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Original Article

Development and Implementation of a Quality Improvement Curriculum for Child Neurology Residents: Lessons Learned

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ABSTRACT

BACKGROUND: Quality improvement is a major component of the Accreditation Council for Graduate Medical Education core competencies required of all medical trainees. Currently, neither the Neurology Residency Review Committee nor the Accreditation Council for Graduate Medical Education defines the process by which this competency should be taught and assessed. We developed a quality improvement curriculum that provides mentorship for resident quality improvement projects and is clinically relevant to pediatric neurologists. **METHODS:** Before and after implementation of the quality improvement curriculum, a 14-item survey assessed resident comfort with quality improvement project skills and attitudes about implementation of quality improvement in clinical practice using a 5-point Likert scale. We used the Kruskal-Wallis and Fisher exact tests to evaluate pre to post changes. **RESULTS:** Residents' gained confidence in their abilities to identify measures ($P = 0.02$) and perform root cause analysis ($P = 0.02$). Overall, 73% of residents were satisfied or very satisfied with the quality improvement curriculum. **CONCLUSIONS:** Our child neurology quality improvement curriculum was well accepted by trainees. We report the details of this curriculum and its impact on residents and discuss its potential to meet the Accreditation Council for Graduate Medical Education's Next Accreditation System requirements.

Keywords: quality improvement, residency, Accreditation Council for Graduate Medical Education, neurology

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Introduction

In the era of health care reform, child neurologists need to become leaders in delivering safe, patient-centered, equitable, cost-effective, timely, and efficient care in clinical practice.[1-3] In recognition that residents must develop quality improvement skills and serve as future patient-safety advocates, the Accreditation Council for Graduate Medical Education (ACGME) currently requires that trainees must be "integrated and actively participate in interdisciplinary clinical quality improvement and patient safety programs."[4] Thus, quality improvement education needs to be integrated into the child neurology training program to allow trainees to learn principles of quality improvement, identify areas in need of improvement in clinical practice, and develop skills to implement feasible, efficacious, and patient-centered improvement plans.

Many challenges exist in developing effective quality improvement education for child neurology residents. The most obvious is time. Child neurology residents are expected to become competent in many domains including adult neurology, genetics, neurodevelopment, epilepsy, psychiatry, neuropathology, and metabolism as well as to master necessary procedural skills. To achieve these goals, training programs must "do more" in less time to meet duty-hour requirements and provide core knowledge. A second major challenge is getting residents to "buy in" to the importance of quality improvement. This is especially difficult if residents are isolated from quality improvement initiatives performed in their departments/institutions and/

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TABLE 1.
List of didactic session topics and learning objectives

Didactic Sessions	Learning Goals, and Objectives	Required Readings by Reference Number
To Err is Human	1. Understand common heuristics and physiologic factors that contribute to diagnostic and treatment errors made by physicians 2. Understand how human and system factors contribute to medical errors 3. Be familiar with skills of root cause analysis	19
Medical Error and Adverse Event Reporting	1. Describe common reasons errors are not reported 2. Describe benefits and potential flaws in hospital error/adverse event data collection systems	20
Developing Measurable Improvement	1. Be able to describe the Plan-Do-Study-Act cycle as a model for improvement 2. Be able to formulate a quality improvement aim 3. Describe need for and necessary characteristics of measurement techniques in quality improvement	21

or do not see meaningful changes implemented from these efforts. The traditional Morbidity and Mortality Conference model may highlight an adverse event or safety issue, but is usually not sufficient to teach residents how to distill the problem and identify the human and systems problems that need improvement.

Last, little guidance is available on what constitutes effective quality improvement training in residency. The education requirements regarding patient safety and quality improvement are incorporated into practice-based learning and improvement and systems-based practice core competencies emphasized by the ACGME,[4] but neither this organization nor the Neurology Residency Review Committee define when, where, and or how these competencies should be met.[5]

Further ambiguity is added in the upcoming Next Accreditation System (NAS). This is a restructured accreditation system developed by the ACGME to begin in July 2014 for neurology training programs that will require residents to demonstrate "trajectory of progress" in the six competencies, including practice-based learning and improvement and systems-based practice.[6,7] The accreditation is to be achieved through evaluation processes that use educational milestones or achievements a resident should be able to demonstrate at specific times in training. In addition, the Clinical Learning Environment Review, part of the NAS, will assess the quality of training institutions in part by how they include effective patient safety and quality improvement programs.[7]

Over the past 3 years, we developed and implemented a formal quality improvement curriculum at our institution to meet the current ACGME core competencies of practice-based learning and improvement and systems-based practice began to adapt to the NAS requirements. To promote discussion about the quality improvement educational needs of child neurology programs in the United States, we describe our quality improvement curriculum, report outcomes after its implementation, and discuss future directions.

Methods

We developed this didactic and experiential quality improvement curriculum based on literature review and resources available at the Institute of Healthcare Improvement's Open School website.[8] Lecture content included patient safety cases solicited from neurology faculty, residents, and staff and were reviewed using root cause analysis.

Currently, the didactic portion of the curriculum includes three, 1-hour lectures in the first 2 months of the academic year taught by quality improvement leaders from the department. Examples of lecture topics, educational objectives, and required/suggested reading used over the past 3 years are listed in Table 1. In general, topics for the curriculum included a general overview of quality improvement, identification of human/system factors in medical errors, and practical development of a quality improvement project in clinical practice. All child neurology residents rotating at Boston Children's Hospital were required to attend the lectures, and attendance was taken. Residents unable to attend because of duty hours, illness, or vacation were excused.

For the experiential portion of the curriculum, residents formed three groups of five members based on their outpatient continuity clinic day. We chose this group structure because it facilitates communication of project ideas and progress between residents and allows mentors to observe residents' development of quality improvement knowledge, skills, and participation over time. The group structure was also designed so that postgraduate year 5 residents assumed project leadership roles.

Each resident group devised a project aimed at improving quality of patient care in the clinic or the inpatient setting. Residents completed a project worksheet during their meetings that included the project aim, target population, measurement tools, and assignment of responsibilities.[9] One or more faculty members with a background in quality improvement was assigned to each group to provide mentorship, ensure feasibility of the project, and help residents connect with appropriate resources as needed for project completion. Mentors met with their resident groups on a monthly basis for a minimum of 30 minutes before or after resident continuity clinic.

The quality improvement projects followed the Plan-Do-Study-Act methodology.[10] Examples of resident projects are listed in Table 2. At the end of the 9-month period, residents made 20- to 30-minute presentations on their projects to the child neurology faculty and staff at an annual department quality improvement meeting. Quality improvement faculty mentors evaluated presentations and participation of residents in their groups using a standardized form which was then reviewed by the child neurology program director.

Assessment tools

Residents were surveyed before and after the 9-month curriculum. Surveys were completed anonymously to elicit unbiased feedback; thus, pairing responses was not possible. The 14-item survey assessed resident comfort with quality improvement project skills and attitudes about implementation of quality improvement in clinical practice using a 5-point Likert scale (Figure). The survey was designed to capture residents' abilities to learn quality improvement skills as well as their reactions and behaviors to quality improvement in clinical practice, important components highlighted in the Kirkpatrick doctrine of training evaluations.[11,12]

Mentors also completed a 9-point Likert scale assessing individual resident participation at the end of the academic year. Likert responses