (common)	"Well-versed in neuro-localization"	Consult
		Investigations analysis (less common)	"Analyzed investigations very well"	Stroke
		Procedure skills (lumbar puncture) (less common)	"Completed an LP on a very difficult patient"	Inpatient
	Areas for Improvement	Basic clinical skills (common)	"Continue to work on the basics of examination and improving history taking"	Consult
		Clinical knowledge (common)	"Clinical knowledge is somewhat limited"	Inpatient
		Differential diagnosis (common)	"Work on expanding differential diagnosis"	Clinics
		Localization (common)	"Needs to improve … brainstem anatomy and localization"	Inpatient
		Basic neurosciences (common)	Neuroanatomy: "needs to review neuroanatomy"	Inpatient
			Neurophysiology: "work on basic pathophysiology"	Clinics
			Neuropharmacology: "work on antiepileptic medications"	Clinics

Communicator	Strengths	Case presentation to staff (common)	"Case presentation was thorough; focus on pertinent points and simplicity"	Stroke
		Rapport with patients (common)	"Was able to explain complicated and sometimes stressful diagnoses to patients and their families"	Inpatient
		Writing a consultation /progress note (common)	"Excellent dictations - complete, accurate, organized, yet not overly verbose"	Clinics
	Areas for Improvement	Case presentation to staff (common)	"Needs to continue to practice … clinical presentations and discussions"	Inpatient
		Writing a consultation /progress note (common)	"Consult notes could be a bit more organized"	Inpatient
Collaborator	Strengths	Interaction with the team members (common)	"Got along well with other members of the team as well as patients and allied health staff"	Inpatient
	Areas for Improvement	Interaction with the team members (less common)	"Discussed with … the importance of letting all team members contribute"	Consult
Leader (Manager)	Strengths	Time management and triaging skills (common)	"Did a very good job with time management" "Recognized the urgency of a matter and took immediate action"	Consult Consult
		Team leadership (common)	"Demonstrated good leadership skills and mentorship of off service residents"	Inpatient
	Areas for Improvement	Time management and triaging skills (common)	"Needs to be slightly more efficient in assessing patients" "Will learn to prioritize emergent patients, deal with them quickly but thoroughly and focusing on serious problems"	Clinics Inpatient

Health Advocate	Strengths	Appropriate use of test (less common)	"Advocated for an EEG in a timely manner, which demonstrated that the patient was in non-convulsive status epilepticus"	Inpatient
		Prevention (less common)	"Excellent knowledge of risk factors, … and secondary prevention"	Stoke
	Areas for Improvement	Appropriate use of test (less common)	"Somewhat inexperienced in sorting out more complicated patients leading to ordering potentially unnecessary tests"	Inpatient
Scholar	Strengths	Teaching skills (common)	"Wonderful teacher to junior members of the team"	Inpatient
		Literature search (common)	"Did an outstanding job of researching a topic"	Consult
	Areas for Improvement	Teaching skills (less common)	"Begin to incorporate additional teaching to the junior team members"	Consult
		Literature search (less common)	"Work on reading relevant literature"	Clinics
Professional	Strengths	Enthusiasm (common)	"Hunger to learn and listens to comments"	Stroke
		Response to Feedback (common)	"Eager for feedback and ways to improve"	Consult
		Punctuality (common)	"Responsible, punctual and sought out learning opportunities"	Inpatient
		Responsibility (common)	"Displayed a level of responsibility … that was above the level expected for an R1"	Stroke
	Areas for Improvement	Level of Confidence	Lack of Confidence (common): "lacks confidence, but this should improve with maturity and experience" Over Confidence (less common): "tends to be overconfident and overestimates … own neurological knowledge"	Consult Inpatient

Table 12: Common Identified Areas for Improvement (Comment Section)

Role	Common Identified Areas for Improvement
Medical Expert	• Basic clinical skills (history taking and neurological examination). • Clinical knowledge. • Differential diagnosis. • Localization. • Basic neurosciences (neuroanatomy, neurophysiology, neuropharmacology).
Communicator	• Case presentation to the attending staff. • Writing a consultation /progress note.
Leader (Manager)	• Time management and triaging skills.
Professional	• Lack of confidence.

4.2 Survey

4.2.1 Participants and Response Rate

In total 18 residents (100%), 53 staff neurologists/ fellows (75.71%), and 6 nurse leaders/ educators (50%) at the University of Calgary completed the survey. The overall response rate was 77% (Table 13).

In the residents' group, there were three PGY-1, four PGY-2, four PGY-3, four PGY-4, and three PGY-5. Clinical experience of the participants in the staff neurologists/ fellows' group was as follows: 9.4% (n=5) < 1 year, 17.0% (n=9) 1-3 years, 24.5% (n=13) 4-10 years, 28.3% (n=15) 11-20 years, 20.8% (n=11) >20 years. In the nurse leaders/ educators' group, four (66.7%) had >20 years clinical experience, but two (33.3%) had 4-10 years of experience. All the members of the ANRPC (four residents and nine staff neurologists) participated in the survey (Table 14-16).

Table 13: Survey Response Rate

Group	Completed Survey	Total	Response Rate
Residents	18	18	100%
Staff Neurologists/ Fellows	53	70	75.71%
Nurse Leaders/ Educators	6	12	50%
Total	77	100	77%

Table 14: Participants (Residents)

Level of Training	Frequency	Percentage
PGY-1	3	16.7%
PGY-2	4	22.2%
PGY-3	4	22.2%
PGY-4	4	22.2%
PGY-5	3	16.7%
Total	18	100%

Table 15: Participants (Staff Neurologists/ Fellows)

Years of Practice	Frequency	Percentage
< 1 year	5	9.4%
1-3 years	9	17.0%
4-10 years	13	24.5%
11-20 years	15	28.3%
>20 years	11	20.8%
Total	53	100%

Table 16: Participants (Nurse Leaders/ Educators)

Years of Practice	Frequency	Percentage
4-10 years	2	33.3%
>20 years	4	66.7%
Total	6	100%

4.2.2 Perceived Need for a Boot Camp Curriculum for PGY-1 Neurology Residents

In total 61% (n=47) of the participants felt that boot camp curriculum for the PGY-1 neurology residents is needed. Only 6.5% (n=5) felt that a boot camp curriculum is not needed. The rest of participants 32.5% (n=25) were unsure. The response to the perceived need for a boot camp curriculum questions among the groups was as follows: residents (yes: 88.9%, no: 5.6%, unsure 5.6%), staff neurologists/ fellows (yes: 47.2 %, no: 7.5%, unsure 45.3%), nurse leaders/ educators (yes: 100 %, no: 0%, unsure 0%). The participants provided several explanations for their responses (Table 17 and 18).

Table 17: Need for Boot Camp Curriculum

Boot camp Needed		Residents	Staff Neurologists/ Fellows	Nurse Leaders/ Educators	Total
Yes	N	16	25	6	47
	%	88.9%	47.2%	100%	61.0%
No	N	1	4	0	5
	%	5.6%	7.5%	0%	6.5%
Unsure	N	1	24	0	25
	%	5.6%	45.3%	0%	32.5%

Table 18: "Free Text Responses" Provided by Participants to Explain the Need for a Boot Camp Curriculum

Response	Reasons	Quotations
Yes	Uneven background training	"People come from different backgrounds of training and would be well served by having a quick reorientation"
	Ease the transition	"Ease transition from clerkship to residency"
	Improve confidence	"Increase resident confidence, decrease angst"
	Alleviate anxiety	"Alleviate anxiety around critical issues during first year"
	Enhance competency	"Good way to ensure basic competencies"
	Improve patient safety	"Reviews foundational knowledge important for patient safety"
	Opportunity to ask questions	"It gives the PGY-1 residents to sit back and ask questions"
	Improve team relationship	"Introducing learners to each other regularly as well as to their 'home' residency curriculum"
No	Maturation effect	"Core neurology knowledge and skill developed only after several years of residency"
	Time commitment	"Comparatively speaking, the time commitment of a neurology residency is not onerous"
Unsure	Unsure of the effect	"Will need to determine if it really makes a difference"
	Unsure of the meaning	"Not sure what boot camp means"
	Unsure of the objectives	"Depends on the scope of boot camp"
	"Spoon feeding"	"Don't know. We seem to be spoon-feeding trainees nowadays"
	Selection bias	"Neurology residents were keen in clerkship for neurology"

4.2.3 Boot Camp Length and Format

The most popular choices for length of the boot camp by the participants were 2-3 days (Median 3, Mean 3.03, SD 1.70). Most of the participants suggested continuous full day sessions all at once (n= 33, 46.5%) or discrete half day sessions spread over multiple weeks (n= 20, 28.2%) (Table 19-21).

Table 19: Suggested Length of Boot Camp Curriculum

Days	Frequency	Percentage
0	2	2.6%
1	6	7.8%
2	25	32.5%
3	21	27.3%
4	1	1.3%
5	10	13.0%
7	6	7.8%
Other	6	7.8%

Table 20: Suggested Format of Boot Camp Curriculum

Format		Residents	Staff Neurologists/ Fellows	Total
Continuous full day sessions (all at once)	N	9	24	33
	%	50.0%	45.3%	46.5%
Discrete half days sessions (spread over multiple weeks)	N	7	13	20
	%	38.9%	24.5%	28.2%
Weekend sessions	N	0	7	7
	%	0%	13.2%	9.9%
Online modules	N	1	1	2
	%	5.6%	1.9%	2.8%
Other	N	1	8	9
	%	5.6%	15.1%	12.7%

Table 21: Other Suggested Length/Format of Boot Camp Curriculum

Other Suggested Length / Format	• Over two weekends • Weekly for 3 blocks • As part of academic half day (or run parallel to half day in first month of residency) • Intensive 3 day session with follow-up sessions in a few weeks • Mix of online modules and half day sessions • Unsure

4.2.4 Boot Camp Content and Reliability

The participants rated their perception of the importance and frequency of each item on a 5-point Likert scale in following the categories: approach to neurological emergencies, clinical and procedural skills and communication and interpersonal skills. The mean scores of importance ranged from 2.88 to 4.81 (overall mean 3.96) in the approach to neurological emergencies category, 4.04 to 4.94 (overall mean 4.55) in the clinical and procedural skills category, and 3.65 to 4.75 (overall mean 4.29) in the communication and interpersonal skills category. The mean scores of frequency ranged from 1.52 to 4.25 (overall mean 2.96) in the approach neurological emergencies category, 3.56 to 4.92 (overall mean 4.66) in the clinical and procedural skills category, and 3.19 to 4.88 (overall mean 3.91) in the communication and interpersonal skills category (Table 22-28). Cronbach's Alpha for the 35 items in the survey in importance and frequency is 0.93.

Table 22: Perceived Rate of Importance for Items Related to Approach to Neurological Emergencies

Item	Residents	Staff Neurologists/ Fellows	Nurse Leaders/ Educators	Total
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Acute ischemic stroke	4.17 (0.86)	4.64 (0.68)	4.67 (0.52)	4.53 (0.74)
Acute intracerebral hemorrhage	3.67 (1.03)	4.28 (0.82)	4.67 (0.52)	4.17 (0.89)
Coma	3.78 (1.00)	4.25 (0.85)	4.50 (0.55)	4.16 (0.89)
Increased intracranial pressure and herniation syndromes	3.83 (0.99)	4.42 (0.75)	4.67 (0.52)	4.30 (0.83)
Status epilepticus	4.83 (0.38)	4.81 (0.44)	4.67 (0.52)	4.81 (0.43)
Subarachnoid hemorrhage and other causes of thunderclap headache	4.22 (0.65)	4.26 (0.63)	4.67 (0.52)	4.29 (0.63)
Anoxic ischemic encephalopathy	2.94 (1.00)	3.23 (1.03)	3.83 (1.17)	3.21 (1.04)
Traumatic brain injury	2.67 (0.91)	2.91 (1.10)	3.83 (1.17)	2.92 (1.09)
Acute myelopathy	4.22 (0.81)	4.60 (0.63)	4.17 (1.17)	4.48 (0.74)
Neuromuscular emergencies (e.g. AIDP/GBS, MG)	4.72 (0.46)	4.62 (0.56)	4.33 (0.52)	4.62 (0.54)
Acute hyperthermic syndromes	2.67 (1.03)	2.83 (1.07)	4.00 (1.27)	2.88 (1.11)

Acute demyelinating event	4.06 (0.80)	3.96 (0.78)	4.00 (0.00)	3.99 (0.75)
Acute dystonic reaction	3.22 (0.88)	3.64 (1.00)	3.67 (0.82)	3.55 (0.97)
Acute vertigo	4.33 (0.60)	4.00 (0.92)	3.00 (0.89)	4.00 (0.90)
Neuro-ophthalmological emergencies	3.72 (0.75)	3.77 (0.99)	4.00 (0.63)	3.78 (0.91)
Delirium	4.22 (1.06)	4.23 (0.80)	4.33 (0.82)	4.23 (0.86)
CNS infection (meningitis, encephalitis)	4.83 (0.38)	4.70 (0.54)	4.33 (0.82)	4.70 (0.54)
Pain crises	3.39 (1.20)	3.25 (0.96)	3.50 (1.05)	3.30 (1.01)
CNS intoxication	3.28 (0.90)	3.38 (0.97)	3.50 (0.84)	3.36 (0.93)

Table 23: Perceived Rate of Frequency for Items Related to Approach to Neurological Emergencies

Item	Residents	Staff Neurologists/ Fellows	Nurse Leaders/ Educators	Total
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Acute ischemic stroke	3.67 (1.19)	4.08 (1.14)	4.83 (0.41)	4.04 (1.14)
Acute intracerebral hemorrhage	2.89 (0.90)	3.17 (1.00)	4.33 (0.82)	3.19 (1.01)
Coma	2.83 (0.86)	3.38 (0.99)	3.33 (1.03)	3.25 (0.98)
Increased intracranial pressure and herniation syndromes	2.39 (0.78)	2.42 (0.75)	3.33 (0.82)	2.48 (0.79)
Status epilepticus	3.50 (1.20)	3.42 (0.97)	3.67 (0.52)	3.45 (0.99)
Subarachnoid hemorrhage and other causes of thunderclap headache	3.06 (0.94)	2.79 (0.86)	3.67 (0.82)	2.92 (0.90)
Anoxic ischemic encephalopathy	2.11 (0.68)	2.64 (0.96)	2.83 (0.75)	2.53 (0.91)
Traumatic brain injury	2.17 (0.62)	2.38 (0.93)	3.33 (1.21)	2.40 (0.92)
Acute myelopathy	2.89 (1.02)	2.58 (0.77)	3.67 (0.82)	2.74 (0.88)
Neuromuscular emergencies (e.g. AIDP/GBS, MG)	3.67 (0.91)	2.91 (0.82)	4.17 (0.75)	3.18 (0.93)
Acute hyperthermic syndromes	1.39 (0.50)	1.49 (0.67)	2.17 (0.75)	1.52 (0.66)
Acute demyelinating event	3.78 (0.81)	3.04 (1.00)	3.50 (1.05)	3.25 (1.00)
Acute dystonic reaction	1.67 (0.69)	1.68 (0.73)	2.50 (1.05)	1.74 (0.77)
Acute vertigo	4.22 (0.81)	3.60 (1.03)	3.83 (1.47)	3.77 (1.04)
Neuro-ophthalmological emergencies	2.72 (0.67)	2.25 (1.04)	3.17 (1.17)	2.43 (1.01)
Delirium	4.72 (0.46)	4.08 (1.05)	4.33 (0.82)	4.25 (0.96)
CNS infection (meningitis, encephalitis)	3.83 (0.86)	3.25 (0.98)	3.83 (0.75)	3.43 (0.97)
Pain crises	3.11 (1.23)	2.64 (1.19)	3.83 (1.17)	2.84 (1.24)
CNS intoxication	2.72 (0.90)	2.75 (1.13)	2.83 (1.17)	2.75 (1.07)

Table 24: Perceived Rate of Importance for Items Related to Clinical and Procedural Skills

Item	Residents	Staff Neurologists/ Fellows	Nurse Leaders/ Educators	Total
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Taking neurological history	4.83 (0.38)	4.96 (0.19)	5.00 (0.00)	4.94 (0.25)
Performing neurological exam	5.00 (0.00)	4.91 (0.30)	5.00 (0.00)	4.94 (0.25)
Basic interpretation of radiographic images of the CNS (CT, MRI)	4.06 (0.54)	4.02 (0.69)	4.17 (0.41)	4.04 (0.64)
Performing lumbar puncture	4.28 (0.46)	4.15 (0.77)	4.17 (1.17)	4.18 (0.74)
Basics of neurological localization	4.83 (0.38)	4.81 (0.40)	4.83 (0.41)	4.82 (0.39)
Basic interpretation of laboratory studies (e.g. blood, urine, CSF studies, etc.)	4.50 (0.62)	4.40 (0.60)	4.83 (0.41)	4.45 (0.60)
Dealing with ward issues (electrolyte disturbance, UTI, falls,,..etc)	4.61 (0.50)	4.45 (0.64)	4.67 (0.52)	4.51 (0.60)

Table 25: Perceived Rate of Frequency for Items Related to Clinical and Procedural Skills

Item	Residents	Staff Neurologists/ Fellows	Nurse Leaders/ Educators	Total
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Taking neurological history	5.00 (0.00)	4.89 (0.47)	5.00 (0.00)	4.92 (0.39)
Performing neurological exam	5.00 (0.00)	4.87 (0.59)	5.00 (0.00)	4.91 (0.49)
Basic interpretation of radiographic images of the CNS (CT, MRI)	4.61 (0.50)	4.66 (0.71)	5.00 (0.00)	4.68 (0.64)
Performing lumbar puncture	3.72 (0.58)	3.47 (0.91)	3.83 (0.41)	3.56 (0.82)
Basics of neurological localization	4.94 (0.24)	4.83 (0.61)	5.00 (0.00)	4.87 (0.52)
Basic interpretation of laboratory studies (e.g. blood, urine, CSF studies, etc.)	4.94 (0.24)	4.83 (0.64)	4.67 (0.52)	4.84 (0.56)
Dealing with ward issues (electrolyte disturbance, UTI, falls,,..etc)	4.94 (0.24)	4.81 (0.68)	4.83 (0.41)	4.84 (0.59)

Table 26: Perceived Rate of Importance for Items Related to Communication and Interpersonal Skills

Item	Residents	Staff Neurologists/ Fellows	Nurse Leaders/ Educators	Total
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Conflict management	4.06 (0.87)	3.94 (0.86)	4.33 (0.52)	4.00 (0.84)
How to obtain informed consent?	4.56 (0.51)	4.49 (0.67)	5.00 (0.00)	4.55 (0.62)
How to break bad news?	4.22 (0.81)	4.36 (0.76)	4.17 (1.17)	4.31 (0.80)
How to disclose a medical error?	3.56 (0.98)	4.15 (0.77)	4.50 (0.84)	4.04 (0.87)
How to prepare a good PowerPoint presentation?	4.11 (0.96)	3.58 (0.82)	2.83 (0.75)	3.65 (0.90)
How to write an appropriate consultation letter?	4.22 (0.65)	4.28 (0.86)	3.67 (1.03)	4.22 (0.84)
How to present a case to your attending?	4.50 (0.71)	4.55 (0.57)	4.17 (0.75)	4.51 (0.62)
How to communicate with ward nursing staff around sick patient?	4.67 (0.49)	4.57 (0.61)	4.67 (0.82)	4.60 (0.59)
Handover skills	4.83 (0.38)	4.74 (0.45)	4.67 (0.82)	4.75 (0.46)

Table 27: Perceived Rate of Frequency for Items Related to Communication and Interpersonal Skills

Item	Residents	Staff Neurologists/ Fellows	Nurse Leaders/ Educators	Total
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Conflict management	3.11 (0.68)	3.17 (1.09)	3.67 (1.03)	3.19 (1.00)
How to obtain informed consent?	4.06 (0.73)	3.87 (0.96)	4.67 (0.52)	3.97 (0.90)
How to break bad news?	3.33 (1.09)	3.62 (1.06)	3.83 (0.98)	3.57 (1.06)
How to disclose a medical error?	2.06 (0.87)	2.21 (1.12)	2.50 (1.23)	2.19 (1.06)
How to prepare a good PowerPoint presentation?	3.72 (0.83)	3.15 (0.91)	3.33 (0.52)	3.30 (0.89)
How to write an appropriate consultation letter?	4.50 (0.79)	4.60 (0.79)	3.50 (0.84)	4.49 (0.84)
How to present a case to your attending?	4.94 (0.24)	4.87 (0.62)	4.83 (0.41)	4.88 (0.54)
How to communicate with ward nursing staff around sick patient?	4.72 (0.46)	4.74 (0.71)	4.67 (0.52)	4.73 (0.64)
Handover skills	4.94 (0.24)	4.81 (0.68)	4.83 (0.41)	4.84 (0.59)

Table 28: Perceived Rate of Importance and Frequency for the Categories (Overall)

Item	Residents	Staff Neurologists/ Fellows	Nurse Leaders/ Educators	Total
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Approach to neurological emergencies (Importance)	3.83 (0.49)	3.99 (0.44)	4.12 (0.51)	3.96 (0.46)
Approach to neurological emergencies (Frequency)	3.02 (0.49)	2.87 (0.63)	3.54 (0.49)	2.96 (0.61)
Clinical and procedural skills (Importance)	4.59 (0.28)	4.53 (0.33)	4.67 (0.17)	4.55 (0.31)
Clinical and procedural skills (Frequency)	4.74 (0.13)	4.62 (0.56)	4.76 (0.17)	4.66 (0.47)
Communication and interpersonal skills (Importance)	4.30 (0.42)	4.30 (0.40)	4.22 (0.51)	4.29 (0.41)
Communication and interpersonal skills (Frequency)	3.93 (0.37)	3.89 (0.60)	3.98 (0.49)	3.91 (0.54)

4.2.5 Comparison between the Groups

One-way ANOVA test was applied to compare residents' and staff neurologists' perception on the level of importance and frequency of the possible topics for the boot camp curriculum for the PGY-1 neurology residents. The nurse leaders/ educators group was excluded for the comparative test giving their small size in comparison to other groups, which can be associated with several biases such as false discovery rate (121-123).

Most of the responses were similar between the residents and the staff neurologists. Only six items in the importance and eight items in the frequency comparisons were statistically significantly different between the two groups.

On average, the staff neurologist reported higher importance of disclosing medical error (4.15 vs. 3.56, F= 6.96, p= .01) and the following neurological emergencies: acute ischemic stroke (4.64 vs. 4.17, F= 5.70, p= .02), acute intracerebral hemorrhage (4.28 vs. 3.67, F= 6.68, p= .01), increased intracranial pressure and herniation syndromes (4.42 vs. 3.83, F= 6.92, p=

.01), and acute myelopathy (4.60 vs. 4.22, *F*= 4.25, *p*= .04) than the residents. The residents on average reported higher frequency of the following neurological emergencies: neuromuscular emergencies (3.67 vs. 2.91, *F*= 11.06, *p*= < .01), acute demyelinating event (3.78 vs. 3.04, *F*= 8.06, *p*= .01), delirium (4.72 vs. 4.08, *F*= 12.78, *p*= < .01), CNS infection (3.83 vs. 3.25, *F*= 5.15, *p*= .03), and acute vertigo (4.22 vs. 3.60, *F*= 5.39, *p*= .02) but less for coma (2.83 vs. 3.38, *F*= 4.36, *p*= .04) and anoxic ischemic encephalopathy (2.11 vs. 2.64, *F*= 6.56, *p*= .01) than staff neurologists. Also, the residents reported higher importance (4.11 vs. 3.58, *F*= 5.07, *p*= .03) and frequency (3.72 vs. 3.15, *F*= 5.56, *p*= .02) of preparing a good PowerPoint presentation than the staff neurologists (Table 29 and 30).

Table 29: Comparison between Residents and Staff Neurologists (Perceived Importance)

Item	Residents N=18	Staff Neurologists / Fellows N=53	Lev. Test Sig	*F*	Sig	Brown-Forsythe Test	
	Mean (SE)	Mean (SE)				Stat.	Sig
Acute ischemic stroke	4.17 (0.20)	4.64 (0.09)	.30	5.70	**.02***		
Acute intracerebral hemorrhage	3.67 (0.24)	4.28 (0.11)	.14	6.68	**.01***		
Coma	3.78 (0.24)	4.25 (0.12)	.88	3.69	.06		
Increased intracranial pressure and herniation syndromes	3.83 (0.23)	4.42 (0.10)	.62	6.92	**.01***		
Status epilepticus	4.83 (0.09)	4.81 (0.06)	.66	0.04	.85		
Subarachnoid hemorrhage and other causes of thunderclap headache	4.22 (0.15)	4.26 (0.09)	.85	0.06	.81		
Anoxic ischemic encephalopathy	2.94 (0.24)	3.23 (0.14)	.75	1.02	.32		
Traumatic brain injury	2.67 (0.21)	2.91 (0.15)	.54	0.69	.41		
Acute myelopathy	4.22 (0.19)	4.60 (0.09)	.09	4.25	**.04***		
Neuromuscular emergencies (e.g. AIDP/GBS, MG)	4.72 (0.11)	4.62 (0.08)	.14	0.46	.50		
Acute hyperthermic syndromes	2.67 (0.24)	2.83 (0.15)	.70	0.32	.57		
Acute demyelinating event	4.06 (0.19)	3.96 (0.11)	.94	0.19	.67		

Acute dystonic reaction	3.22 (0.21)	3.64 (0.14)	.38	2.50	.12		
Acute vertigo	4.33 (0.14)	4.00 (0.13)	.44	2.06	.16		
Neuro-ophthalmological emergencies	3.72 (0.18)	3.77 (0.14)	.12	0.04	.84		
Delirium	4.22 (0.25)	4.23 (0.11)	.11	0.00	.99		
CNS infection (meningitis, encephalitis)	4.83 (0.09)	4.70 (0.07)	.04*	0.96	.33	1.34	.25
Pain crises	3.39 (0.28)	3.25 (0.13)	.16	0.27	.61		
CNS intoxication	3.28 (0.21)	3.38 (0.13)	.60	0.15	.70		
Taking neurological history	4.83 (0.09)	4.96 (0.03)	.00*	3.48	.07	1.87	.19
Performing neurological exam	5.00 (0.00)	4.91 (0.04)	.00*	1.82	.18	-	-
Basic interpretation of radiographic images of the CNS (CT, MRI)	4.06 (0.13)	4.02 (0.10)	.35	0.04	.84		
Performing lumbar puncture	4.28 (0.11)	4.15 (0.11)	.16	0.43	.51		
Basics of neurological localization	4.83 (0.09)	4.81 (0.05)	.68	0.04	.84		
Basic interpretation of laboratory studies (e.g. blood, urine, CSF studies, etc.)	4.50 (0.15)	4.40 (0.08)	.89	0.40	.53		
Dealing with ward issues (electrolyte disturbance, UTI, falls,,..etc)	4.61 (0.12)	4.45 (0.09)	.11	0.91	.34		
Conflict management	4.06 (0.21)	3.94 (0.12)	.73	0.23	.64		
How to obtain informed consent?	4.56 (0.12)	4.49 (0.09)	.29	0.14	.71		
How to break bad news?	4.22 (0.19)	4.36 (0.11)	.84	0.42	.52		
How to disclose a medical error?	3.56 (0.23)	4.15 (0.11)	.07	6.96	**.01***		
How to prepare a good PowerPoint presentation?	4.11 (0.23)	3.58 (0.11)	.97	5.07	**.03***		
How to write an appropriate consultation letter?	4.22 (0.15)	4.28 (0.12)	.15	0.08	.79		
How to present a case to your attending?	4.50 (0.17)	4.55 (0.08)	.22	0.08	.78		
How to communicate with ward nursing staff around sick patient?	4.67 (0.11)	4.57 (0.08)	.15	0.41	.53		
Handover skills	4.83 (0.09)	4.74 (0.06)	.07	0.69	.41		

Table 30: Comparison between Residents and Staff Neurologists (Perceived Frequency)

Item	Residents N=18	Staff Neurologists / Fellows N=53	Lev. Test Sig	*F*	Sig	Brown-Forsythe Test	
	Mean (SE)	Mean (SE)				Stat.	Sig
Acute ischemic stroke	3.67 (0.28)	4.08 (0.16)	.41	1.69	.20		
Acute intracerebral hemorrhage	2.89 (0.21)	3.17 (0.14)	.31	1.12	.29		
Coma	2.83 (0.20)	3.38 (0.14)	.21	4.36	**.04***		
Increased intracranial pressure and herniation syndromes	2.39 (0.18)	2.42 (0.10)	.96	0.02	.90		
Status epilepticus	3.50 (0.28)	3.42 (0.13)	.21	0.09	.76		
Subarachnoid hemorrhage and other causes of thunderclap headache	3.06 (0.22)	2.79 (0.12)	.84	1.20	.28		
Anoxic ischemic encephalopathy	2.11 (0.16)	2.64 (0.13)	.02*	4.66	**.03***	6.56	**.01***
Traumatic brain injury	2.17 (0.15)	2.38 (0.13)	.02*	0.81	.37	1.19	.28
Acute myelopathy	2.89 (0.24)	2.58 (0.11)	.26	1.76	.19		
Neuromuscular emergencies (e.g. AIDP/GBS, MG)	3.67 (0.21)	2.91 (0.11)	.19	11.06	**.00***		
Acute hyperthermic syndromes	1.39 (0.12)	1.49 (0.09)	.23	0.35	.56		
Acute demyelinating event	3.78 (0.19)	3.04 (0.14)	.81	8.06	**.01***		
Acute dystonic reaction	1.67 (0.16)	1.68 (0.10)	.82	0.00	.95		
Acute vertigo	4.22 (0.19)	3.60 (0.14)	.22	5.39	**.02***		
Neuro-ophthalmological emergencies	2.72 (0.16)	2.25 (0.14)	.11	3.33	.07		
Delirium	4.72 (0.11)	4.08 (0.15)	.01*	6.33	**.01***	12.78	**.00***
CNS infection (meningitis, encephalitis)	3.83 (0.20)	3.25 (0.13)	.35	5.15	**.03***		
Pain crises	3.11 (0.29)	2.64 (0.16)	.92	2.05	.16		
CNS intoxication	2.72 (0.21)	2.75 (0.16)	.13	0.01	.91		
Taking neurological history	5.00 (0.00)	4.89 (0.06)	.04*	1.05	.31	-	-
Performing neurological exam	5.00 (0.00)	4.87 (0.08)	.06	0.89	.35		
Basic interpretation of radiographic images of the CNS (CT, MRI)	4.61 (0.12)	4.66 (0.10)	.84	0.07	.79		
Performing lumbar puncture	3.72 (0.14)	3.47 (0.13)	.02*	1.19	.28	1.85	.18
Basics of neurological localization	4.94 (0.06)	4.83 (0.08)	.13	0.59	.44		

Basic interpretation of laboratory studies (e.g. blood, urine, CSF studies, etc.)	4.94 (0.06)	4.83 (0.09)	.14	0.54	.46		
Dealing with ward issues (electrolyte disturbance, UTI, falls,,..etc)	4.94 (0.06)	4.81 (0.09)	.10	0.66	.42		
Conflict management	3.11 (0.16)	3.17 (0.15)	.02*	0.05	.83	0.07	.79
How to obtain informed consent?	4.06 (0.17)	3.87 (0.13)	.14	0.57	.45		
How to break bad news?	3.33 (0.26)	3.62 (0.15)	.92	0.99	.32		
How to disclose a medical error?	2.06 (0.21)	2.21 (0.15)	.18	0.28	.60		
How to prepare a good PowerPoint presentation?	3.72 (0.20)	3.15 (0.13)	.88	5.56	**.02***		
How to write an appropriate consultation letter?	4.50 (0.19)	4.60 (0.11)	.77	0.23	.63		
How to present a case to your attending?	4.94 (0.06)	4.87 (0.09)	.30	0.26	.61		
How to communicate with ward nursing staff around sick patient?	4.72 (0.11)	4.74 (0.10)	.78	0.01	.94		
Handover skills	4.94 (0.06)	4.81 (0.09)	.10	0.66	.42		

4.2.6 Ranking of Boot Camp Content

The study used four of the five methods approach to ranking items on needs assessments, as described by Smith and Beran (116). The Rasch model, which requires a larger sample size, was not used in this study (117). Taking a neurological history and performing a neurological examination received the highest two ranks respectively by all four methods. The multiplicative method had the highest correlation to all other ranking methods, so it was determined to be the most precise method. Using this method, the three highest ranked topics within categories were: acute ischemic stroke, delirium, and status epilepticus in the approach to neurological emergencies category; taking neurological history, performing neurological exam, and basics of neurological localization in the clinical and procedural skills category; and handover skills, case presentation to the staff attending, and communication with nursing staff in the communication and interpersonal skills category (Table 31 and 32).

Table 31: Ranking of Boot Camp Content

Ordered by Multiplicative Method (Descending)	Importance Method		Frequency Method		Multiplicative Method		Three-Step Method	
Item	**Mean (SD)**	**Rank**	**Mean (SD)**	**Rank**	**Mean (SD)**	**Rank**	**Score**	**Rank**
Taking neurological history	4.94 (0.25)	1	4.92 (0.39)	1	24.29 (2.25)	1	687	1
Performing neurological exam	4.94 (0.25)	2	4.91 (0.49)	2	24.25 (2.85)	2	687	2
Basics of neurological localization	4.82 (0.39)	3	4.87 (0.52)	4	23.52 (3.26)	3	670	6
Handover skills	4.75 (0.46)	5	4.84 (0.59)	5	23.12 (3.84)	4	687	3
How to present a case to your attending?	4.51 (0.62)	12	4.88 (0.54)	3	22.10 (4.15)	5	678	4
Dealing with ward issues (electrolyte disturbance, UTI, falls,,..etc)	4.51 (0.60)	11	4.84 (0.59)	6	21.86 (4.14)	6	669	8
How to communicate with ward nursing staff around sick patient?	4.60 (0.59)	8	4.73 (0.64)	8	21.83 (4.44)	7	672	5
Basic interpretation of laboratory studies (e.g. blood, urine, CSF studies, etc.)	4.45 (0.60)	14	4.84 (0.56)	7	21.62 (3.98)	8	670	7
How to write an appropriate consultation letter?	4.22 (0.84)	19	4.49 (0.84)	10	19.19 (5.63)	9	650	9
Basic interpretation of radiographic images of the CNS (CT, MRI)	4.04 (0.64)	23	4.68 (0.64)	9	19.01 (4.37)	10	619	11
Acute ischemic stroke	4.53 (0.74)	10	4.04 (1.14)	12	18.66 (6.55)	11	593	12
Delirium	4.23 (0.86)	18	4.25 (0.96)	11	18.25 (6.07)	12	577	13
How to obtain informed consent?	4.55 (0.62)	9	3.97 (0.90)	13	18.16 (5.12)	13	622	10

Status epilepticus	4.81 (0.43)	4	3.45 (0.99)	17	16.70 (5.26)	14	530	18
CNS infection (meningitis, encephalitis)	4.70 (0.54)	6	3.43 (0.97)	18	16.22 (5.27)	15	532	17
How to break bad news?	4.31 (0.80)	15	3.57 (1.06)	15	15.70 (5.99)	16	550	14
Acute vertigo	4.00 (0.90)	25	3.77 (1.04)	14	15.31 (5.99)	17	533	15
Performing lumbar puncture	4.18 (0.74)	20	3.56 (0.82)	16	15.04 (4.87)	18	533	16
Neuromuscular emergencies (e.g. AIDP/GBS, MG)	4.62 (0.54)	7	3.18 (0.93)	24	14.74 (4.82)	19	440	24
Coma	4.16 (0.89)	22	3.25 (0.98)	20	13.92 (5.90)	20	475	20
Acute intracerebral hemorrhage	4.17 (0.89)	21	3.19 (1.01)	22	13.62 (5.77)	21	466	21
Acute demyelinating event	3.99 (0.75)	27	3.25 (1.00)	21	13.10 (5.30)	22	459	22
Conflict management	4.00 (0.84)	26	3.19 (1.00)	23	13.08 (5.57)	23	453	23
Subarachnoid hemorrhage and other causes of thunderclap headache	4.29 (0.63)	17	2.92 (0.90)	25	12.71 (4.84)	24	484	19
How to prepare a good PowerPoint presentation?	3.65 (0.90)	29	3.30 (0.89)	19	12.44 (5.50)	25	427	25
Acute myelopathy	4.48 (0.74)	13	2.74 (0.88)	28	12.32 (4.62)	26	336	28
Increased intracranial pressure and herniation syndromes	4.30 (0.83)	16	2.48 (0.79)	30	10.75 (3.95)	27	336	29
Pain crises	3.30 (1.01)	32	2.84 (1.24)	26	9.82 (6.15)	28	393	26
CNS intoxication	3.36 (0.93)	31	2.75 (1.07)	27	9.57 (4.89)	29	291	32
Neuro-ophthalmological emergencies	3.78 (0.91)	28	2.43 (1.01)	31	9.56 (5.45)	30	345	27

How to disclose a medical error?	4.04 (0.87)	24	2.19 (1.06)	33	9.23 (5.58)	31	319	30
Anoxic ischemic encephalopathy	3.21 (1.04)	33	2.53 (0.91)	29	8.52 (4.90)	32	249	33
Traumatic brain injury	2.92 (1.09)	34	2.40 (0.92)	32	7.49 (4.87)	33	304	31
Acute dystonic reaction	3.55 (0.97)	30	1.74 (0.77)	34	6.32 (3.64)	34	226	34
Acute hyperthermic syndromes	2.88 (1.11)	35	1.52 (0.66)	35	4.68 (3.29)	35	161	35

Table 32: Correlations of the Four Ranking Methods

Spearman's rho	Importance	Frequency	Multiplicative	Three-Step
Importance	1.00	0.71**	0.81**	0.76**
Frequency	0.71**	1.00	0.98**	0.97**
Multiplicative	0.81**	0.98**	1.00	0.98**
Three-Step	0.76**	0.97**	0.98**	1.00

Note. **p<.001

4.2.7 Ranking of Boot Camp Content by the Participant Groups

Similarly, taking a neurological history and performing a neurological examination received the highest ranks by all groups. Also, there is a very strong correlation between the residents' and staff neurologist' overall ranking (r= 0.93, p <. 001). Additionally, there is a strong correlation between nurses' and residents' overall ranking (r= 0.80, p < .001) as well as the staff neurologists' overall ranking (r= 0.86, p <. 001) (Table 33 and 34).

Table 33: Ranking of Boot Camp Content by the Groups (Multiplicative Method)

Ordered by Total Multiplicative Method (Descending)	Residents		Staff Neurologists/ Fellows		Nurse Leaders/ Educators		Total	
Item	**Mean (SD)**	**Rank**	**Mean (SD)**	**Rank**	**Mean (SD)**	**Rank**	**Mean (SD)**	**Rank**
Taking neurological history	24.17 (1.92)	2	24.25 (2.48)	1	25.00 (0.00)	1	24.29 (2.25)	1
Performing neurological exam	25.00 (0.00)	1	23.91 (3.39)	2	25.00 (0.00)	2	24.25 (2.85)	2
Basics of neurological localization	23.94 (2.55)	4	23.30 (3.59)	3	24.17 (2.04)	3	23.52 (3.26)	3
Handover skills	23.94 (2.55)	3	22.87 (4.04)	4	22.83 (5.31)	5	23.12 (3.84)	4
How to present a case to your attending?	22.28 (3.82)	7	22.25 (4.22)	5	20.33 (4.76)	11	22.10 (4.15)	5
Dealing with ward issues (electrolyte disturbance, UTI, falls,,..etc)	22.83 (2.94)	5	21.43 (4.50)	7	22.67 (3.83)	6	21.86 (4.14)	6
How to communicate with ward nursing staff around sick patient?	22.11 (3.58)	8	21.72 (4.68)	6	22.00 (5.29)	9	21.83 (4.44)	7
Basic interpretation of laboratory studies (e.g. blood, urine, CSF studies, etc.)	22.28 (3.41)	6	21.28 (4.19)	8	22.67 (3.83)	7	21.62 (3.98)	8
How to write an appropriate consultation letter?	19.11 (4.79)	10	19.89 (5.49)	9	13.33 (6.62)	27	19.19 (5.63)	9
Basic interpretation of radiographic images of the CNS (CT, MRI)	18.83 (3.90)	11	18.87 (4.71)	11	20.83 (2.04)	10	19.01 (4.37)	10
Acute ischemic stroke	15.61 (6.72)	19	19.26 (6.48)	10	22.50 (2.74)	8	18.66 (6.55)	11
Delirium	20.06 (5.68)	9	17.57 (6.23)	12	18.83 (5.42)	13	18.25 (6.07)	12
How to obtain informed consent?	18.39 (3.63)	13	17.49 (5.47)	13	23.33 (2.58)	4	18.16 (5.12)	13

Status epilepticus	17.11 (6.34)	16	16.49 (5.05)	14	17.33 (4.13)	15	16.70 (5.26)	14
CNS infection (meningitis, encephalitis)	18.56 (4.59)	12	15.38 (5.35)	16	16.67 (5.05)	17	16.22 (5.27)	15
How to break bad news?	14.39 (5.49)	21	16.06 (6.04)	15	16.50 (7.45)	18	15.70 (5.99)	16
Acute vertigo	18.33 (4.46)	14	14.66 (6.12)	18	12.00 (6.07)	29	15.31 (5.99)	17
Performing lumbar puncture	16.00 (3.36)	17	14.60 (5.27)	19	16.00 (5.06)	19	15.04 (4.87)	18
Neuromuscular emergencies (e.g. AIDP/GBS, MG)	17.44 (5.07)	15	13.45 (4.32)	21	18.00 (3.85)	14	14.74 (4.82)	19
Coma	11.17 (5.37)	25	14.70 (5.86)	17	15.33 (6.19)	23	13.92 (5.90)	20
Acute intracerebral hemorrhage	11.00 (5.54)	27	13.79 (5.53)	20	20.00 (3.16)	12	13.62 (5.77)	21
Acute demyelinating event	15.28 (4.65)	20	12.26 (5.46)	23	14.00 (4.20)	25	13.10 (5.30)	22
Conflict management	12.72 (3.95)	23	12.89 (6.12)	22	15.83 (4.40)	20	13.08 (5.57)	23
Subarachnoid hemorrhage and other causes of thunderclap headache	13.00 (4.73)	22	12.13 (4.83)	24	17.00 (3.46)	16	12.71 (4.84)	24
How to prepare a good PowerPoint presentation?	15.83 (6.01)	18	11.60 (5.04)	26	9.67 (3.83)	33	12.44 (5.50)	25
Acute myelopathy	12.33 (5.34)	24	11.94 (4.04)	25	15.67 (6.53)	21	12.32 (4.62)	26
Increased intracranial pressure and herniation syndromes	9.39 (3.88)	29	10.68 (3.60)	27	15.50 (4.09)	22	10.75 (3.95)	27
Pain crises	11.11 (7.12)	26	8.89 (5.50)	32	14.17 (7.14)	24	9.82 (6.15)	28
CNS intoxication	9.28 (4.60)	30	9.55 (4.99)	28	10.67 (5.61)	32	9.57 (4.89)	29
Neuro-ophthalmological emergencies	10.39 (4.26)	28	8.96 (5.89)	30	12.33 (3.61)	28	9.56 (5.45)	30

How to disclose a medical error?	7.83 (4.91)	31	9.45 (5.65)	29	11.50 (6.80)	30	9.23 (5.58)	31
Anoxic ischemic encephalopathy	6.39 (3.29)	32	8.92 (5.14)	31	11.33 (5.13)	31	8.52 (4.90)	32
Traumatic brain injury	6.00 (2.87)	33	7.30 (4.64)	33	13.67 (7.42)	26	7.49 (4.87)	33
Acute dystonic reaction	5.61 (3.20)	34	6.19 (3.50)	34	9.67 (4.80)	34	6.32 (3.64)	34
Acute hyperthermic syndromes	3.78 (2.10)	35	4.47 (3.11)	35	9.17 (4.58)	35	4.68 (3.29)	35

Table 34: Correlations of the Ranking among the Groups (Multiplicative Method)

Spearman's rho	Residents	Staff Neurologists/ Fellows	Nurse Leaders/ Educators	Total
Residents	1.00	0.93**	0.80**	0.96**
Staff Neurologists/ Fellows	0.93**	1.00	0.86**	0.99**
Nurse Leaders/ Educators	0.80**	0.86**	1.00	0.86**
Total	0.96**	0.99**	0.86**	1.00

Note. **p<.001

4.2.8 Safety Assessment Matrix for Neurological Emergencies

Using the median scores for importance and frequency of neurological emergencies, the assessed risk index was calculated. The assessed risk index prioritizes the potential hazards by combining safety probability and importance (118). The following subjects were in the intolerable risk region (score 5A, 5B, 5C, 4A, 4B, and 3A): acute ischemic stroke, delirium, CNS infection, status epilepticus, acute myelopathy, neuromuscular emergencies, delirium and acute vertigo. These topics will be a high priority for the PGY-1 neurology boot camp (Table 35 and 36).

Table 35: Safety Risk Index for Neurological Emergencies

Neurological Emergency	Median Importance	Median Frequency	Assessed Risk Index	Danger Zone
Acute ischemic stroke	5.00 (A)	5.00	5A	Red
Acute intracerebral hemorrhage	4.00 (B)	3.00	3B	Yellow
Coma	4.00 (B)	3.00	3B	Yellow
Increased intracranial pressure and herniation syndromes	4.00 (B)	3.00	3B	Yellow
Status epilepticus	5.00 (A)	3.00	3A	Red
Subarachnoid hemorrhage and other causes of thunderclap headache	4.00 (B)	3.00	3B	Yellow
Anoxic ischemic encephalopathy	3.00 (C)	2.00	2C	Yellow
Traumatic brain injury	3.00 (C)	2.00	2C	Yellow
Acute myelopathy	5.00 (A)	3.00	3A	Red
Neuromuscular emergencies (e.g. AIDP/GBS, MG)	5.00 (A)	3.00	3A	Red
Acute hyperthermic syndromes	3.00 (C)	1.00	1C	Green
Acute demyelinating event	4.00 (B)	3.00	3B	Yellow
Acute dystonic reaction	4.00 (B)	2.00	2B	Yellow
Acute vertigo	4.00 (B)	4.00	4B	Red
Neuro-ophthalmological emergencies	4.00 (B)	2.00	2B	Yellow
Delirium	4.00 (B)	5.00	5B	Red
CNS infection (meningitis, encephalitis)	5.00 (A)	4.00	4A	Red
Pain crises	3.00 (C)	3.00	3C	Yellow
CNS intoxication	4.00 (B)	3.00	3B	Yellow

Table 36: Safety Risk Assessment Matrix for Neurological Emergencies

Neurological Emergencies			Importance				
			Very important **A**	Important **B**	Neutral **C**	Somewhat important **D**	Not at all important **E**
Frequency	More than once per week	**5**	Acute ischemic stroke	Delirium			
	Once per week	**4**	CNS infection	Acute vertigo			
	Once per month	**3**	Status epilepticus Acute myelopathy Neuromuscular emergencies	Acute ICH Coma Increased ICP and herniation syndromes SAH and other causes of thunderclap headache Acute demyelinating event CNS intoxication	Pain crises		
	Once to few times per year	**2**		Acute dystonic reaction Neuro-ophthalmological emergencies	Anoxic ischemic encephalopathy Traumatic brain injury		
	Less than once per year	**1**			Acute hyperthermic syndromes		

4.2.9 Boot Camp Teaching Strategies and Other Suggested Topics

Small group discussion and problem-based learning were the preferred methods of teaching in all categories. Simulation was considered one of the preferred methods for teaching neurological emergencies and clinical and procedural skills, and the standardized patient encounter was one of the preferred methods of teaching for communication and interpersonal skills (Table 37). Several other teaching methods and topics were suggested by a few of the participants (Table 38 and 39).

Table 37: Preferred Methods of Teaching for the Boot Camp Curriculum

Teaching Method	Neurological Emergencies		Clinical and Procedural Skills		Communication and interpersonal skills	
	N	%	N	%	N	%
Simulation	46	59.7	45	58.4	26	33.8
Small group discussion	55	71.4	46	59.7	55	71.4
Didactic lecture	21	27.3	14	18.2	18	23.4
Problem based learning	55	71.4	45	58.4	36	46.8
Standardized patient encounter	27	35.1	28	36.4	37	48.1
E-learning	12	15.6	12	15.6	11	14.3
Other	4	5.2	6	7.8	3	3.9

Table 38: Free-Text Reponses for Other Suggested Methods of Teaching for the Boot Camp Curriculum

Teaching Method	Category	Quotations
Real Patient Encounters	**Neurological Emergencies**	"Small group 'real' case scenarios" "With patients in a closely supervised environment"
	Clinical and Procedural Skills	"Perform lumbar punctures under supervision in the LP clinic" "Having staff or senior watch you in clinical setting and provide feedback" "Real life exposure on service" "With real patients in a closely supervised setting"
	Communication and interpersonal skills	"Real life exposure"
Key Articles	**Neurological Emergencies**	"Selection of key articles that are 'must know'"
Observation	**Communication and interpersonal skills**	"Sometimes watching a more experienced practitioner perform the skill is helpful (e.g. breaking bad news)"

Table 39: Free-Text Reponses for Other Suggested Topics for the Boot Camp Curriculum

Role	Other Topics
Medical Expert	• Neuroanatomy • Common medications in Neurology • Status migrainosus • Basics of EEG and EMG terminology • First time seizure • Neurologic manifestations of systemic disease • Functional neurological disease • Sub-acute stroke and Post-stroke management
Communicator	• Referral logistics and skills • Phone consultation • Goals of care and end of life care discussions • Proper documentation - e.g. admission history and physical, progress notes, discharge summaries
Leader (Manager)	• Time management and triaging skills
Health Advocate	• Resources for patients and families
Collaborator	• Working with allied health • Regional hospital/ system orientation
Professional	• Expectations and duties • Resident's wellness • Common errors of PGY-1 Residents • When to call for help/ a code

4.3 Consensus Meeting and Final Curriculum

A consensus meeting was conducted with 11 of 13 members of the ANRPC during one of their scheduled meetings. At the beginning of the meeting, the results of the ITER review and the surveys were presented, including the suggested duration, format, teaching methods, and the highest ranked topics, with the proposed curriculum agenda. After inquiring about a few points in the results, the committee did not identify any major gap in the curriculum and unanimously agreed with the integration of the results from the ITER review and the surveys. They suggested removing the time frame limit for the sessions and provide the residency program with the proposed topics and teaching strategies with their specific objectives. The residency program

will decide about the time frame for each session as it can be affected by several factors such as human resources and space availability. Based on the results of the ITER review and survey, the final curriculum was created with a total of 21 topics over three days. The final curricular content and the general objectives for the boot camp curriculum are shown in Table 40 and 41. The specific objectives for each session are provided in Appendix I.

Table 40: Final Curricular Content for the PGY-1 Neurology Resident Boot Camp Curriculum

Categories	Topics	Suggested Teaching Methods
Approach to Neurological Emergencies	1. Acute Ischemic Stroke 2. CNS Infection 3. Status Epilepticus 4. Delirium 5. Neuromuscular Emergencies 6. Acute Myelopathy** 7. Acute Vertigo	• Small group discussion • Problem based learning • Simulation
Clinical and Procedural Skills	8. Taking a Neurological History 9. Performing a Neurological Exam 10. Basics of Neurological Localization and Differential Diagnosis* 11. Dealing with Ward Issues (Electrolyte Disturbance, UTI, Falls,,..etc) 12. Basic Interpretation and Use* of Lab Studies (e.g. Blood, Urine, CSF studies, etc.) 13. Basic Interpretation and Use* of Radiographic Images of the CNS (CT, MRI) 14. Performing Lumbar Puncture	• Small group discussion • Problem based learning • Simulation
Communication and Interpersonal Skills	15. Handover Skills 16. Presenting a Case to the Attending 17. Communicating with Ward Nursing Staff around Sick Patient 18. Writing an Appropriate Consultation Letter and Progress Note* 19. Obtaining Informed Consent 20. Breaking Bad News 21. Time Management and Triaging Skills*	• Small group discussion • Standardized patient encounter • Problem based learning

* Added based on the result of ITERs review
** Added based on the safety risk assessment matrix of neurological emergencies

Table 41: The General Objectives for the PGY-1 Neurology Resident Boot Camp Curriculum

By the end of the sessions the PGY-1 neurology resident will be able to:

Objectives	CanMEDS Roles
1. Demonstrate a step-wise approach for assessment and management of patients with common neurological emergencies including: a. Acute Ischemic Stroke b. CNS Infection c. Status Epilepticus d. Delirium e. Neuromuscular Emergencies f. Acute Myelopathy g. Acute Vertigo	Medical Expert, Health Advocate, Scholar
2. Obtain a focused history of the common neurological complaints.	Medical Expert
3. Perform a screening neurological examination.	Medical Expert
4. Discuss the characteristic features of the common localizations in the neuroanatomical axis.	Medical Expert
5. Generate lists of differential diagnoses for common neurological complaints.	Medical Expert
6. Recognize the first few steps for assessment and management and the time to consult other services for the common ward issues.	Medical Expert, Health Advocate
7. List the indications and interpret the results of the basic laboratory workup.	Medical Expert, Health Advocate
8. Demonstrate a systematic approach for interpreting neuroimaging (CT/MRI).	Medical Expert
9. Perform a lumbar puncture procedure.	Medical Expert
10. Perform a skillful handover	Communicator, Health Advocate
11. Deliver an effective case presentation to the attending physician.	Communicator
12. Perform a clear, concise communication with the nursing staff around sick patients.	Communicator, Collaborator
13. Write a clear concise consultation letter and progress note.	Communicator, Collaborator, Health Advocate
14. Obtain informed consent.	Communicator
15. Convey bad news with skill and compassion.	Communicator
16. Manage time appropriately and prioritize urgent and non-urgent tasks.	Leader (Manager)
17. Recognize personal limitations and the appropriate time to ask for help	Professional

Chapter 5: Discussion

In this chapter, several points will be discussed including the value of ITER as a needs assessment method, the role of a multi-modal approach for a targeted need assessment, boot camp curriculum content, and the potential outcomes of the curriculum such as the effects on the patient safety and easing the CBD transition. Also, the discussion will highlight the observation of high self-awareness and lack of confidence as possible unique features of the "Transition to Discipline" developmental stage. Finally, the study limitations and future directions will be addressed.

5.1 Value of ITER as a Needs Assessment Method

The ITER is the most commonly used method for evaluation in post-graduate medical training programs in Canada despite concerns about its validity and quality (124, 125). In this study the overall performance of the PGY-1 neurology residents at the University of Calgary over the last five-year (July 2012 to June 2017) was high (4.20 +/- 0.58). None of the residents failed any neurology rotation. These findings could be related to the standard of the selection criteria for residents, the quality of residents' previous training during clerkship electives or merely the evaluators' expectations of the PGY-1 residents. The inpatient service rotation evaluation had the greatest range of performance ratings compared to the other rotations. It is possible that preceptors had a better ability in discriminating the levels of performance of the trainees during the inpatient service either because it is a more challenging rotation, more time is spent in direct observation, or more opportunities exist during this rotation for tackling higher order tasks.

Ginsburg and colleagues in 2017 performed a study on two cohorts of PGY-1 internal medicine residents at the University of Toronto to determine the reliability of using variable amounts of commentary in ITERs to discriminate between residents (126). Based on their analysis, they concluded that using the written comments can be extremely reliable to discriminate between residents.

Reviewing the written comments of the ITERs in this study provided more valuable information to discriminate between residents as well as competencies in comparison to the quantitative scoring, which provided a very narrow range of performance rating. Most of the identified areas for improvement in the scoring section were related to the medical expert role, but several additional competency roles were highlighted in the comments section. This observation could be due to the ease of teaching and evaluating the medical expert role in comparison to the other roles. It has been previously shown that preceptors are able to evaluate the medical expert role easily, but find other competencies such as health advocate and leader/ manger to be more challenging (127). This could suggest that preceptors find that the "intrinsic" CanMEDs roles are more easily assessed using narrative comments than Likert scales.

In contrast, the health advocate role was found as a potential area for improvement using the scoring section despite the rarity of any remark about that role in the comments section. These findings may reflect the challenges previously described in assessing health advocacy in postgraduate training (128). Also, it reinforces the need for implementation of a neurology health advocacy curriculum as suggested by Abuzinadah and Cooke (129).

5.2 Role of a Multi-Modal Approach for a Targeted Need Assessment

Needs assessment is the cornerstone of curriculum design. However, the utility of a needs assessment is highly dependent upon the approach taken. Keister and Grames in 2012 reviewed needs assessments in the published literature and identified that a more robust approach to needs assessment needs to be taken (110). They suggested that a multi-modal needs assessment approach can optimize and enhance curriculum development.

This study confirms the complementary effects of using a multi-modal approach recommended by Keister and Grames. A robust multi-modal design was used to assess both self-reported and objective learning needs for curriculum designing by triangulating the findings of an analysis of five years of ITERs with the results of a survey of not only learners but two other key informant groups; the nurses and faculty who routinely observe junior learners in neurology. Also, the supplementary piece of the consensus meeting with ANRPC members provided the curriculum with further validity as well as practicality for future implementation.

In this study, in most instances the ITERs review and the survey validated the findings of one another. All of the frequently mentioned areas for improvement in the ITERs comment section such as history taking, neurological examination, and neuroanatomical localization were also highly ranked in the survey. Despite the rigorous survey development, the ITERs analysis still identified additional learning needs, which would have been overlooked if the needs assessment was comprised of only the survey. For example, time management and triaging skills were among the commonly mentioned areas for improvement on ITERs that had not been formally included in the survey.

Several ranking methods for needs assessment items using the Likert rating scales of frequency and/ or importance have been proposed in the literature. Smith and Beran in 2012

performed a study to compare five methods of ranking Likert ratings based on frequency and importance of clinical presentations (116). These ranking methods include importance mean, frequency mean, multiplicative method, three-step model, and Rasch model. Using the correlation analysis between the methods, they concluded that the Rasch model provides the most precise results but requires a large sample size (117). Also in their study, the multiplicative method was found to be the highest correlated to Rasch model, which can serve as an alternative method for smaller sample size (<100). Similarly, the multiplicative method was found to be the most precise ranking method after excluding the Rasch model by Blackmore and colleagues in their targeted needs assessment for a boot camp curriculum for pediatric surgery residents (101).

This study again examined four of the five methods approach described by Smith and Beran, excluding the Rasch model, due to the small sample size. The results of the correlation analysis confirmed the finding of previous studies that the multiplicative method is most precise method among the other ranking methods (importance, frequency, and three-step model).

5.3 Boot Camp Curriculum Content

Overall, the clinical and procedural skills-related items in the survey were rated as the highest for importance and frequency followed by communication and interpersonal skills and finally by the approach to neurological emergencies. While it was anticipated that an approach to emergencies might have been more highly ranked, these findings suggest that first-year neurology residents recognize the need to learn the basic foundational skills first in order to deal with neurological emergency situations. The resident and staff neurologist groups had a similar perception of importance and frequency for most of the surveyed items. These findings are consistent with previously performed needs assessments in neurosurgery and pediatric surgery (44, 101). There were minor differences in the self-reported learning needs for some the neurological emergencies between the residents and the staff neurologist groups. Also, neurology staff rated disclosure of medical error more 'important' than residents, although they rated the frequency similarly. Also, the residents reported somewhat higher importance and frequency than the neurologists for preparing a good PowerPoint presentation. These minor differences may result from discrepancies in practice between staff and residents. It is possible that the residents and the staff may be reflecting on what their own practices are like and that the learning needs reported reflected this. For example, staff physicians are likely to be more well-versed in handling medical error because of their experiences in independent practice. On the other hand, the emphasis on preparing a good PowerPoint presentation by the residents may reflect the day-to-day tasks that residents have to attend and present at rounds -- a high-frequency task for trainees and less so for staff. Despite these minor differences, the final ranking of the curriculum content wasn't significantly impacted, as there was a very strong correlation between the residents' and staff neurologists' rankings as well as with final ranking.

In this study, small group discussion and problem-based learning were the preferred methods of teaching in all categories. The simulation was considered one of the preferred methods for teaching neurological emergencies and clinical and procedural skills, while the standardized patient encounter was one of the preferred methods of teaching for communication and interpersonal skills. Despite this study being the first neurology boot camp curriculum developed based on a targeted needs assessment but a few previously performed targeted need assessment for boot camp curricula showed similar findings. Blackmore and colleagues in 2015 conducted a targeted needs assessment to determine the best content and format of a pediatric surgery boot camp (101). They found that the preferred format for the boot camp was 3–4 days in duration using multiple educational methods including problem-based learning, small group teaching, and high-fidelity simulation. These findings are also consistent with the need for active involvement of the learner, which is one of the basic principles for adult learning that applies to medical education (130).

5.4 Patient Safety

Phillips and colleagues in 2010 investigated medical errors from 1979 to 2006 in American medical institutions and discovered that fatal medication errors spiked by 10% during the month of July at teaching hospitals, but not in neighboring hospitals (131). Young and colleagues in 2011 performed a systemic review of 39 published studies describing the effects of trainee changeover on patient outcomes. Based on their analysis they concluded that efficiency decreases in hospitals and patients' mortality increases because of year-end changeovers, which was referred to as the “July effect” (3). Similarly, in the United Kingdom, there is an influx of newly certified doctors into the National Health Service (NHS) each August, which is associated

with an increase in medical errors and referred as the "Killing Season" (132). Several studies argued against this concept of the “July effect” (133-135). Jenna and colleagues in 2013 provided new insights that the increased risk of mortality during the initial month of the academic year in the most teaching-intensive hospital is limited to the most severely ill patients (136, 137). The implementation of simulation-based boot camp curricula in common emergency situations is one of the proposed solutions to mitigate the “July effect” (5, 14, 21, 40, 43, 90, 91). Recent evidence suggested that the implementation of a case-based neurology resident educational stroke boot camp reduced door to needle (DTN) times, which is a commonly used process measure in treating patients with acute stroke (41).

The use of the safety assessment matrix and assessed risk index to prioritize items for an educational needs assessment is an approach that has not been reported previously and is a unique contribution of this work. The safety assessment matrix has been used extensively in the field of patient safety to determine the highest priority hazards (118-120). The goal of using this method is to use a patient safety “lens” with which to view the needs assessment item rankings, because of the importance of the “July effect” and the inherent goals of the boot camp to mitigate this effect. This method has a unique element compared to the other needs assessment rankings described by Smith and Beran because it gives a slightly higher weight for items with the highest level of importance or frequency (median score of 5 on a 5-point Likert scale), which is possibly more appropriate in the field of patient safety.

In this study, the safety assessment matrix was used to prioritize neurological emergencies for the boot camp curriculum, given the potential risk of inexperienced PGY-1 neurology residents who must deal with these situations. Items in the intolerable risk region (score 5A, 5B, 5C, 4A, 4B, and 3A) were considered to be the highest priority neurological

emergencies that need to be mastered by PGY-1 neurology residents to minimize the potential "July effect". The use of this method identified an additional neurological emergency, "acute myelopathy", which had a high importance score of 5 but a lower frequency score of 3; this is still within the intolerable risk region. This learning need would otherwise have been missed using the other ranking methods and ITER review only. Based on this finding, the use of the safety assessment matrix to prioritize topics for an educational curriculum is strongly encouraged in designing boot camp curricula to minimize the potential "July effect".

5.5 CBD Transition

Competency-based medical education (CBME) is "an outcomes-based approach to the design, implementation, assessment, and evaluation of a medical education program using an organizing framework of competencies" (138). Competence by Design (CBD) is the Canadian version of CBME (100). As of 2018, Neurology Residency programs in Canada are expected to work with the Royal College of Physicians and Surgeons of Canada to prepare for implementation of CBD; in 2020, neurology residents will enter into a CBD-based program and experience CBD-based learning and assessment (99). CBD organizes residency training into four developmental stages: Transition to Discipline, Foundations of Discipline, Core of Discipline, and Transition to Practice. The "Transition to Discipline" stage is the first stage, and it emphasizes the orientation and assessment of new trainees. Several initiatives in Canada have been proposed to ease the transition from medical school to residency including a post-match boot camp pilot project by the University of Dalhousie, in which the participants agreed that the components of the course prepared them for residency (139). Specifically, at the first Canadian CBD workshop for designing the neurology CBD program in 2018, residency training program

directors agreed that there was a strong need for a national neurology boot camp for residents in "Transition to Discipline" stage (Personal Communication from Dr. Lara Cooke, CBD lead, Neurology, RCPSC). This could potentially be hosted at the annual congress of the Canadian Neurological Sciences Federation (CNSF). The neurology boot camp curriculum proposed in this study may be helpful in the implementation of the Royal College of Physicians and Surgeons of Canada's CBD project starting in 2020 by smoothing the transition from medical school to the first developmental stage of residency.

5.6 High Self-Awareness and Lack of Confidence as Possible Unique Features of the "Transition to Discipline" Developmental Stage

It has been shown that physicians in practice have a tendency to rate themselves more highly than objective measures (140-142). In a systematic review performed by Davis and colleagues in 2006, they reviewed 17 published articles to determine the accuracy of physician self-assessment compared with external observations of their competency. They found little, no, or an inverse relationship between self- and external assessment in most of the comparison domains. Based on their review the evidence suggested that physicians have a poor ability to accurately self-assess themselves.

In contrast to these previous studies, which emphasized the gaps between learners' self-reported needs and the observed learning needs by preceptors, this study highlighted the homogeneity between the perceived learning needs by the learners (i.e., neurology residents) and the learners' observers (i.e., staff neurologists and nurse leaders/ educators) as well as the objectively measured competencies by ITERs. Similarly, Blackmore and colleagues in 2015 found no significant differences between practicing physicians' and residents' perceptions on

their targeted needs assessment to determine the best content and format of a pediatric surgery boot camp (101). It could be argued that the similarity between learners' self-reported needs and the observed learning needs by preceptors in both studies were confounded by the inclusion of learners with a higher level of training (>PGY-1), who may be more representative of 'preceptors' for the newly starting residents. The observed findings by Brandman and colleagues in 2015 in their targeted needs assessment for neurosurgical residents would counter this argument (44). As they conducted a national web survey in Canada, which only included current and incoming neurosurgery PGY-1 residents comparing their perceptions with their program directors to identify the foundational skills during the transition from medical school to residency, they found that response trends were fairly consistent between residents and program directors regarding incoming PGY-1 training needs. Based on this observation, it is possible to speculate that a higher degree of self-awareness is a unique feature of the "Transition to Discipline" developmental stage, which continues to be memorable throughout residency training and career. Therefore, in this study, similar early resident learning needs were captured in the needs assessment of senior residents and practicing physicians as compared to junior residents. This concept remains assumptive at this point, as a study with larger sample size and direct comparison between the practicing physicians and first-year residents is required for validation.

In this study, lack of confidence was noted to be a potential area for improvement by many of the evaluators in the ITER review. Also, many of the survey's responders expressed the need for a boot camp curriculum for PGY-1 neurology residents to improve confidence, facilitate the transition, and alleviate anxiety. Similarly, improving confidence level was the main target of many of the previously published boot camp curricula in other specialties (6, 14, 18, 29, 42, 68,

72, 73, 77, 79, 86, 88-90, 103-105). Blackmore and colleagues in 2014 performed a meta-analysis of 15 published articles to evaluate the effectiveness of boot camp curricula in the transition to residency training (90). They found a significant improvement with a large effect size in the confidence level of the trainees post boot camp training.

The "four stages of competence" or "conscious competence" learning model, divides the process of progression of competency into the following stages: unconscious incompetence, conscious incompetence, conscious competence, and unconscious competence (143). Using this learning model, it is possible that the residents in the "Transition to Discipline" period spend most of their time in the "conscious incompetence" stage, during which they characteristically recognize their deficits and the value of new skills in addressing their learning gaps, but also manifest a lack of confidence. This could explain the robust observed effect of an educational intervention such as "boot camp" aiming to improve the confidence level and competency in self-aware and motived learners. It is also important to emphasize that the goal of such intervention is to improve the learners' comfort level with foundational skills and not to be dangerously overconfident.

5.7 Study Limitations

Despite the excellent response rate, the main limitation of this study is the relatively small sample size within a single-center; this can affect the external validity for future implementation. This issue could be addressed by replication of a similar study in other centers or by conducting a national needs assessment. The small sample size of the nursing group and the relatively lower response rate (possibly due to the requirement of indirect enrollment through managers as per Alberta Health Services policy) limited the detailed comparison with other

groups. Overall, this limitation is less likely to affect the final results of the study given the strong correlation of ranking order by the responders of the nursing group with the other groups and the final results.

5.8 Future Directions

This study developed the foundational content for a competency-based boot camp curriculum for PGY-1 neurology residents. To allow further generalizability and validation of the results of this study, a national needs assessment could be considered. Future needs assessment studies could incorporate some of the additional suggested strategies and topics in table 43 and 44. Using the proposed objectives and teaching strategies, futures studies could complete other phases of curriculum development: implementation, and evaluation and feedback (108). Implementation of such a curriculum could be done at local or national level. Several methods can be used to assess to evaluate the outcome of the curriculum such as the Kirkpatrick four-level training evaluation model (reaction, learning, behavior, and results) or Guskey's five critical levels of professional development evaluation (participants' reactions, participants' learning, organization support and change, participants' use of new knowledge and skills, and student learning outcomes) (144, 145). Pre- and post-surveys could be used to measure the confidence level of the participants' as well as self-efficacy assessment (146, 147). Pre- and post-knowledge and clinical and technical skills tests, as well as performance evaluation by the learners' observers, could be used as measures of outcomes. Long-term effects could be measured after six months from curriculum implementation. Patient safety process outcome measures, especially in emergency situations such as DTN time for acute ischemic stroke, could be used. The selection of appropriate methods would depend on the homogeneity of the

participants (local vs. national), sample size, and the availability of resources. Ongoing curriculum maintenance and enhancement are required to ensure that the curriculum achieves its goals and learning needs.

Chapter 6: Conclusion

This research makes two main contributions to the medical education literature. One is around the development of a specific curriculum for which there is an immediate need, and the other is methodological.

First, this study described the development of a competency-based neurology boot camp to support beginning residents in neurology programs in Canada and to support the planned "Transition to Discipline" stage of Competence by Design, which will begin in 2020. Although the "boot camp" literature is growing, there has been little work in this area for neurology residents before now.

Second, this research used a robust, multi-modal approach to needs assessment and a novel approach to incorporating patient safety methodology into curriculum design. The approach of this study using an analysis of evaluation reports to triangulate with the needs assessment survey elicited important content for the curriculum that might otherwise have been missed. Likewise, the approach of using the safety assessment matrix resulted in prioritizing at least one critical item that would otherwise not have ranked in the curriculum design. This work suggests that there may be a role for incorporation of this type of approach in future curricular design activities in medical education and speaks to the opportunity to enhance educational design through intersectionality with the literature from other disciplines such as patient safety. Additionally, in contrast to previous studies, which emphasize the gaps between learners' self-reported needs and the observed learning needs by preceptors, this study highlighted the homogeneity between them as well as the objectively measured needs, which could be a unique feature of the "Transition to Discipline" developmental stage.

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APPENDIX A: Summary of the Boot Camp Literature Review Articles

Table 42: Summary of the Boot Camp Literature Review Articles

Ref.	Author	Year	Discipline	Focus of Training	Teaching Strategies	Sample Size	Length of Program	Type of Study	Measurement	Outcome	Follow Up
(20)	Lossing	1992	Surgery	Procedural skills	Didactic lectures Animal lab Hands-on sessions	28	4 hours per week for 8 weeks over 3 months for 3 years	Survey Pre-experimental design	Pre- and post technical skills tests Post survey	Technical skills level Learners' satisfaction	NA
(23)	Heppell	1995	Surgery	Cognitive knowledge Procedural skills	Teaching videos Hands-on sessions Animal lab Didactic lectures Round table discussion Problem based learning	119 over 5 years	5 days	Survey	Post survey	Learners' satisfaction	NA
(24)	Marshall	2000	Surgery	Cognitive knowledge Patient management	Simulation Small group discussion	11	3 days	Survey	Pre- and post surveys	Confidence level	NA
(25)	Boehler	2003	Surgery	Cognitive knowledge Patient management Procedural skills	Didactic lectures Hands-on session Cadaver dissection session Mock page exercises Feedback with standardized patient	12	1 month	Survey Pre-experimental design	Post survey Pre- and post knowledge tests	Learners' satisfaction Knowledge level	NA
(26)	Meier	2005	Surgery	Cognitive knowledge Patient management	Web based session Simulation	17	NA	Survey	Pre- and post surveys	Confidence level Learners' satisfaction	NA
(27)	Peyre	2006	Surgery	Procedural skills	Gross anatomy sessions Hands-on sessions Simulation Animal lab	29	3 weeks	Survey	Pre- and post surveys	Confidence level	NA
(2)	Esterl	2006	Surgery	Cognitive knowledge Patient management Procedural skills Administrative skills	Didactic lectures Problem based learning Simulation	16	4 weeks	Mixed method (Survey and Focus group discussion)	Pre- and post surveys	Confidence level Clinical skills level	NA
(6)	Pliego	2008	Ob/Gyn	Patient management (emergencies)	Simulation	23	3 months	Survey	Pre- and post surveys	Confidence level Stress hardiness Technical skills level (perception)	NA
(22)	Parent	2008	Surgery	Procedural skills	Didactic lectures Simulation	15 13 controls	3 days	Randomized controlled study Survey	Pre- and post surveys	Confidence level Technical skills level	1 month 6 months
(28)	Brunt	2008	Surgery	Patient management (emergencies) Procedural skills	Didactic lectures Hands-on sessions	31	3 hours every week for 7 weeks	Survey Pre-experimental design	Pre- and post technical skills tests Pre- and post surveys	Confidence level Technical skills level	NA

(89)	Nishisaki	2009	Pediatric Critical Care	Patient management (emergencies) Procedural skills	Didactic lectures Simulation Small group discussion	22	2 ½ days	Survey	Post survey	Clinical skills level Confidence level	7 months
(29)	Antonoff	2009	Surgery	Patient management (emergencies) Procedural skills	Didactic lectures Simulation	20	3 weeks	Survey Pre-experimental design	Pre- and post knowledge tests Post survey	Learners' satisfaction Confidence level Knowledge level	NA
(103)	Laack	2010	General	Patient management (emergencies) Safety Communication Legal/Ethical Data Interpretation Procedural skills	Problem based learning Simulation Standardized patient	12 28 controls	1 week	Survey	Post survey	Level of preparation for residency (perception)	5-7 months
(31)	Zeng	2010	Surgery	Cognitive knowledge Patient management Procedural skills	Didactic lectures Hands-on session Animal lab	65	3 hours every week for 7 weeks	Survey Pre-experimental design	Pre- and post knowledge tests Pre- and post technical skills tests Pre- and post surveys	Confidence level Knowledge level Technical skills level	NA
(83)	Williams (poster)	2010	Palliative Care	Communication skills	Standardized patient encounters	17	3 hours	Qualitative study (thematic analysis)	Post written and verbal feedback	Level of Preparation for residency (perception)	NA
(56)	Carter	2010	Thoracic Surgery	Procedural skills	Didactic lectures Simulation	12	3 weeks (weekly session)	Pre-experimental design Survey	Pre- and post OSATS Pre- and post surveys	Technical skills level Confidence level	NA
(30)	Naylor	2010	Surgery	Cognitive knowledge Patient management Clinical skills Procedural skills Practice-based learning Communications Professionalism Systems-based practice	Didactic lectures Hands-on sessions Simulation Cadaver dissections Team training Independent study Feedback	9	4 weeks	Survey Pre-experimental design	Pre- and post technical skills tests Pre- and post surveys	Confidence level Technical skills level	NA
(55)	Fann	2010	Cardiovascular Surgery	Procedural skills	Simulation	33	4 hours	Pre-experimental design Survey	Pre- and post OSATS Post survey	Technical skills level	6 months
(75-78)	Malloy Malekzadeh Deutsch	2011 2014	Otolaryngology	Patient management (emergencies) Procedural skills	Simulation	30	1 day	Survey	Pre- and post surveys	Clinical performance (perception) Learners' and teachers' satisfaction Confidence level	6 months
(19)	Dehmer (poster)	2011	Surgery	Professionalism Interpersonal skills Communication skills Cognitive knowledge Procedural skills	Interactive didactic sessions Teamwork training Simulation	18	2 days	Survey	Pre- and post knowledge tests Post survey	Knowledge level Learners' satisfaction	NA

(54)	Hicks	2011	Cardiovascular Surgery	Procedural skills	Simulation	30	4 hours	Pre-experimental design Survey	Post knowledge tests Post survey	Knowledge level Technical skills level (perception)	NA
(18)	Antonoff	2011	Surgery	Procedural skills Professionalism Patient management (emergencies)	Didactic lectures Small group discussion Simulation Mock page exercises Team-based problem solving	22	1 month	Survey Pre-experimental design	Pre- and post surveys Pre- and post knowledge tests Pre- and post OSATS	Knowledge level Confidence level Technical skills level	NA
(33)	Todd	2011	Surgery	Clinical skills Professionalism Cognitive knowledge Patient management Medical documentation Communication skills	Interactive sessions	8	16 hours over 1 month	Survey	Pre- and post surveys	Confidence level	NA
(46-48)	Selden	2011 2013	Neurosurgery	Cognitive knowledge Procedural skills	Didactic lectures Simulation	18 (pilot) 186 residents 75 faculty staffs	2 days	Survey	Pre- and post surveys	Knowledge level (perception) Learners' and teachers' satisfaction	6 months
(35-37)	Sonnadara	2011 2013	Orthopedic	Procedural skills	Didactic lectures Simulation	6 16 control	1 month	Quasi-experimental design	Pre- and post OSATS	Technical skills level	6 months
(17)	Fernandez	2012	Surgery	Cognitive knowledge Patient management Procedural skills	Didactic lectures Simulation	30	9 weeks	Pre-experimental design	Pre- and post knowledge tests Pre and post clinical and technical skills tests	Residents' performance	NA
(53)	Bismuth	2012	Cardiovascular Surgery	Cognitive Knowledge Procedural skills	Didactic lectures Simulation	150	3 days (weekend)	Survey	Post survey	Learners' satisfaction	NA
(43)	Mohamed (poster)	2012	Neurology	Patient management (emergencies)	NA	NA	4 days	Pre-experimental design Survey	Pre- and post knowledge tests Post survey	Knowledge level Learners' satisfaction	8 months
(21)	Okusanya	2012	Surgery	Cognitive knowledge Patient management Procedural skills	Didactic lectures Simulation	29 9 Control	5 days	Quasi-experimental design Survey	Pre- and post surveys	Confidence level	6 months
(5)	Cohen	2013	Internal Medicine	Cognitive knowledge Patient management Procedural skills Communication skills Professionalism	Didactic lectures Small group discussion Simulation Deliberate practice Individualized feedback	47 109 control	3 days	Cohort study Survey	Post clinical skills tests Post survey	Clinical skills Learners' satisfaction	NA

(16)	Krajewski	2013	Surgery	Cognitive knowledge Procedural skills	Didactic lectures Simulation Web based self study modules Standardized patient encounters	108	2 months	Pre-experimental design Survey	Post survey Pre- and post clinical skills tests Post knowledge test	Residents' performance (perception) Knowledge level Technical skills level	NA
(87)	Moazed	2013	Critical Care	Cognitive knowledge Procedural skills Communication skills Patient management	Didactic lectures Deliberate skills practice Assessment to mastery standards Simulation	47	3 days	Cohort study	Post clinical skill test	Retention of knowledge Clinical skills level	1 month-1 year
(64)	Maskatia	2013	Pediatric Cardiology	Cognitive knowledge Procedural skills	Didactic lectures Hands-on sessions Reading	6 28 control	3 days	Quasi-experimental design Survey	Pre- and post knowledge and performance- based tests Pre- and post surveys	Residents' performance level Knowledge level	NA
(74)	Deutsch	2013	Otolaryngology	Patient management (emergencies) Procedural skills	Simulation	35 staff	1 day	Qualitative study (content analysis of semi-structured interviews)	Post verbal feedback	Factors motivate faculty staff to participate	NA
(15)	Tocco	2013	Surgery	Procedural skills	Hands-on sessions	23	5 days	Survey	Pre- and post surveys Pre- and post knowledge tests	Confidence level Technical skills Knowledge level	NA
(79)	Chin	2014	Otolaryngology	Patient management (emergencies) Procedural skills Clinical reasoning Communication skills	Simulation	28	1 day	Mixed method (survey and individual phone interview)	Pre- and post surveys	Confidence level	NA
(70)	Naritoku	2014	Anatomic and Clinical Pathology	Cognitive knowledge Procedural skills	Didactic lectures Hands-on sessions	NA	1-12 weeks (3 models)	Mixed method (pre-experimental design and focus group discussion) Survey	Pre- and post knowledge tests Post survey	Knowledge level Confidence level	NA
(42)	Tariq (poster)	2014	Neurology	Patient management (emergencies)	Simulation	13	2 days	Mixed method	Pre- and post knowledge tests Post debriefing	Knowledge level Confidence level	NA
(1)	Min	2014	Emergency Medicine	Cognitive knowledge Patient management (emergencies) Procedural skills	Didactic lectures Simulation	24	5 days	Survey	Post survey	Learners' satisfaction	NA
(40)	Wayne	2014	Internal Medicine	Patient management (emergencies) Procedural skills Communication skills	Simulation Individualized feedback and skills assessment	20 109 historical control	2 days	Cohort study Survey	Post clinical skills test Post survey	Clinical skills level Learners' satisfaction	NA

(52)	Macfie	2014	Cardiothoracic Surgery	Procedural skills	Simulation	64	4 hours	Pre-experimental design	Pre- and post OSATS	Technical skills level	NA
(69)	Jambhekar	2014	Radiology	Medical knowledge Patient management Procedural skills Interpersonal skills Communication skills Professionalism Practice-based learning Systems-based practice Research	Didactic lectures Simulation Social interaction	6	2 weeks	Survey	Post survey	Confidence level Clinical skills level (perception)	6 months
(90)	Blackmore	2014	Multiple Specialties	NA	NA	15 articles	NA	Meta Analysis	NA	Clinical skills level Knowledge level Confidence level	NA
(59)	Sawyer	2014	Neonatal-Perinatal Medicine	Patient management (emergencies) Procedural skills Non-procedural skills	Simulation	32	2 days	NA	NA	Challenges	NA
(71)	Jaswal	2015	Radiation Oncology	Cognitive knowledge Procedural skills	Didactic lectures Small group discussion	29	2.5 days	Mixed method	Pre- and post knowledge tests Feedback	Residents' performance (perception) Knowledge level	NA
(68)	Ataya	2015	Emergency Medicine	Procedural skills Leadership skills Communication skills Resource management	Simulation Inter professional debriefing	12	2 days	Survey	Pre and post surveys	Confidence level	NA
(101)	Blackmore	2015	Pediatric Surgery	Cognitive knowledge Patient management Procedural skills	Problem-based learning E-Learning Small group discussion Simulation Didactic lectures	12 residents 23 staff	3-4 days (suggested)	Survey	Survey	Needs assessment	NA
(91)	Singh	2015	Surgery	Procedural skills	Simulation	18 articles	1 week (suggested)	Systematic review	Pre- and post OSCE, OSATS, survey (suggested)	Needs assessment	NA
(51)	Sheahan	2015	Vascular Surgery	Procedural skills	Simulation Hands-on sessions Feedback	24	3 days	Survey	Pre- and post surveys	Confidence level	NA
(107)	Strom	2015	Advanced Cardiac Life Support	Cognitive knowledge Patient management (emergencies)	Didactic lectures Simulation Self-Study	19	4 days	Prospective cohort study	Post-course clinical skills test Post knowledge test	Learners' performance level	NA

(39)	Esch	2015	Internal medicine (ambulatory clinic)	Cognitive knowledge Inter-professional skills	Didactic lectures Observation	38	2 days	Survey Pre-experimental design	Pre- and post surveys Pre- and post knowledge tests	Confidence level Knowledge level	NA
(82)	Ferguson	2015	Clinical Pharmacy	Literature evaluation skills	Individual feedback	13	1 week	Survey	Post survey	Learners' satisfaction	NA
(45)	Haji	2015	Neurosurgery	Procedural skills Cognitive knowledge Patient management Communication skills Team training skills	Didactic lectures Small group discussion Simulation Role play Debriefing Expert demonstration	23	2 days	Survey Pre-experimental design	Pre- and post knowledge tests Post survey	Learners' and teachers' satisfaction Knowledge level	3 months
(14)	Heskin	2015	Surgery	Cognitive knowledge Procedural skills Patient management (emergencies)	Deliberate practice Simulation Bench models Role playing Scenario setting	58	5 days	Cohort study Survey	Pre- and post knowledge tests Pre- and post OSATS Pre- and post surveys	Confidence level Knowledge level Technical skills level	NA
(44)	Brandman	2015	Neurosurgery	Patient management Procedural skills Clinical skills Communication skills Inter-professional skills	NA	38	NA	Survey	Survey	Needs assessment	NA
(13)	Minter	2015	Surgery	Cognitive knowledge Patient management Procedural skills Professionalism Interpersonal skills Communication skills Practice-based Learning Systems-based practice	NA	158	NA	Mixed method	Survey Thematic analysis of the open ended question responds analysis	Confidence level Level of preparation	NA
(84)	Ambardekar	2016	Pediatric Anesthesia	Procedural skills Patient management	Simulation Group discussions	18	1 day	Survey	Post survey	Knowledge level Confidence level Technical skills level Clinical skills level	NA
(104)	Figueroa	2016	Trauma	Communication skills Teamwork skills Patient management (emergencies)	Simulation Didactic lectures Group discussion	15	1 day	Survey	Pre- and post surveys	Confidence level Knowledge level Teamwork skills	NA
(12)	Bhatt	2016	Surgery	Clinical decision making skills	Clinical decision making workshop Didactic lectures Interactive discussion	57	2 hours every week for 3 weeks	Survey	Pre- and post surveys	Residents' understanding and attitude toward clinical decision making teaching	NA

(102)	Bontempo	2016	Multiple Specialties	Cognitive knowledge Procedural skills Communication skills	Didactic lectures Small group discussion Hands-on sessions Simulation	65	3 half days	Survey	Post survey	Confidence level	3 months
(38)	Brydges	2016	Internal Medicine	Procedural skills	Simulation	20	1 hour	Qualitative study (thematic analysis of interviews)	Post verbal feedback	Confidence level	NA
(105)	Burns	2016	Multiple Specialties	Cognitive knowledge Organization skills Communication skills Clinical skills Patient management (emergencies)	Didactic lectures Small group discussion Roleplaying Facilitated debriefing Simulation	16	5 days	Survey Pre-experimental design	Pre- and post OSCES Pre- and post surveys	Confidence level Clinical skill level Learners' satisfaction	NA
(73)	Chin	2016	Otolaryngology	Procedural skills Patient management (emergencies)	Simulation Interactive panel discussion	22	1 day	Survey	Pre- and post surveys	Confidence level	1 month
(88)	Castro	2016	Pediatric Critical Care	Cognitive knowledge Procedural skills Patient management (emergencies) Team training skills	Simulation Deliberate practice Pre-course assignments Interactive teaching	16	3 days	Survey Pre-experimental design	Pre- and post technical skills tests Pre- and post surveys	Confidence level Technical skills level Learners' satisfaction	NA
(11)	Cleland	2016	Surgery	Socio-cultural complexity	Simulation	19 residents 10 faculty staffs	4 days	Qualitative method	Observations Field interviews Formal interviews	Socio-cultural complexity	NA
(34)	Seeley	2016	Orthopedic	Procedural skills	Simulation	8 7 control	3 weeks (once per week)	Quasi-experimental design	Pre- and post technical skills tests	Technical skills level	NA
(81)	Omlor	2016	Geriatric Medicine (falls risk assessment)	Cognitive knowledge Clinical skills Patient management	Didactic lecture Standardized patients Video recognition Problem-based learning	238	1 hour	Survey	Pre- and post surveys	Confidence level	NA
(106)	Minha	2016	General	Cognitive knowledge Procedural skills Patient management (emergencies) Communication skills Integrated skills	Simulation Hands-on sessions Standardized patient encounters	4172 (806 replied)	5 days	Survey	Post survey	Learners' competency (perception) Learners' satisfaction	Up to 3 years

(67)	Lamba	2016	Emergency Medicine	Procedural skills	Flipped classroom approach Pre-reading Online video Hands-on sessions Simulation	9	1 day	Survey	Pre- and post surveys Post technical skills test	Confidence level Learners' competency (perception) Learners' satisfaction	NA
(10)	Schoolfield	2016	Surgery	Cognitive knowledge Patient management Procedural skills Interpersonal skills Communication skills Practice-based Learning	Didactic lectures Hands-on sessions	21	2 days	Survey	Pre- and post surveys	Confidence level	NA
(9)	Wancata	2016	Surgery	Procedural Skills Patient management	Didactic lectures Hands-on sessions	20	4 weeks	Cohort study	Post knowledge test Post technical skills test	Knowledge level Technical skills level	NA
(86)	Yee	2016	Critical Care (Mechanical Ventilation)	Procedural Skills Patient management (emergencies)	Simulation	17	3 days	Pre-experimental design Survey	Pre- and post survey Pre- and post knowledge tests Pre- and post clinical skills tests	Confidence level	NA
(72)	Smith	2016	Otolaryngology	Cognitive knowledge Patient management (emergencies)	Didactic lectures Simulation Hands-on sessions	18	1 day	Pre-experimental design Survey	Pre- and post knowledge tests Post survey	Confidence level Knowledge level Learner's satisfaction	NA
(8)	Ting	2016	Surgery	Clinical skills Patient management (emergencies)	Didactic lectures Interactive sessions	145	4 hours	Survey	Post survey	Learner's satisfaction	NA
(63)	Allan	2016	Pediatric Cardiology	Cognitive knowledge Clinical skills	Didactics lectures Hands-on sessions Simulation Self-guided learning	16	4 weeks	Survey	Pre- and post surveys	Confidence level	NA
(92)	Neylan	2016	Surgery	NA	NA	10 articles	NA	Systematic review	NA	Confidence level Learners' competency	NA
(62)	Ceresnak	2016	Pediatric Cardiology	Cognitive knowledge Clinical skills Procedural skills	Hands-on sessions Simulation Didactic lectures Group learning	8	2 days	Survey Pre-experimental design	Pre- and post knowledge tests Pre- and post surveys	Knowledge level Confidence level	NA
(61)	Ceresnak	2017	Pediatric Cardiology	Cognitive knowledge Clinical skills Procedural skills	Hands-on session Simulation Didactic lectures Group learning	16 16 control	2 days	Survey Quasi-experimental design	Pre- and post knowledge tests Pre- and post surveys	Knowledge level Confidence level	2 months
(57)	Davidson	2017	Plastic Surgery	Cognitive knowledge Procedural skills Communication skills Clinical skills	Didactic lectures Hands-on sessions Simulation	43	3 days	Survey	Pre- and post surveys	Confidence level	6 months

(85)	Rábago (Spanish)	2017	Anesthesia	Procedural skills	Simulation	12	4 days	Prospective study Survey	Post survey Post technical skills test	Technical skills level Learners' satisfaction	NA
(32)	Acosta	2017	Surgery	Cognitive knowledge Procedural skills Patient management (emergencies) Administrative skills	Didactic lectures Simulation Practical sessions	20	84 hours	Survey	Pre- and post surveys	Learners' competency (perception)	NA
(49)	Ament	2017	Neurosurgery	Cognitive knowledge Procedural skills	Didactic lectures Case discussions Hands-on sessions Simulation	24 residents 5 staff	2 days	Survey	Post survey	Knowledge level (perception) Course effectiveness	NA
(58)	Castillo	2017	Dental Surgery	Cognitive knowledge Procedural skills Clinical Skills	Hands-on sessions Interactive lectures Standardized patient scenarios Simulation	6	3 days	Survey	Pre- and post surveys	Knowledge level (perception) Confidence level	NA
(50)	Hunt	2017	Neurosurgery	Cognitive knowledge Procedural skills	Didactic lectures Case discussions Hands-on sessions Simulation Videos	30	2 days	Survey	Pre- and post surveys	Learners' feedback	3 months
(65)	Maskatia	2017	Pediatric Cardiology	Cognitive knowledge Procedural skills	Didactic lectures Hands-on sessions	32	3 days	Survey Pre-experimental design Cohort study	Pre- and post knowledge tests Pre- and post surveys	Knowledge level Technical skills Self efficacy	NA
(60)	Starr	2017	Pediatrics	Procedural skills	Simulation	30	½ day	Pre- and post survey	Pre- and post surveys	Perceived competency Confidence level	NA
(80)	Yeh	2017	Otolaryngology	Cognitive knowledge Procedural skills Professional skills	Hands-on sessions Simulation	NA	1 day (suggested)	Review article	NA	NA	NA
(41)	Ruff	2017	Neurology (Stroke)	Patient management (emergencies)	Case based discussion	15	3 hours	Pre-experimental design Cohort study	Pre- and post knowledge tests	Knowledge level Patient outcome	NA
(66)	Khobrani	2018	Pediatric Trauma	Cognitive knowledge Clinical Skills Teamwork skills Communication skills	Simulation Standardized patient encounters	13	2 days	Survey Pre-experimental design	Pre- and post knowledge tests Pre- and post clinical tests Pre- and post surveys	Knowledge level Confidence level Teamwork skills Communication skills	NA

APPENDIX B: Sample ITERs

University of Calgary
Neurology (Adult)

Evaluated By : evaluator's name
Evaluating : person (role) or moment's name (if applicable)
Dates : start date to end date

* indicates a mandatory response

In-Training Evaluation Report
Inpatient Neurology Rotation PGY 1 & 2

Indicate Site:

- ○ FMC
- ○ RGH
- ○ SHC

Ratings:

N/A= not assessed
1=completely fails to meet objective for PGY-level
2=fails to meet objective for level, but does meet in part
3=meets objective for PGY-level
4=Exceeds objective for PGY-level
5=Exceeds objective routinely and consistently performs at consultant level

This junior resident is able to:

MEDICAL EXPERT

		FAIL		PASS		
	NA	1	2	3	4	5
Conduct a complete and systematic neurological examination, recognizing significant findings most of the time.	○	○	○	○	○	○
Localize symptoms and signs correctly most of the time	○	○	○	○	○	○
Make decisions promptly, showing good judgment, based on logical reasoning.	○	○	○	○	○	○
Recognize patients in need of emergent action.	○	○	○	○	○	○
Call for help in cases of patients in need of emergent action an sometimes initiate care in such patients.	○	○	○	○	○	○
Order appropriate tests and understand the findings.	○	○	○	○	○	○
List indications and contraindications for common ancillary tests including CT or MRI head with and without contrast, lumbar puncture, EEG, EMG/NCS.	○	○	○	○	○	○
Identify first line treatments for most common neurological conditions encountered on the inpatient service	○	○	○	○	○	○
Describe the fundamental physiology for common neurological conditions.	○	○	○	○	○	○
Describe the method and risks of performing a lumbar puncture	○	○	○	○	○	○
Perform a lumbar puncture on an average patient	○	○	○	○	○	○

SCHOLAR

		FAIL		PASS		
	NA	1	2	3	4	5
Often read articles pertaining to patient care questions.	○	○	○	○	○	○
Make an effort to teach medical students and junior learners on the team	○	○	○	○	○	○

		FAIL		PASS		
	NA	1	2	3	4	5
Make an organized, well-conceived case presentation at academic rounds.	○	○	○	○	○	○

PROFESSIONAL

		FAIL		PASS		
	NA	1	2	3	4	5
Recognize personal limitations and ask for help when appropriate.	○	○	○	○	○	○
Demonstrate professional behaviour: Punctual	○	○	○	○	○	○
Demonstrate professional behaviour: Polite and respectful of patients and staff	○	○	○	○	○	○
Demonstrate professional behaviour: Seeks out new learning	○	○	○	○	○	○
Demonstrate professional behaviour: Honest, and shows integrity.	○	○	○	○	○	○

COMMUNICATOR

		FAIL		PASS		
	NA	1	2	3	4	5
Effectively establish therapeutic relationship with patients.	○	○	○	○	○	○
Efficiently elicit accurate histories from patients and families, including patient perspective and context.	○	○	○	○	○	○
Provide information in concise, understandable, lay terms to patients and families.	○	○	○	○	○	○
Make accurate, legible, inclusive chart notes to document clinical encounters.	○	○	○	○	○	○
Demonstrate empathy for patients and families.	○	○	○	○	○	○

HEALTH ADVOCATE

		FAIL		PASS		
	NA	1	2	3	4	5
List risk factors and prevention strategies for common neurological conditions.	○	○	○	○	○	○
Appropriately allocate finite resources, such as urgent MRI slots or EMG/NCS.	○	○	○	○	○	○
Identify relevant community resources for neurology to assist in discharging patients.	○	○	○	○	○	○
Complete discharge summaries and contact primary care givers in the management of transition out of hospital.	○	○	○	○	○	○

COLLABORATOR

		FAIL		PASS		
	NA	1	2	3	4	5
Contribute to daily discussion of the inpatients by the team, incorporating input from nurses, social work, and rehab team as appropriate.	○	○	○	○	○	○
Clearly communicate issues in a concise manner to other health care professionals who are asked to become involved in the care of individual patients.	○	○	○	○	○	○
Participate in team/family meetings, where appropriate, providing input on medical issues, and incorporating the recommendations of others	○	○	○	○	○	○
Always demonstrate respectful behavior to all health care providers on the team.	○	○	○	○	○	○
Recruit appropriate health care professionals needed in arranging disposition/discharge of patients.	○	○	○	○	○	○

MANAGER

		FAIL		PASS		
	NA	1	2	3	4	5
Demonstrate punctuality and attendance at all academic rounds and ward rounds.	○	○	○	○	○	○
Prioritize urgent and non-urgent tasks.	○	○	○	○	○	○
Manage time appropriately such that a new consultation is completed in less than 90 minutes.	○	○	○	○	○	○
Contribute to the team by managing at least 2-4 in-patients.	○	○	○	○	○	○

	FAIL		PASS		
	1	2	3	4	5
OVERALL PERFORMANCE	○	○	○	○	○

*Please describe outstanding performance, failures, or difficulties:

Other Comments:

**Did the trainee respond to feedback during the course of the rotation by altering behaviour/making appropriate changes? (Mandatory)

○ Yes
○ No
○ Sometimes

The following will be displayed on forms where feedback is enabled...
(for the evaluator to answer...)

*Did you have an opportunity to meet with this trainee to discuss their performance?

○ Yes
○ No

(for the evaluee to answer...)

*Did you have an opportunity to discuss your performance with your preceptor/supervisor?

○ Yes
○ No

*I agree with this performance evaluation!

○ Yes
○ No

Please enter any comments you have(if any) on this evaluation.

University of Calgary
Neurology (Adult)

Evaluated By :evaluator's name
Evaluating :person (role) or moment's name (if applicable)
Dates :start date to end date

* indicates a mandatory response

In-Training Evaluation Report
Consult Neurology Rotation PGY 1 & 2

Ratings:

N/A= not assessed
1=completely fails to meet objective for PGY-level
2=fails to meet objective for level, but does meet in part
3=meets objective for PGY-level
4=Exceeds objective for PGY-level
5=Exceeds objective routinely and consistently performs at consultant level

MEDICAL EXPERT

		FAIL		PASS		
	NA	1	2	3	4	5
Performs a thorough, accurate neurological examination	○	○	○	○	○	○
Usually localizes symptoms and signs correctly	○	○	○	○	○	○
Demonstrates good judgment in selecting appropriate investigations and disposition for the patient at the end of the consultation.	○	○	○	○	○	○
Demonstrates an appropriate fund of basic science/pathophysiology knowledge for PGY-level	○	○	○	○	○	○
Demonstrates an approach to the patient with delirium	○	○	○	○	○	○
Demonstrates an approach to the inpatient with a movement disorder	○	○	○	○	○	○
Demonstrates an approach to the prognosis in a patient post -cardiac arrest	○	○	○	○	○	○
Recongizes patients in need of acute/emergent intervention (e.g. status epilepticus, deteriorating LOC, stroke)	○	○	○	○	○	○
Identifies first and second line interventions for common neurological presentations.	○	○	○	○	○	○

SCHOLAR

		FAIL		PASS		
	NA	1	2	3	4	5
Often searches for and identifies best evidence for clinical questions that arise in daily practice	○	○	○	○	○	○
Takes time to teach medical students and off-service residents in a collegial manner	○	○	○	○	○	○
Participates in the preparation of educational rounds	○	○	○	○	○	○
Asks thoughtful questions about clinical presentations and management of patients	○	○	○	○	○	○

PROFESSIONAL

		FAIL		PASS		
	NA	1	2	3	4	5
Recognizes limitations and asks for help appropriately.	○	○	○	○	○	○
Acknowledges openly and honestly when errors are made, or omissions are made from the exam, history, or consultation note.	○	○	○	○	○	○

		FAIL		PASS		
	NA	1	2	3	4	5
Ensures that clear sign off and arrangements for follow-up when consultations are complete.	○	○	○	○	○	○
Recognizes when it may be more appropriate for the attending physician to communicate with the referring attending.	○	○	○	○	○	○
Provides a consultation in a timely manner	○	○	○	○	○	○
Communicates in a respectful and professional manner when receiving a new consultation and when delivering an impression and recommendations	○	○	○	○	○	○
Demonstrates professional behaviour: Punctual, attends rounds.	○	○	○	○	○	○
Demonstrates professional behaviour: Polite and respectful of patients and staff	○	○	○	○	○	○
Demonstrates professional behaviour: Seeks out new learning	○	○	○	○	○	○
Demonstrates professional behaviour: Honest, and shows integrity.	○	○	○	○	○	○

COMMUNICATOR

		FAIL		PASS		
	NA	1	2	3	4	5
Effectively establishes therapeutic relationship with patients.	○	○	○	○	○	○
Efficiently elicits accurate histories from patients and families, including patient perspective and context.	○	○	○	○	○	○
Provides information in concise, understandable, lay terms to patients and families.	○	○	○	○	○	○
Makes accurate, legible, inclusive chart notes to document clinical encounters.	○	○	○	○	○	○
Identifies or clarifies the referring physicians primary question(s) and how they would like it addressed (or degree of involvement)	○	○	○	○	○	○
Can present a detailed history and physical examination in an organized and comprehensive manner.	○	○	○	○	○	○
Includes a clear impression and recommendations with consultation notes.	○	○	○	○	○	○
Should be able to effectively deliver recommendations to the primary care provider in person	○	○	○	○	○	○
Identifies or clarifies the referring physicians primary question(s) and how they would like it addressed (or degree of involvement)	○	○	○	○	○	○
Demonstrates empathy for patients and families.	○	○	○	○	○	○
Should be able to effectively deliver recommendations to the primary care provider in person	○	○	○	○	○	○
Generates written consultation notes which are legible, clearly communicate an impression and plan, clarify who is responsible for carrying out these recommendations	○	○	○	○	○	○

HEALTH ADVOCATE

		FAIL		PASS		
	NA	1	2	3	4	5
Can list risk factors and prevention strategies for common neurological conditions, including stroke and delirium	○	○	○	○	○	○
Enlists the help of other services to support patients in returning to the community, or supported housing (e.g. transition, rehab, social work, etc).	○	○	○	○	○	○
Appropriately orders investigations, recognizing that resources are finite (e.g. MRI, angiograms, EEG, EMG).	○	○	○	○	○	○

COLLABORATOR

		FAIL		PASS		
	NA	1	2	3	4	5
Appropriately identifies when additional help is warranted from other professionals, including other specialties, rehab services, transition services, social work, etc.	○	○	○	○	○	○

		FAIL		PASS		
	NA	1	2	3	4	5
Interacts respectfully with all members of the healthcare team.	○	○	○	○	○	○
Participates in team or family meetingsiately orders investigations, recognizing that resources are finite (e.g. MRI, angiograms, EEG, EMG).	○	○	○	○	○	○

MANAGER

		FAIL		PASS		
	NA	1	2	3	4	5
Can perform a full consultation on a complex inpatient in approximately 90 minutes, including collateral history, review of old charts, and writing a detailed consultation note.	○	○	○	○	○	○
Prioritizes competing consultations according to the best interests of patient care, with attention to acuity, urgency, and discharge planning considerations.	○	○	○	○	○	○
Manages multiple tasks that are ongoing throughout the week, including following up on multiple investigations for longstanding inpatients and complex cases.	○	○	○	○	○	○

	FAIL		PASS		
	1	2	3	4	5
OVERALL PERFORMANCE	○	○	○	○	○

*Please describe outstanding performance, failures, or difficulties:

Other Comments:

*Did the trainee respond to feedback by altering behaviour/making appropriate changes (Mandatory):

- ○ Yes
- ○ No
- ○ Sometimes
- ○ NA

The following will be displayed on forms where feedback is enabled...
(for the evaluator to answer...)

*Did you have an opportunity to meet with this trainee to discuss their performance?

- ○ Yes
- ○ No

(for the evaluee to answer...)

*Did you have an opportunity to discuss your performance with your preceptor/supervisor?

- ○ Yes
- ○ No

*I agree with this performance evaluation!

- ○ Yes

○ No

Please enter any comments you have(if any) on this evaluation.

University of Calgary
Neurology (Adult)

Evaluated By :evaluator's name
Evaluating :person (role) or moment's name (if applicable)
Dates :start date to end date

* indicates a mandatory response

In-Training Evaluation Report
Mixed Ambulatory Neurology Rotation
Junior Residents (PGY 1 & 2)

Ratings:

N/A= not assessed
1=completely fails to meet objective for PGY-level
2=fails to meet objective for level, but does meet in part
3=meets objective for PGY-level
4=Exceeds objective for PGY-level
5=Exceeds objective routinely and consistently performs at consultant level

MEDICAL EXPERT

		Fail		Pass		
	NA	1	2	3	4	5
Performs a thorough and accurate neurological history and examination in less than 90 minutes.	○	○	○	○	○	○
Posits a logical differential diagnosis based on the clinical findings in each patient.	○	○	○	○	○	○
Usually localizes symptoms and signs correctly.	○	○	○	○	○	○
Demonstrates good judgment in selecting appropriate investigations and disposition for the patient at the end of a consultation.	○	○	○	○	○	○
Demonstrates an appropriate fund of clinical knowledge for their level of training.	○	○	○	○	○	○
Demonstrates an appropriate fund of basic science and/or pathophysiology knowledge for their level of training.	○	○	○	○	○	○
Recognizes when a patient in the ambulatory setting needs admission emergently.	○	○	○	○	○	○
Identifies first and second line therapeutic interventions for common neurological presentations.	○	○	○	○	○	○

SCHOLAR

		Fail		Pass		
	NA	1	2	3	4	5
Routinely searches for and identifies best evidence for clinical questions that arise in daily practice.	○	○	○	○	○	○
Demonstrates preparedness for a given clinic by having read around the topic area before attending the clinic.	○	○	○	○	○	○
Asks thoughtful questions around the evidence, diagnosis, and management of patients presenting in a given clinic.	○	○	○	○	○	○

PROFESSIONAL

		Fail		Pass		
	NA	1	2	3	4	5
Recognizes limitations and ask for help appropriately.	○	○	○	○	○	○

		Fail		Pass		
	NA	1	2	3	4	5
Demonstrates professional behavior, including competence, altruism, honesty, integrity, and punctuality. read around the topic area before attending the clinic.	○	○	○	○	○	○

COMMUNICATOR

		Fail		Pass		
	NA	1	2	3	4	5
Establishes therapeutic relationships with patients.	○	○	○	○	○	○
Presents patient histories and clinical synthesis in an organized, logical fashion for each case reviewed.	○	○	○	○	○	○
Efficiently elicits accurate histories from patients and families, including the patient perspectives and context.	○	○	○	○	○	○
Provides information in concise, understandable, lay terms to patients and families.	○	○	○	○	○	○
Demonstrates caring and compassion in interactions with patients and families.	○	○	○	○	○	○
Makes accurate, legible, requisitions for tests ordered for each patient.	○	○	○	○	○	○
Learns to use an electronic medical record, where relevant.	○	○	○	○	○	○

HEALTH ADVOCATE

		Fail		Pass		
	NA	1	2	3	4	5
Lists risk factors and prevention strategies for common neurological conditions, including headache, stroke, back pain, and neuropathy.	○	○	○	○	○	○
Appropriately allocates finite resources such as urgent MRI slots or electrophysiology studies.	○	○	○	○	○	○

COLLABORATOR

		Fail		Pass		
	NA	1	2	3	4	5
Works collaboratively with clinic staff.	○	○	○	○	○	○
Demonstrates appropriate communication with allied health care professionals and other specialists by conducting appropriate phone consultations and/or providing written consultations to these professionals for patients that need additional referrals from the community.	○	○	○	○	○	○

MANAGER

		Fail		Pass		
	NA	1	2	3	4	5
Recognizes that timely completion of forms on behalf of patients is a required component of patient care.	○	○	○	○	○	○
Uses time efficiently to ensure there is sufficient time to complete consultations, organize investigations, and dictate consultation letters.for patients that need additional referrals from the community.	○	○	○	○	○	○

	Fail		Pass		
	1	2	3	4	5
OVERALL PERFORMANCE	○	○	○	○	○

*Please describe outstanding performance, failures, or difficulties:

Other Comments:

Did the trainee respond to feedback by altering behavior/making appropriate changes (Mandatory):

- ○ No
- ○ Sometimes
- ○ Yes

The following will be displayed on forms where feedback is enabled...
(for the evaluator to answer...)

*Did you have an opportunity to meet with this trainee to discuss their performance?

- ○ Yes
- ○ No

(for the evaluee to answer...)

*Did you have an opportunity to discuss your performance with your preceptor/supervisor?

- ○ Yes
- ○ No

*I agree with this performance evaluation!

- ○ Yes
- ○ No

Please enter any comments you have(if any) on this evaluation.

University of Calgary
Neurology (Adult)

Evaluated By : evaluator's name
Evaluating : person (role) or moment's name (if applicable)
Dates : start date to end date

* indicates a mandatory response

Mixed Ambulatory Rotation Daily Encounter Form

Daily Encounter forms should be completed by your preceptor at the end of your clinic a minimum of five clinics per week of ambulatory clinic rotations. These will then be collated to create your ITER. It is the residents' responsibility to sit down briefly with the staff to complete this document at the end of a clinic.

This task will be made much easier if the staff is able to take a few minutes per case to directly observe your clinical work.

1 = Does not meet any of the expectations
2 = Only meets some expectations, but is performing below expected level for level of training
3 = Meets expectations for level of training
4 = Sometimes exceeds expectations for level of training
5 = Outstanding performance

Medical Expert

Objective

		Fail		Pass		
	N/A	1	2	3	4	5
Correctly localizes the lesion	○	○	○	○	○	○
Generates an appropriate differential diagnosis	○	○	○	○	○	○
Can describe the pathophysiology of most likely diagnoses	○	○	○	○	○	○
Performs a complete, organized neurological examination.	○	○	○	○	○	○

Professional

Objective

		Fail		Pass		
	N/A	1	2	3	4	5
Professional comportment	○	○	○	○	○	○
Admits openly to omissions & errors	○	○	○	○	○	○
Recognizes limitations	○	○	○	○	○	○
Arrives on time for clinic & stayed until work was done (including dictations)	○	○	○	○	○	○

Manager

Objective

		Fail		Pass		
	N/A	1	2	3	4	5
Completes necessary paperwork relevant to the clinic	○	○	○	○	○	○

		Fail		Pass		
	N/A	1	2	3	4	5
Completes a new consult in appropriate time for level of training (PGY 1-2, 90 minutes, PGY 3-5 1hr15 min)	○	○	○	○	○	○

Scholar

Objective

		Fail		Pass		
	N/A	1	2	3	4	5
Asks relevant questions	○	○	○	○	○	○
Demonstrates some knowledge of relevant literature & basic science	○	○	○	○	○	○
Teaches when junior learners are present	○	○	○	○	○	○

Collaborator

Objective

		Fail		Pass		
	N/A	1	2	3	4	5
Treats administrative and allied health staff with respect, and carefully considers their input	○	○	○	○	○	○

Health Advocate

Objective

		Fail		Pass		
	N/A	1	2	3	4	5
Identifies and addresses risk factors for neurological diseases with patients/families	○	○	○	○	○	○
Can identify relevant social determinants of health that impact at least one patient in a clinic	○	○	○	○	○	○
Can list a community resource available for patients seen	○	○	○	○	○	○

Keep Doing:

Work on:

Did you complete this assessment face-to-face with your preceptor?

○ No
○ Yes

Do you agree with this assessment?

○ No
○ Yes

Resident Comment (optional):

The following will be displayed on forms where feedback is enabled...
(for the evaluator to answer...)

*Did you have an opportunity to meet with this trainee to discuss their performance?
- Yes
- No

(for the evaluee to answer...)

*Did you have an opportunity to discuss your performance with your preceptor/supervisor?
- Yes
- No

*I agree with this performance evaluation!
- Yes
- No

Please enter any comments you have(if any) on this evaluation.

University of Calgary
Neurology (Adult)

Evaluated By :evaluator's name
Evaluating :person (role) or moment's name (if applicable)
Dates :start date to end date

* indicates a mandatory response

In-Training Evaluation Report
Stroke Unit 100-111-112 Rotation

Ratings:

N/A= not assessed
1=completely fails to meet objective for PGY-level
2=fails to meet objective for level, but does meet in part
3=meets objective for PGY-level
4=Exceeds objective for PGY-level
5=Exceeds objective routinely and consistently performs at consultant level

MEDICAL EXPERT

		Fail		Pass		
	NA	1	2	3	4	5
Localizes the neurologic deficits in non-acute stroke presentations.	○	○	○	○	○	○
Describes the presentation and pathophysiology of lacunar syndromes.	○	○	○	○	○	○
Describes the major etiologies for ischemic and hemorrhagic strokes.	○	○	○	○	○	○
Lists and describes the clinical presentations of recognized brainstem syndromes (e.g. Weber, Wallenberg, Claude, etc).	○	○	○	○	○	○
Interprets some CT, angiographic and MRI findings in acute and non-acute ischemic and hemorrhagic stroke.	○	○	○	○	○	○
Describes current best evidence for primary and secondary prevention of stroke.	○	○	○	○	○	○

SCHOLAR

		Fail		Pass		
	NA	1	2	3	4	5
Efficiently accesses the medical literature to answer clinical questions about post-stroke care in an evidence-based fashion.	○	○	○	○	○	○

PROFESSIONAL

		Fail		Pass		
	NA	1	2	3	4	5
Describes the ethical considerations in end-of-life decision making in patients with stroke.	○	○	○	○	○	○
Describes the ethical considerations in obtaining informed consent for TPa in the setting of acute stroke.	○	○	○	○	○	○

COMMUNICATOR

		Fail		Pass		
	NA	1	2	3	4	5
Synthesizes and presents the history and pertinent exam findings for patients with non-acute stroke to the stroke fellow or staff on call, including describing how they would localize the findings, and initiate management of the patient in hospital.	○	○	○	○	○	○

		Fail		Pass		
	NA	1	2	3	4	5
Explains the diagnosis and management plans to patients and families in a caring and compassionate manner.	○	○	○	○	○	○
Explains diagnosis, investigations and management plans to patients and families in language that is easily understood, with a minimum of medical jargon.	○	○	○	○	○	○

HEALTH ADVOCATE

		Fail		Pass		
	NA	1	2	3	4	5
Describes current best evidence for primary and secondary prevention of stroke.	○	○	○	○	○	○
Lists the evidence for known risk factors for stroke.	○	○	○	○	○	○
Lists the varied community resources available to patients and families after they have suffered a stroke.	○	○	○	○	○	○
Participates in securing community resources as needed for stroke patients transitioning out of hospital. This would include completion of long term care applications, and referrals for outpatient services, including driving assessments and rehab.	○	○	○	○	○	○
Identifies at-risk populations using the principles of social determinants of health, including those who might be at risk because of social or economic factors that might limit access to care for primary or secondary prevention of stroke.	○	○	○	○	○	○
Discusses smoking cessation with patients and families as a means of secondary prevention.	○	○	○	○	○	○

COLLABORATOR

		Fail		Pass		
	NA	1	2	3	4	5
Participates in multidisciplinary rounds to present patients that they are primarily responsible for.	○	○	○	○	○	○
Interacts with allied health professionals to determine appropriate recommendations for rehabilitation, placement, transfer, and community care of stroke patients.	○	○	○	○	○	○
Appropriately involves nurses, transition services, physio, occupational and speech language pathologists in the management of patients on the stroke unit.	○	○	○	○	○	○
Collaborates in a respectful manner with the nurse practitioner, bedside nurses, and fellows in order to triage pressing and routine work involved in the care of stroke patients on Unit 100.	○	○	○	○	○	○

MANAGER

		Fail		Pass		
	NA	1	2	3	4	5
Demonstrates leadership in decision making in the management of assigned post-stroke patients on Unit 100.	○	○	○	○	○	○
Manages time effectively such that urgent duties are prioritized in the care of assigned patients, and all work is effectively completed at the end of each day on the service.	○	○	○	○	○	○

	Fail		Pass		
	1	2	3	4	5
OVERALL PERFORMANCE	○	○	○	○	○

*Please describe outstanding performance, failures, or difficulties:

Other Comments:

*Did the trainee respond to feedback by altering behaviour/making appropriate changes (Mandatory):

- ○ No
- ○ Sometimes
- ○ Yes

The following will be displayed on forms where feedback is enabled...
(for the evaluator to answer...)

*Did you have an opportunity to meet with this trainee to discuss their performance?

- ○ Yes
- ○ No

(for the evaluee to answer...)

*Did you have an opportunity to discuss your performance with your preceptor/supervisor?

- ○ Yes
- ○ No

*I agree with this performance evaluation!

- ○ Yes
- ○ No

Please enter any comments you have(if any) on this evaluation.

University of Calgary
Neurology (Adult)

Evaluated By :evaluator's name
Evaluating :person (role) or moment's name (if applicable)
Dates :start date to end date

* indicates a mandatory response

In-Training Evaluation Report
Stroke Night Float Rotation

Ratings:
N/A= not assessed
1=completely fails to meet objective for PGY-level
2=fails to meet objective for level, but does meet in part
3=meets objective for PGY-level
4=Exceeds objective for PGY-level
5=Exceeds objective routinely and consistently performs at consultant level

MEDICAL EXPERT

		Fail		Pass		
	NA	1	2	3	4	5
Localizes the neurologic deficits in acute stroke presentations.	○	○	○	○	○	○
Describes the presentation and pathophysiology of lacunar syndromes.	○	○	○	○	○	○
Lists a broad differential diagnosis for acute stroke mimics seen in the ER.	○	○	○	○	○	○
Describes the major etiologies for ischemic and hemorrhagic strokes.	○	○	○	○	○	○
Lists and describes the clinical presentations of recognized brainstem syndromes (e.g. Weber, Wallenberg, Claude, etc).	○	○	○	○	○	○
Interprets some CT, angiographic and MRI findings in acute and non-acute ischemic and hemorrhagic stroke.	○	○	○	○	○	○
Describes current best evidence for primary and secondary prevention of stroke.	○	○	○	○	○	○

SCHOLAR

		Fail		Pass		
	NA	1	2	3	4	5
Efficiently accesses the medical literature to answer clinical questions about post-stroke care in an evidence-based fashion.	○	○	○	○	○	○

PROFESSIONAL

		Fail		Pass		
	NA	1	2	3	4	5
Describes the ethical considerations in end-of-life decision making in patients with stroke.	○	○	○	○	○	○
Describes the ethical considerations in obtaining informed consent for TPa in the setting of acute stroke.	○	○	○	○	○	○

COMMUNICATOR

		Fail		Pass		
	NA	1	2	3	4	5
Rapidly synthesizes and presents the history and pertinent exam findings for patients with acute stroke to the stroke fellow or staff on call, including describing how they would localize the findings, and initiate management of the patient.	○	○	○	○	○	○

		Fail		Pass		
	NA	1	2	3	4	5
Explains the diagnosis and management plans to patients and families in a concise, caring and compassionate manner.	○	○	○	○	○	○
Explains diagnosis, investigations and management plans to patients and families in language that is easily understood, with a minimum of medical jargon.	○	○	○	○	○	○

HEALTH ADVOCATE

		Fail		Pass		
	NA	1	2	3	4	5
Describes current best evidence for primary and secondary prevention of stroke.	○	○	○	○	○	○
Lists the evidence for known risk factors for stroke.	○	○	○	○	○	○
Lists the varied community resources available to patients and families after they have suffered a stroke.	○	○	○	○	○	○
Participates in securing community resources as needed for stroke patients transitioning out of hospital. This would include completion of long term care applications, referrals for outpatient services, as well as driving assessments and rehab.	○	○	○	○	○	○
Identifies at-risk populations using the principles of social determinants of health, including those who might be at risk because of social or economic factors that might limit access to care for primary or secondary prevention of stroke.	○	○	○	○	○	○
Discusses smoking cessation with patients and families as a means of secondary prevention.	○	○	○	○	○	○

COLLABORATOR

		Fail		Pass		
	NA	1	2	3	4	5
Interacts with out-of hospital physicians, ER nurses and physicians, and other allied health professionals to assess and investigate acute stroke patients emergently.	○	○	○	○	○	○
Collaborates in a respectful manner with the nurse practitioner, bedside nurses, and fellows in order to triage pressing and routine work involved in the care of acute stroke patients.	○	○	○	○	○	○

MANAGER

		Fail		Pass		
	NA	1	2	3	4	5
Manages time effectively such that urgent duties are prioritized in the care of assigned patients, and all work is effectively completed at the end of each night on the service.	○	○	○	○	○	○

	Fail		Pass		
	1	2	3	4	5
OVERALL PERFORMANCE	○	○	○	○	○

*Please describe outstanding performance, failures, or difficulties:

Other Comments:

*Did the trainee respond to feedback by altering behavior/making appropriate changes (Mandatory):

- ○ No
- ○ Sometimes
- ○ Yes

The following will be displayed on forms where feedback is enabled...
(for the evaluator to answer...)

*Did you have an opportunity to meet with this trainee to discuss their performance?

- ○ Yes
- ○ No

(for the evaluee to answer...)

*Did you have an opportunity to discuss your performance with your preceptor/supervisor?

- ○ Yes
- ○ No

*I agree with this performance evaluation!

- ○ Yes
- ○ No

Please enter any comments you have(if any) on this evaluation.

APPENDIX C: Survey Form

Development of a Competency-Based "Boot Camp" Curriculum for the PGY-1 Neurology Residents

a. Please answer the following questions to generate an anonymous ID (only to avoid data duplication).		
What is your city of birth (first and second letter)?		
What is your birthdate (day of the month)?		
What is your mother's first name (first and second letter)?		
What is your father's first name (first and second letter)?		

b. What is your current position (please check one):		
☐ Neurology Resident If checked, then complete Resident section below.	☐ Neurologist / Fellow If checked, then complete Neurologist / Fellow section below.	☐ Nurse Leader/Educator If checked, then complete Nurse Leader/Educator section below.

c1- Resident section

c1-a. Level of training: (Please check one)

☐ PGY-1	☐ PGY-2	☐ PGY-3	☐ PGY-4	☐ PGY-5

c1-b. Do you think a Neurology Boot Camp Curriculum is needed for the PGY1 Neurology Residents? (Please check only one answer)

☐ Yes ☐ No ☐ Unsure Why? _____

c1-c. How much time would you be willing to spend in a Boot Camp "not necessarily all at once" if you were starting PGY-1? (Please check one)

☐ 1 day	☐ 2 days	☐ 3 days	☐ 4 days	☐ 5 days	☐ 6 days	☐ 7 days	☐ Other: _____

c1-d. What would be the best format for the Boot Camp curriculum? (Please check one)

☐ Continuous full days sessions (all at once)	☐ Discrete half days sessions (spread over multiple weeks)	☐ Weekend sessions
☐ Online modules	☐ Other:	

c2- Neurologist / Fellow section

c2-a. Years in practice: (Please check one)

☐ < 1 year	☐ 1-3 years	☐ 4-10 years	☐ 11-20 years	☐ >20 years

c2-b. Are you currently a member of the residency training committee? (Please check one)

☐ Yes ☐ No (If Yes, for how many years?):

c2-c. Do you think a Neurology Boot Camp Curriculum is needed for the PGY1 Neurology Residents? (Please check only one answer)

☐ Yes ☐ No ☐ Unsure Why? _____

c2-d. How many days in total "not necessarily all at once" is reasonable to allow the residents to be away from clinical duties to participate in the Boot Camp? (Please check only one answer)

☐ 1 day	☐ 2 days	☐ 3 days	☐ 4 days	☐ 5 days	☐ 6 days	☐ 7 days	☐ Other: _____

c2-e. What would be the best format for the Boot Camp curriculum? (Please check one)

☐ Continuous full days sessions (all at once)	☐ Discrete half days sessions (spread over multiple weeks)	☐ Weekend sessions
☐ Online modules	☐ Other:	

c3- Nurse Leader/Educator section

c3-a. Years in practice: (Please check one)

☐ < 1 year	☐ 1-3 years	☐ 4-10 years	☐ 11-20 years	☐ >20 years

c3-b. Do you think a Neurology Boot Camp Curriculum is needed for the PGY1 Neurology Residents? (Please check only one answer)

☐ Yes ☐ No ☐ Unsure Why? _____

c3-c. How many days in total "not necessarily all at once" is reasonable to allow the residents to be away from clinical duties to participate in the Boot Camp? (Please check only one answer)

☐ 1 day	☐ 2 days	☐ 3 days	☐ 4 days	☐ 5 days	☐ 6 days	☐ 7 days	☐ Other: _____

c. Boot Camp curriculum content and teaching strategies:

d1- Neurological Emergencies:

d1-a. Please rate your perception on the level of the <u>importance and frequency*</u> of each of following items related to **Neurological Emergencies** to help us prioritize the Boot Camp content for the PGY-1 Neurology Resident:

	Importance					**Frequency**				
	1	2	3	4	5	1	2	3	4	5
1. Acute ischemic stroke	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2. Acute intracerebral hemorrhage	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3. Coma	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. Increased intracranial pressure and herniation syndromes	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5. Status epilepticus	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6. Subarachnoid hemorrhage and other causes of thunderclap headache	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7. Anoxic ischemic encephalopathy	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8. Traumatic brain injury	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
9. Acute myelopathy	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
10. Neuromuscular emergencies (e.g. AIDP/GBS, MG)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
11. Acute hyperthermic syndromes	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
12. Acute demyelinating event	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
13. Acute dystonic reaction	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
14. Acute vertigo	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
15. Neuro-ophthalmological emergencies	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
16. Delirium	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
17. CNS infection (meningitis, encephalitis)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
18. Pain crises	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
19. CNS intoxication	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

d1-b. What is your preferred teaching method(s) for the **Neurological Emergencies** section in the Boot Camp curriculum? (You can check more than one)

☐ Simulation	☐ Small group discussion	☐ Didactic lecture
☐ Problem based learning	☐ Standardized patient encounter	☐ E-learning
☐ Other:		

d2- Clinical and Procedural Skills:

d2-a. Please rate your perception on the level of the <u>importance and frequency*</u> of each of following items related to **Clinical and Procedural Skills** to help us prioritize the Boot Camp content for the PGY-1 Neurology Resident:

	Importance					**Frequency**				
	1	2	3	4	5	1	2	3	4	5
20. Taking neurological history	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
21. Performing neurological exam	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
22. Basic interpretation of radiographic images of the CNS (CT, MRI)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
23. Performing lumbar puncture	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
24. Basics of neurological localization	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
25. Basic interpretation of laboratory studies (e.g. blood, urine, CSF studies, etc.)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
26. Dealing with ward issues (electrolyte disturbance, UTI, falls,,..etc)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

d2-b. What is your preferred teaching method(s) for the **Clinical and Procedural Skills** section in the Boot Camp curriculum? (You can check more than one)

☐ Simulation	☐ Small group discussion	☐ Didactic lecture
☐ Problem based learning	☐ Standardized patient encounter	☐ E-learning
☐ Other:		

d3- Communication and Interpersonal Skills:

d3-a. Please rate your perception on the level of the importance and frequency* of each of following items related to **Communication and Interpersonal Skills** to help us prioritize the Boot Camp content for the PGY-1 Neurology Resident:

	Importance					**Frequency**				
	1	2	3	4	5	1	2	3	4	5
27. Conflict management.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
28. How to obtain informed consent	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
29. How to break bad news	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
30. How to disclose a medical error	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
31. How to prepare a good PowerPoint presentation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
32. How to write an appropriate consultation letter	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
33. How to present a case to your attending.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
34. How to communicate with ward nursing staff around sick patient	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
35. Handover skills	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

d3-b. What is your preferred teaching method(s) for the **Communication and Interpersonal Skills** section in the Boot Camp curriculum? (You can check more than one)

☐ Simulation	☐ Small group discussion	☐ Didactic lecture
☐ Problem based learning	☐ Standardized patient encounter	☐ E-learning
☐ Other:		

e. Please suggest other topics which you think should be included in the Boot Camp Curriculum for the PGY-1 Neurology Residents:

_____

_____

*Rating Scales and Definition:

	Importance	Frequency
Definition	How critical do you believe this problem/skill is for neurology residents to be mastered during their first year of residency?	How often are the neurology residents likely to encounter this problem/skill during their first year of residency?
1	Not at all important	Less than once per year
2	Somewhat important	Once to few times per year
3	Neutral	Once per month
4	Important	Once per week
5	Very important	More than once per week

APPENDIX D: Survey Invitation Letter

UNIVERSITY OF CALGARY

SURVEY Invitation Letter

Dear Colleague:
I am writing to request your participation in this electronic survey for Development of a Competency-Based "Boot Camp" Curriculum for the PGY-1 Neurology Residents, which will be part of Dr. Seraj Makkawi's Master Thesis in Medical Education.

As you know, there is significant stress and sense of insecurity in the transition from being a medical student to a first-year resident. Once the residency begins, the overwhelming number of responsibilities placed on the resident often makes learning new knowledge and skills more difficult. Boot camp training early in the curriculum has the potential to enhance residents' confidence, competency, and stress hardiness in managing their patients. However, to the researchers' knowledge, a neurology boot camp curriculum has not been formally developed. This study is designed to obtain your input so that we can design a high-quality boot camp experience for first-year residents in neurology.

Your participation in this survey is completely voluntary and all of your responses are anonymous. None of the responses will be connected to identifying information.
The survey will take about 10-15 minutes to complete.

To participate, please click on the following link:
https://www.surveymonkey.com/r/Neurology-bootcamp

Note: The online survey is being administered by Survey Monkey©, an American Software Company. As such, your responses are subject to U.S. laws, including the USA Patriot Act. The risks associated with participation are minimal, however, and similar to those associated with many e--mail programs, such as Hotmail© and social utilities spaces, such as Facebook©.

If you have any questions about this survey, or difficulty in accessing the site or completing the survey, please contact Dr. Seraj Makkawi (email:), Dr. Lara Cooke (email:), or Dr. Michael Yeung (email:)
The University of Calgary Conjoint Health Research Ethics Board has approved this research study. Ethics ID number (REB14-1835)
Thank you in advance for your participation.

Sincerely,
Dr. Lara Cooke, MD, MSc (Med Ed), FRCPC (Neurology)
Dr. Michael Yeung, MD, FRCPC (Neurology)

APPENDIX E: Consensus Meeting Invitation Letter

UNIVERSITY OF CALGARY

Consensus Meeting Invitation Letter

Dear Colleague:

I am writing to request your participation in the consensus meeting on **mmm dd, yyyy** for Development of a Competency-Based "Boot Camp" Curriculum for the PGY-1 Neurology Residents, which will be part of Dr. Seraj Makkawi's Master Thesis in Medical Education. This meeting will be conducted during the monthly scheduled Adult Neurology Residency Training Program Committee (ANRPC) meeting.

As you know, there is significant stress and sense of insecurity in the transition from being a medical student to a first-year resident. Once the residency begins, the overwhelming number of responsibilities placed on the resident often makes learning new knowledge and skills more difficult. Boot camp training early in the curriculum has the potential to enhance residents' confidence, competency, and stress hardiness in managing their patients. However, to the researchers' knowledge, a neurology boot camp curriculum has not been formally developed. This study is designed to obtain your input so that we can design a high-quality boot camp experience for first-year residents in neurology.

Your participation in this consensus meeting is completely voluntary and all of your responses are anonymous. None of the responses will be connected to identifying information.
The consensus meeting will take about 30 minutes.

If you have any questions about this meeting please contact Dr. Seraj Makkawi (email:), Dr. Lara Cooke (email:), or Dr. Michael Yeung (email:)

The University of Calgary Conjoint Health Research Ethics Board has approved this research study. Ethics ID number (REB14-1835)
Thank you in advance for your participation.

Sincerely,
Dr. Lara Cooke, MD, MSc (Med Ed), FRCPC (Neurology)
Dr. Michael Yeung, MD, FRCPC (Neurology)

APPENDIX F: Survey Informed Consent Form

UNIVERSITY OF CALGARY

SURVEY CONSENT FORM

TITLE: Development of a Competency-Based "Boot Camp" Curriculum for the PGY-1 Neurology Residents.

SPONSOR: Not Applicable.

INVESTIGATORS: Dr. Lara Cooke, Dr. Seraj Makkawi, Dr. Michael Yeung, and Dr. Alexandra Harrison.

Main phone contact:

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the proposed study. This consent form describes the procedures, benefits, risks and discomforts of the study. It also describes your right to withdraw from the study at any time. This consent form is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more details about what is mentioned here or information that is not included here, please ask. Take the time to read this carefully and to understand any accompanying information.

BACKGROUND

There is significant stress and sense of insecurity in the transition from being a medical student to a first-year resident. Once the residency begins, the overwhelming number of responsibilities placed on the resident often makes learning new knowledge and skills more difficult. Boot camp training early in the curriculum has the potential to enhance residents' confidence, competency, and stress hardiness in managing their patients. However, to the researchers' knowledge, a neurology boot camp curriculum has not been formally developed. This study is designed to obtain your input so that we can design a high-quality boot camp experience for first-year residents in neurology.

WHAT IS THE PURPOSE OF THE STUDY?

Our goal is to develop a competency-based boot camp curriculum for the PGY-1 neurology residents based upon a targeted needs assessment. Our objective is to determine the subjective learning needs for the boot camp curriculum for the PGY-1 neurology residents by conducting a needs assessment survey of the learners (i.e. neurology residents) and the learners' observers (i.e. staff neurologists and nurse leaders/educators).

WHAT WOULD I HAVE TO DO?

As a participant in the study, you will be invited to complete an online anonymous survey. You will be asked to rate your perception on the importance and frequency of each item on a 5-point Likert scale for several items that could be included in a boot camp curriculum for PGY-1 neurology residents. Additionally, you will be asked few questions regarding the possible duration and teaching strategies for the Boot Camp Curriculum. In order to avoid duplication, there will be self-generated anonymized identification questions. The survey should take about 10-15 minutes to fill out.

WHAT ARE THE RISKS?

There are no risks or consequences to you in participating in this study. The data you provide us will be kept confidential and will not be used for a formal evaluation. The final developed curriculum will not be implemented on you as part of this study.

WILL I BENEFIT IF I TAKE PART?

If you participate in this study, there may or may not be a direct benefit to you. By taking part in this study, you will get an opportunity to provide information regarding topics that you believe they should be included in a boot camp curriculum for PGY-1 neurology residents. Thus, your responses are highly appreciated and could provide the basis of such a Boot Camp, helping future incoming PGY-1 Neurology residents in their transition from medical schools and possibly having a "safer July."

DO I HAVE TO PARTICIPATE?

Voluntariness and Withdrawal of consent

Your participation in this study is strictly voluntary and you may withdraw from the study at any time without consequences. No one will know who has or has not participated in the study. If you choose to participate in the questionnaire assessments, you may end your participation at any time before submitting the online survey without any need to contact the research team. Completion of the electronic survey will be taken as implied consent for your participation in our study. Afterward, you can contact the research team directly through email to withdraw the consent by providing the self-generated anonymized identification code. Data withdrawal from the online survey can be only done up to one week after the deadline of the survey. Data withdrawal can be limited if you were unable to provide the self-generated anonymized identification code.

WHAT ELSE DOES MY PARTICIPATION INVOLVE?

You will be asked to complete an online survey about your perception of the importance and frequency for several items that could be included in a boot camp curriculum for PGY-1 neurology residents. It will take you about 10-15 minutes to fill the survey.

WILL I BE PAID FOR PARTICIPATING, OR DO I HAVE TO PAY FOR ANYTHING?

Your participation is highly appreciated but you will not be paid or have to pay to participate in this study. The USB flash drive is our gift to you as appreciation for participation in our survey.

WILL MY RECORDS BE KEPT PRIVATE?

The online survey is being administered by Survey Monkey©, an American Software Company. As such, your responses are subject to U.S. laws, including the USA Patriot Act. The risks associated with participation are minimal, however, and similar to those associated with many e--mail programs, such as Hotmail© and social utilities spaces, such as Facebook©.
Adequate safeguards have been put in place to protect your privacy of any personal information obtained from you in this study. We will store your data anonymously (i.e., stripped of any personal identifying information) in a password-protected and encrypted computer. Only the data analyst will have access to your contact information, which will not be tied to any of your responses. No individual information will be disclosed to anyone else. All the collected data will be anonymous without any identifying information, and only aggregate data will be presented.

The University of Calgary Conjoint Health Research Ethics Board will have access to the records.

No direct or indirect harm is foreseen for the study subjects regarding confidentiality because there will not be any connection of your identity to your specific contribution to the research.

CONSENT

Your participation and completion in our online survey will be taken as implied consent indicating that you have understood to your satisfaction the information regarding your participation in the research project and agreement to participate as a subject. In no way does this waive your legal rights nor release the investigators or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time. If you have further questions concerning matters related to this research, please contact:

Dr. Seraj Makkawi

Or

Dr. Lara Cooke

Or

Dr. Michael Yeung

If you have any questions concerning your rights as a possible participant in this research, please contact the Chair, Conjoint Health Research Ethics Board, University of Calgary at 403-220-7990.

The University of Calgary Conjoint Health Research Ethics Board has approved this research study.

APPENDIX G: Consensus Meeting Informed Consent Form

UNIVERSITY OF CALGARY

CONSENSUS MEETING CONSENT FORM

TITLE: Development of a Competency-Based "Boot Camp" Curriculum for the PGY-1 Neurology Residents.

SPONSOR: Not Applicable.

INVESTIGATORS: Dr. Lara Cooke, Dr. Seraj Makkawi, Dr. Michael Yeung, and Dr. Alexandra Harrison.

Main phone contact:

This consent form is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, please ask. Take the time to read this carefully and to understand any accompanying information. You will receive a copy of this form.

BACKGROUND

There is significant stress and sense of insecurity in the transition from being a medical student to a first-year resident. Once the residency begins, the overwhelming number of responsibilities placed on the resident often makes learning new knowledge and skills more difficult. Boot camp training early in the curriculum has the potential to enhance residents' confidence, competency, and stress hardiness in managing their patients. However, to the researchers' knowledge, a neurology boot camp curriculum has not been formally developed. This study is designed to obtain your input so that we can design a high-quality boot camp experience for first-year residents in neurology.

WHAT IS THE PURPOSE OF THE STUDY?

Our goal is to develop a competency-based boot camp curriculum for the PGY-1 neurology residents based upon a targeted needs assessment. Our objective is to integrate the subjective and objective learning needs to build a consensus on the content and structure of the boot camp curriculum for the PGY-1 neurology residents by conducting a consensus meeting with the University of Calgary Adult Neurology Residency Training Program Committee (ANRPC).

WHAT WOULD I HAVE TO DO?

As a participant in the study, you will be invited to participate in a voluntary consensus meeting, which will be scheduled during one of the monthly ANRPC meetings. At the beginning of the meeting, the results from reviewing the in-training evaluation reports (ITERs) of the neurology rotations for the PGY-1 neurology residents at the University of Calgary over the last five years and the previously distributed surveys will be presented. This will include the suggested duration, format, teaching methods, and the highest ranked topics, with the proposed curriculum agenda. Based on the provided information, you will be asked with the other committee members to reach a consensus on the final agenda of the boot camp curriculum for PGY-1 neurology residents. The consensus meeting should take about 30 minutes to complete.

WHAT ARE THE RISKS?

There are no risks or consequences to you in participating in this study. The data you provide us will be kept confidential and will not be used for a formal evaluation. The final developed curriculum will not be implemented on you as part of this study.

WILL I BENEFIT IF I TAKE PART?

If you participate in this study, there may or may not be a direct benefit to you. By taking part in this study, you will get an opportunity to provide your opinion regarding topics that you believe they should be integrated in a boot camp curriculum for PGY-1 neurology residents based on the provided information. Thus, your responses are highly appreciated and could provide the basis of such a Boot Camp, helping future incoming PGY-1 Neurology residents in their transition from medical schools and possibly having a "safer July."

DO I HAVE TO PARTICIPATE?

Voluntariness and Withdrawal of consent

Your participation in this study is strictly voluntary and you may withdraw from the study at any time before or during the consensus meeting without any consequences. Afterward, data withdrawal from the consensus meeting is not possible, as the data will be pooled during the meeting without any identifying information of the comment's provider.

WHAT ELSE DOES MY PARTICIPATION INVOLVE?

You will be asked to provide comments on the provided information and finally to reach a consensus with the other ANRPC members on the final agenda of the boot camp curriculum for PGY-1 neurology residents. It will take you about 30 minutes to conduct this meeting.

WILL I BE PAID FOR PARTICIPATING, OR DO I HAVE TO PAY FOR ANYTHING?

Your participation is highly appreciated but you will not be paid or have to pay to participate in this study.

WILL MY RECORDS BE KEPT PRIVATE?

You will not be individually identified as a subject participant in this study in any reports or publications of this research. Although the researchers will know who you are during the consensus meeting, your name will not be recorded with any of your responses. The meeting will not be audio or video taped. The researchers will be taking notes during the meeting without any identifying information of the comment's provider. Only the data analyst will have access to your contact information, which will not be tied to any of your responses. No individual information will be disclosed to anyone else. All the collected data will be anonymous without any identifying information, and only aggregate data will be presented.
The University of Calgary Conjoint Health Research Ethics Board will have access to the records.
No direct or indirect harm is foreseen for the study subjects regarding confidentiality because there will not be any connection of your identity to your specific contribution to the research.

SIGNATURES

Your signature on this form indicates that you have understood to your satisfaction the information regarding your participation in the research project and agree to participate as a participant. In no way does this waive your legal rights nor release the investigators or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time without any consequences. If you have further questions concerning matters related to this research, please contact:

Dr. Seraj Makkawi
Or
Dr. Lara Cooke
Or
Dr. Michael Yeung

If you have any questions concerning your rights as a possible participant in this research, please contact the Chair, Conjoint Health Research Ethics Board, University of Calgary at 403-220-7990.

Participant's Name	Signature and Date
Investigator/Delegate's Name	Signature and Date
Witness' Name	Signature and Date

The University of Calgary Conjoint Health Research Ethics Board has approved this research study. A copy of this consent form has been given to you to keep for your records and reference.

APPENDIX H: Results of ITERs Analysis for Neurology Consult, Stroke Unit, Stroke Night Float, and Mixed Ambulatory Neurology Clinics

Table 43: Neurology Consult ITERs in Ascending Order By Mean Score

Order	Item	N	Min	Max	Mean (SD)
1	Identifies first and second line interventions for common neurological presentations.	44	3	5	4.02 (0.55)
2	Demonstrates an approach to the inpatient with a movement disorder	27	3	5	4.04 (0.52)
3	Appropriately orders investigations, recognizing that resources are finite (e.g. MRI, angiograms, EEG, EMG).	45	3	5	4.04 (0.64
4	Should be able to effectively deliver recommendations to the primary care provider in person	39	3	5	4.05 (0.61)
5	Manages multiple tasks that are ongoing throughout the week, including following up on multiple investigations for longstanding inpatients and complex cases.	40	3	5	4.07 (0.62)
6	Demonstrates an approach to the patient with delirium	36	3	5	4.08 (0.50)
7	Demonstrates an approach to the prognosis in a patient post -cardiac arrest	11	3	5	4.09 (0.54)
8	Recognizes limitations and asks for help appropriately.	44	3	5	4.09 (0.60)
9	Can perform a full consultation on a complex inpatient in approximately 90 minutes, including collateral history, review of old charts, and writing a detailed consultation note.	45	3	5	4.11 (0.61)
10	Generates written consultation notes which are legible, clearly communicate an impression and plan, clarify who is responsible for carrying out these recommendations	43	3	5	4.12 (0.63)
11	Often searches for and identifies best evidence for clinical questions that arise in daily practice	42	3	5	4.12 (0.55)
12	Appropriately identifies when additional help is warranted from other professionals, including other specialties, rehab services, transition services, social work, etc.	42	3	5	4.12 (0.63)
13	Can list risk factors and prevention strategies for common neurological conditions, including stroke and delirium	40	3	5	4.13 (0.46)
14	Should be able to effectively deliver recommendations to the primary care provider in person	39	3	5	4.13 (0.57)

15	Demonstrates good judgment in selecting appropriate investigations and disposition for the patient at the end of the consultation.	45	3	5	4.13 (0.59)
16	Includes a clear impression and recommendations with consultation notes.	45	3	5	4.13 (0.55)
17	Enlists the help of other services to support patients in returning to the community, or supported housing (e.g. transition, rehab, social work, etc).	30	3	5	4.13 (0.51)
18	Identifies or clarifies the referring physicians' primary question(s) and how they would like it addressed (or degree of involvement)	37	3	5	4.14 (0.59)
19	Demonstrates an appropriate fund of basic science/pathophysiology knowledge for PGY-level	41	3	5	4.15 (0.48)
20	Identifies or clarifies the referring physicians' primary question(s) and how they would like it addressed (or degree of involvement)	40	3	5	4.15 (0.58)
21	Usually localizes symptoms and signs correctly	44	3	5	4.16 (0.65)
22	Effectively establishes therapeutic relationship with patients.	44	3	5	4.16 (0.53)
23	Provides information in concise, understandable, lay terms to patients and families.	41	3	5	4.17 (0.50)
24	Prioritizes competing consultations according to the best interests of patient care, with attention to acuity, urgency, and discharge planning considerations.	41	3	5	4.17 (0.59)
25	Recognizes patients in need of acute/emergent intervention (e.g. status epilepticus, deteriorating LOC, stroke)	34	3	5	4.18 (0.58)
26	Can present a detailed history and physical examination in an organized and comprehensive manner.	45	3	5	4.18 (0.58)
27	Participates in team or family meeting, appropriately orders investigations, recognizing that resources are finite (e.g. MRI, angiograms, EEG, EMG).	28	3	5	4.18 (0.55)
28	Recognizes when it may be more appropriate for the attending physician to communicate with the referring attending.	35	3	5	4.20 (0.53)

29	Ensures that clear sign off and arrangements for follow-up when consultations are complete.	43	3	5	4.21 (0.51)
30	Demonstrates empathy for patients and families.	43	3	5	4.21 (0.56)
31	Takes time to teach medical students and off-service residents in a collegial manner	33	3	5	4.21 (0.60)
32	Efficiently elicits accurate histories from patients and families, including patient perspective and context.	45	3	5	4.22 (0.52)
33	Performs a thorough, accurate neurological examination	45	3	5	4.22 (0.67)
34	Provides a consultation in a timely manner	45	3	5	4.24 (0.57)
35	Acknowledges openly and honestly when errors are made, or omissions are made from the exam, history, or consultation note.	36	4	5	4.25 (0.44)
36	Participates in the preparation of educational rounds	36	3	5	4.25 (0.55)
37	Makes accurate, legible, inclusive chart notes to document clinical encounters.	44	3	5	4.25 (0.58)
38	Asks thoughtful questions about clinical presentations and management of patients	44	3	5	4.25 (0.62)
39	Interacts respectfully with all members of the healthcare team.	43	3	5	4.30 (0.56)
40	Communicates in a respectful and professional manner when receiving a new consultation and when delivering an impression and recommendations	45	3	5	4.31 (0.51)
41	Demonstrates professional behaviour: Polite and respectful of patients and staff	45	3	5	4.44 (0.59)
42	Demonstrates professional behaviour: Seeks out new learning	42	3	5	4.45 (0.55)
43	Demonstrates professional behaviour: Punctual, attends rounds.	43	3	5	4.47 (0.55)
44	Demonstrates professional behaviour: Honest, and shows integrity.	42	4	5	4.50 (0.51)

Table 44: Stroke Unit ITERs in Ascending Order By Mean Score

Order	Item	N	Min	Max	Mean (SD)
1	Describes current best evidence for primary and secondary prevention of stroke.	15	3	5	4.00 (0.76)
2	Efficiently accesses the medical literature to answer clinical questions about post-stroke care in an evidence-based fashion.	16	3	5	4.06 (0.68)
3	Describes current best evidence for primary and secondary prevention of stroke.	16	3	5	4.06 (0.68)
4	Interprets some CT, angiographic and MRI findings in acute and non-acute ischemic and hemorrhagic stroke.	15	3	5	4.07 (0.80)
5	Lists the evidence for known risk factors for stroke.	15	3	5	4.07 (0.70)
6	Localizes the neurologic deficits in non-acute stroke presentations.	16	3	5	4.13 (0.72)
7	Describes the presentation and pathophysiology of lacunar syndromes.	15	3	5	4.13 (0.64)
8	Demonstrates leadership in decision making in the management of assigned post-stroke patients on Unit 100.	15	3	5	4.13 (0.74)
9	Lists the varied community resources available to patients and families after they have suffered a stroke.	13	3	5	4.15 (0.69)
10	Synthesizes and presents the history and pertinent exam findings for patients with non-acute stroke to the stroke fellow or staff on call, including describing how they would localize the findings, and initiate management of the patient in hospital.	16	3	5	4.19 (0.75)
11	Participates in multidisciplinary rounds to present patients that they are primarily responsible for.	16	3	5	4.19 (0.75)
12	Describes the ethical considerations in obtaining informed consent for TPa in the setting of acute stroke.	14	3	5	4.21 (0.80)
13	Lists and describes the clinical presentations of recognized brainstem syndromes (e.g. Weber, Wallenberg, Claude, etc).	14	3	5	4.21 (0.70)
14	Describes the ethical considerations in end-of-life decision making in patients with stroke.	13	3	5	4.23 (0.83)

15	Participates in securing community resources as needed for stroke patients transitioning out of hospital. This would include completion of long term care applications, and referrals for outpatient services, including driving assessments and rehab.	13	3	5	4.23 (0.73)
16	Identifies at-risk populations using the principles of social determinants of health, including those who might be at risk because of social or economic factors that might limit access to care for primary or secondary prevention of stroke.	12	3	5	4.25 (0.75)
17	Explains diagnosis, investigations and management plans to patients and families in language that is easily understood, with a minimum of medical jargon.	16	3	5	4.25 (0.68)
18	Appropriately involves nurses, transition services, physio, occupational and speech language pathologists in the management of patients on the stroke unit.	16	3	5	4.25 (0.78)
19	Describes the major etiologies for ischemic and hemorrhagic strokes.	15	3	5	4.27 (0.70)
20	Explains the diagnosis and management plans to patients and families in a caring and compassionate manner.	15	3	5	4.27 (0.70)
21	Interacts with allied health professionals to determine appropriate recommendations for rehabilitation, placement, transfer, and community care of stroke patients.	16	3	5	4.31 (0.79)
22	Collaborates in a respectful manner with the nurse practitioner, bedside nurses, and fellows in order to triage pressing and routine work involved in the care of stroke patients on Unit 100.	16	3	5	4.31 (0.79)
23	Manages time effectively such that urgent duties are prioritized in the care of assigned patients, and all work is effectively completed at the end of each day on the service.	16	3	5	4.31 (0.79)
24	Discusses smoking cessation with patients and families as a means of secondary prevention.	12	3	5	4.33 (0.78)

Table 45: Stroke Night Float ITERs in Ascending Order By Mean Score

Order	Item	N	Min	Max	Mean (SD)
1	Efficiently accesses the medical literature to answer clinical questions about post-stroke care in an evidence-based fashion.	11	3	5	4.09 (0.54)
2	Lists and describes the clinical presentations of recognized brainstem syndromes (e.g. Weber, Wallenberg, Claude, etc).	10	3	5	4.10 (0.57)
3	Describes the ethical considerations in end-of-life decision making in patients with stroke.	10	3	5	4.10 (0.57)
4	Lists the varied community resources available to patients and families after they have suffered a stroke.	10	3	5	4.10 (0.57)
5	Participates in securing community resources as needed for stroke patients transitioning out of hospital. This would include completion of long term care applications, referrals for outpatient services, as well as driving assessments and rehab.	10	3	5	4.10 (0.57)
6	Identifies at-risk populations using the principles of social determinants of health, including those who might be at risk because of social or economic factors that might limit access to care for primary or secondary prevention of stroke.	10	3	5	4.10 (0.57)
7	Describes current best evidence for primary and secondary prevention of stroke.	12	3	5	4.17 (0.58)
8	Manages time effectively such that urgent duties are prioritized in the care of assigned patients, and all work is effectively completed at the end of each night on the service.	12	3	5	4.17 (0.58)
9	Describes the ethical considerations in obtaining informed consent for TPa in the setting of acute stroke.	11	3	5	4.18 (0.60)
10	Explains the diagnosis and management plans to patients and families in a concise, caring and compassionate manner.	11	3	5	4.18 (0.60)
11	Explains diagnosis, investigations and management plans to patients and families in language that is easily understood, with a minimum of medical jargon.	11	3	5	4.18 (0.60)
12	Discusses smoking cessation with patients and families as a means of secondary prevention.	11	3	5	4.18 (0.60)

13	Describes the presentation and pathophysiology of lacunar syndromes.	12	4	5	4.25 (0.45)
14	Lists a broad differential diagnosis for acute stroke mimics seen in the ER.	12	4	5	4.25 (0.45)
15	Describes the major etiologies for ischemic and hemorrhagic strokes.	12	4	5	4.25 (0.45)
16	Interprets some CT, angiographic and MRI findings in acute and non-acute ischemic and hemorrhagic stroke.	12	4	5	4.25 (0.45)
17	Describes current best evidence for primary and secondary prevention of stroke.	12	3	5	4.25 (0.62)
18	Lists the evidence for known risk factors for stroke.	12	3	5	4.25 (0.62)
19	Interacts with out-of hospital physicians, ER nurses and physicians, and other allied health professionals to assess and investigate acute stroke patients emergently.	12	4	5	4.25 (0.45)
20	Collaborates in a respectful manner with the nurse practitioner, bedside nurses, and fellows in order to triage pressing and routine work involved in the care of acute stroke patients.	12	4	5	4.25 (0.45)
21	Localizes the neurologic deficits in acute stroke presentations.	12	4	5	4.33 (0.49)
22	Rapidly synthesizes and presents the history and pertinent exam findings for patients with acute stroke to the stroke fellow or staff on call, including describing how they would localize the findings, and initiate management of the patient.	12	4	5	4.33 (0.49)

Table 46: Mixed Ambulatory Neurology Clinics ITERs (Mixed Ambulatory Form) in Ascending Order By Mean Score

Order	Item	N	Min	Max	Mean (SD)
1	Routinely searches for and identifies best evidence for clinical questions that arise in daily practice.	4	4	4	4.00 (0.00)
2	Demonstrates preparedness for a given clinic by having read around the topic area before attending the clinic.	5	4	4	4.00 (0.00)
3	Identifies first and second line therapeutic interventions for common neurological presentations.	7	4	5	4.14 (0.38)
4	Learns to use an electronic medical record, where relevant.	6	4	5	4.17 (0.41)
5	Demonstrates appropriate communication with allied health care professionals and other specialists by conducting appropriate phone consultations and/or providing written consultations to these professionals for patients that need additional referrals from	6	4	5	4.17 (0.41)
6	Recognizes when a patient in the ambulatory setting needs admission emergently.	5	4	5	4.20 (0.45)
7	Recognizes that timely completion of forms on behalf of patients is a required component of patient care.	4	4	5	4.25 (0.50)
8	Demonstrates good judgment in selecting appropriate investigations and disposition for the patient at the end of a consultation.	8	4	5	4.25 (0.46)
9	Demonstrates an appropriate fund of clinical knowledge for their level of training.	8	4	5	4.25 (0.46)
10	Demonstrates an appropriate fund of basic science and/or pathophysiology knowledge for their level of training.	8	4	5	4.25 (0.46)
11	Works collaboratively with clinic staff.	7	4	5	4.29 (0.49)
12	Appropriately allocates finite resources such as urgent MRI slots or electrophysiology studies.	3	4	5	4.33 (0.58)
13	Posits a logical differential diagnosis based on the clinical findings in each patient.	8	4	5	4.38 (0.52)
14	Recognizes limitations and ask for help appropriately.	8	4	5	4.38 (0.52)
15	Establishes therapeutic relationships with patients.	8	4	5	4.38 (0.52)

16	Presents patient histories and clinical synthesis in an organized, logical fashion for each case reviewed.	8	4	5	4.38 (0.52)
17	Asks thoughtful questions around the evidence, diagnosis, and management of patients presenting in a given clinic.	7	4	5	4.43 (0.54)
18	Demonstrates professional behavior, including competence, altruism, honesty, integrity, and punctuality. read around the topic area before attending the clinic.	7	4	5	4.43 (0.54)
19	Makes accurate, legible, requisitions for tests ordered for each patient.	7	4	5	4.43 (0.54)
20	Uses time efficiently to ensure there is sufficient time to complete consultations, organize investigations, and dictate consultation letters for patients that need additional referrals from the community.	7	4	5	4.43 (0.54)
21	Performs a thorough and accurate neurological history and examination in less than 90 minutes.	8	4	5	4.50 (0.54)
22	Usually localizes symptoms and signs correctly.	8	4	5	4.50 (0.54)
23	Efficiently elicits accurate histories from patients and families, including the patient perspectives and context.	8	4	5	4.50 (0.54)
24	Provides information in concise, understandable, lay terms to patients and families.	8	4	5	4.50 (0.54)
25	Demonstrates caring and compassion in interactions with patients and families.	8	4	5	4.50 (0.54)
26	Lists risk factors and prevention strategies for common neurological conditions, including headache, stroke, back pain, and neuropathy.	4	4	5	4.50 (0.58)

Table 47: Mixed Ambulatory Neurology Clinics ITERs (Daily Encounter Form) in Ascending Order By Mean Score

Order	Item	N	Min	Max	Mean (SD)
1	Can describe the pathophysiology of most likely diagnoses	46	3	5	4.00 (0.67)
2	Can list a community resource available for patients seen	27	3	5	4.11 (0.64)
3	Generates an appropriate differential diagnosis	47	3	5	4.13 (0.68)
4	Correctly localizes the lesion	47	3	5	4.15 (0.66)
5	Demonstrates some knowledge of relevant literature & basic science	44	3	5	4.16 (0.61)
6	Teaches when junior learners are present	15	3	5	4.20 (0.68)
7	Performs a complete, organized neurological examination.	44	3	5	4.25 (0.65)
8	Can identify relevant social determinants of health that impact at least one patient in a clinic	35	3	5	4.26 (0.70)
9	Identifies and addresses risk factors for neurological diseases with patients/families	37	3	5	4.27 (0.65)
10	"Completes a new consult in appropriate time for level of training	42	3	5	4.29 (0.67)
11	Recognizes limitations	46	3	5	4.33 (0.63)
12	Arrives on time for clinic & stayed until work was done (including dictations)	47	3	5	4.36 (0.57)
13	Admits openly to omissions & errors	44	3	5	4.36 (0.65)
14	Completes necessary paperwork relevant to the clinic	46	3	5	4.37 (0.57)
15	Professional comportment	48	3	5	4.38 (0.57)
16	Asks relevant questions	47	3	5	4.38 (0.61)
17	Treats administrative and allied health staff with respect, and carefully considers their input	37	3	5	4.51 (0.61)

APPENDIX I: The Specific Objectives for Each Session in the PGY-1 Neurology Resident Boot Camp Curriculum

Approach to Neurological Emergencies

Table 48: The Specific Objectives for the Sessions Related to Approach to Neurological Emergencies

By the end of the session the PGY-1 neurology resident will be able to:

Topic	Objectives
1. Acute Ischemic Stroke	• Define acute ischemic stroke. • Describe the basic mechanisms of acute ischemic stroke. • List the common risk factors of acute ischemic stroke. • Recognize the common presentations of acute ischemic stroke syndromes. • Calculate the National Institutes of Health Stroke Scale (NIHSS). • List the common acute stroke mimickers. • List the basic workup for acute ischemic stroke. • Recognize the signs of acute ischemic stroke on brain imaging (CT/MRI). • Demonstrate a step-wise approach for assessment and management of patients with acute ischemic stroke. • List the indications and contraindications of tPA and interventional therapy.
2. CNS Infection	• Define the following conditions: meningitis, encephalitis and brain abscess. • List the common causes of acute CNS infections. • Differentiate between viral and bacterial CNS infections by clinical and cerebrospinal fluid (CSF) features. • Demonstrate the Kernig and Brudzinski signs. • List the basic workup for patients with suspected acute CNS infection. • Demonstrate a step-wise approach for assessment and management of patients with suspicious acute CNS infection. • Recall the empirical medications with dosage for patient with suspected acute CNS infection. • List the common complications of acute CNS infections.

3. Status Epilepticus	• Define status epilepticus. • Describe the basic pathophysiology and consequences of status epilepticus. • List the common causes of status epilepticus including the reversible causes. • Recognize the common clinical features of status epilepticus. • List the basic workup for status epilepticus. • Demonstrate a step-wise approach for assessment and management of patients with status epilepticus. • Recall the first and second line medications with dosage for patient with status epilepticus. • Recognize the indications for critical care admission and continuous EEG monitoring.
4. Delirium	• Define delirium. • Describe the types of delirium. • Differentiate between delirium and dementia. • List the common causes of delirium. • List the risk factors of delirium in hospitalized patients. • Recognize the common clinical features of delirium. • List the basic workup for delirium. • Demonstrate a step-wise approach for assessment and management of patients with delirium.
5. Neuromuscular Emergencies	• Describe the basic pathophysiology of Guillain-Barré Syndrome (GBS) and Myasthenia Gravis (MG). • List the common causes of respiratory failure due to neuromuscular diseases. • List the basic workup for respiratory failure due to neuromuscular diseases. • Recognize the common clinical features of GBS and MG. • Recognize the indications and timing of NCS/EMG in patients with suspected GBS. • Define MG crisis. • List the common causes of MG crisis including possible medications. • Perform the fatigability tests for myasthenia gravis. • Demonstrate a step-wise approach for assessment and management of patients with suspected MG crisis and GBS.

6. Acute Myelopathy	• List the common causes of acute myelopathy. • Recognize the common clinical features of acute myelopathy syndromes. • List the basic workup for patients with suspected acute myelopathy. • Recognize the common features of common causes of acute myelopathy in neuroimaging and CSF analysis. • Demonstrate a step-wise approach for assessment and management of patients with suspected acute myelopathy. • Recognize the indications for neurosurgical consult in patients with acute myelopathy.
7. Acute Vertigo	• Differentiate vertigo from other causes of "dizziness". • Describe the basic pathophysiology of vertigo. • List the common causes of acute vertigo. • Differentiate between central and peripheral causes of vertigo. • Recognize the common clinical features of acute vertigo. • List the basic workup for acute vertigo. • Perform the Hints exam (Head Impulse, Nystagmus, Test of Skew), and Dix-Hallpike /Epley manoeuvres. • Demonstrate a step-wise approach for assessment and management of patients with acute vertigo.

Clinical and Procedural Skills

Table 49: The Specific Objectives for the Sessions Related to Clinical and Procedural Skills

By the end of the session the PGY-1 neurology resident will be able to:

Topic	Objectives
8. Taking a Neurological History	• Obtain a focused history of the common neurological complaints including: o Weakness o Altered sensation o Headache o Abnormal movement o "Fits and faints" o Diplopia
9. Performing a Neurological Exam	• Perform a screening neurological examination of the following: o Mental status including language o Cranial nerves o Motor system o Sensation o Coordination o Gait
10. Basics of Neurological Localization and Differential Diagnosis	• Differentiate between upper and lower motor neuron localization. • Discuss the characteristic features of the following localizations in the neuroanatomical axis: o Cortical o Subcortical o Brainstem o Cerebellum o Spinal cord o Anterior horn cell o Nerve root/plexus o Peripheral nerve o Neuromuscular junction o Muscle • Generate lists of differential diagnoses for common neurological complaints based on localization, onset, progression and patient's age group.

11. Dealing with Ward Issues	• Recognize the first few steps for assessment and management and the time to consult other services for following common ward issues including: o Electrolyte disturbances o Urinary tract infection (UTI) o Fever o Fall o Chest pain/ shortness of breath
12. Basic Interpretation and Use of Lab Studies	• List the indications and interpret the results of the basic laboratory workup including: o Blood for complete blood count (CBC), electrolytes, liver function tests, renal function tests, glucose level, thyroid function tests, arterial blood gases, lipid profile and coagulation profile. o Basic urinalysis o Basic CSF analysis
13. Basic Interpretation and Use of Radiographic Images of the CNS	• List the benefits and limitations of neuroimaging modalities (CT/MRI). • Identify the major neuroanatomical structures on neuroimaging (CT/MRI). • Recognize the common views and sequences of neuroimaging (CT/MRI). • Demonstrate a systematic approach for interpreting neuroimaging (CT/MRI). • Generate lists of differential diagnoses for common neuroimaging abnormalities.
14. Performing Lumbar Puncture	• List the common indications and contraindications of lumbar puncture procedure, including but not limited to, history, neurological examination, laboratory work-up, and neuroimaging. • Perform a lumbar puncture procedure on simulated model.

Communication and Interpersonal Skills

Table 50: The Specific Objectives for the Sessions Related to Communication and Interpersonal Skills

By the end of the session the PGY-1 neurology resident will be able to:

Topic	Objectives
15. Handover Skills	• Recognize the importance of skilful handovers and the consequences of poor-quality handovers. • Perform a skilful handover using one of the standardized tools such as the SBAR tool (**S**ituation, **B**ackground, **A**ssessment and **R**ecommendation).
16. Presenting a Case to the Attending	• Perform an effective case presentation to the attending physician including: o History o Physical examination o Localization o Differential diagnosis o Completed investigations o Proposed management plan
17. Communicating with Ward Nursing Staff around Sick Patient	• Recognize the importance of clear communication with the nursing staff and the consequences of poor-quality communication. • Identify the common reasons for the nurse-physician communication failures. • Perform a clear concise communication with the nursing staff around sick patients using one of the standardized tools such as the SBAR tool (**S**ituation, **B**ackground, **A**ssessment and **R**ecommendation).
18. Writing an Appropriate Consultation Letter and Progress Notes	• Recognize the role of the consultation letter and progress note in patient care. • Identify the key elements in the consultation letter and progress notes. • Recognize the common problems in the consultation letter and progress notes. • Write a clear concise consultation letter. • Write a clear concise progress notes using the SOAP tool (**S**ubjective, **O**bjective, **A**ssessment, and **P**lan).

19. Obtaining Informed Consent	• Define the informed consent. • Describe the role of the informed consent. • List the essential elements of the informed consent. • Obtain informed consent for common procedures such as lumbar puncture.
20. Breaking Bad News	• Recognize the importance of skilful disclosure of bad news and the consequences of poor delivery. • Describe the SPIKES model (**S**etting, **P**erception, **I**nvitation, **K**nowledge, **E**mpathy, **S**ummarize and **S**trategize). • Convey bad news with skill and compassion using the SPIKES model.
21. Time Management and Triaging Skills	• Recognize the importance of time management and triaging skills in patient care. • Identify the common time wasters and distractors during the working day. • Sort out patient problems by importance and role of the service(s) involved. • Recognize the indicators of urgency in dealing with sick patients. • Recognize personal limitations and the appropriate time to ask for help. • Prioritize urgent and non-urgent tasks.