Education Research: Changing practice

Residents' adoption of the atraumatic lumbar puncture needle

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ABSTRACT

Background: The atraumatic needle is recommended over the cutting needle to prevent complications related to lumbar puncture and to reduce costs to the health care system. However, very few practicing neurologists use the atraumatic needle, which in turn limits the teaching of its use to neurology residents. Despite this, neurology residents may be able to adopt the atraumatic needle for lumbar punctures.

Methods: Residents at one neurology residency program were given didactic sessions regarding the atraumatic needle and the opportunity to practice using a lumbar puncture simulator. After the first time a resident performed a lumbar puncture with the atraumatic needle, he or she was asked to complete an electronic survey.

Results: The reported mean number of lumbar punctures performed using the cutting needle prior to the study was 25. Eleven residents (92%) who used the atraumatic needle said they would use it again for future lumbar punctures. The most common reasons cited for wanting to continue to use the atraumatic needle were to prevent post-lumbar puncture headaches, to choose the cost-effective option, and to stay up-to-date with changes in practice.

Conclusion: Neurology residents can successfully adopt the atraumatic needle as standard of care for lumbar punctures. *Neurology*® 2013;80:e180-e182

GLOSSARY

AAN = American Academy of Neurology; **ACGME** = Accreditation Council for Graduate Medical Education; **PGY** = post-graduate year; **PLPH** = post-lumbar puncture headache.

Lumbar puncture is a routine procedure for neurologists. Post-lumbar puncture headache (PLPH) is a common consequence of lumbar puncture. For every 6 neurology patients undergoing a lumbar puncture with an atraumatic spinal needle instead of a standard cutting needle, one patient will be prevented from having a PLPH.¹ Despite clear evidence that the atraumatic needle effectively prevents PLPH compared to the cutting needle, as well as the recommendation of the American Academy of Neurology (AAN) that the atraumatic needle replace the cutting needle for use in lumbar punctures, few established neurologists have adopted its use.² A survey conducted in 2001 of senior, fellow, and active AAN members in the United States found that only 2% of neurologists use the atraumatic needle. The most common reasons given by neurologists for not using the needle were not having knowledge of atraumatic needles, non-availability of the needles, expense, slow flow, and difficulty of use.³ The results of multiple studies have contradicted criticisms of increased technical difficulty, altered flow dynamics, and increased cost associated with the atraumatic needle. The atraumatic needle was recently shown to be cost-saving compared to the cutting needle. Based on prevention of PLPH alone, the atraumatic needle may save at least \$10.4 million per year to the health care system.⁴

Lumbar puncture technique is commonly taught during residency. Residents learn primarily by watching others. Teaching regarding use of the atraumatic needle is significantly limited by the number of neurologists who do not know of or use the atraumatic needle. Despite this, given their relative inexperience compared to practicing neurologists, neurology residents may have

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fewer biases toward using one needle over the other. Residents may be able to easily adopt the atraumatic needle for lumbar punctures.

METHODS Adult and child neurology residents (20 total, postgraduate years [PGY] 2–5) at one neurology residency program were strongly encouraged to attend at least one of 2 didactic sessions held by the study author (also a resident) regarding the atraumatic needle. During these hour-long sessions, evidence was presented from previously published studies regarding the atraumatic needle, including decreased risk of PLPH, cost savings, ease of use, and flow dynamics.^{2–6} Residents were given samples of the atraumatic needle (22-G Sprotte) to compare to the cutting needle (20-G Quincke). Residents also observed a lumbar puncture with the atraumatic needle performed on a lumbar puncture simulator and had the opportunity to practice on the simulator. The study period began after the second didactic session. After the first time a resident performed a lumbar puncture with the atraumatic needle in any clinical setting, he or she was asked to answer a brief electronic survey. The survey was developed from a review of published literature and research questions. The survey consisted of 10 total questions, a mix of Likert, yes/no, and multiple response items. Residents were given 5 days post-lumbar puncture to answer the survey. Residents received weekly e-mail reminders to participate promptly in the survey after performing a lumbar puncture using the atraumatic needle for the first time. Survey responses were collected over a total time frame of 6 months after the atraumatic needle became available at the study site. Survey respondents' identities were undisclosed to the author and there was no access to information that could allow identification of the respondents.

RESULTS At the beginning of the study period, none of the residents had ever used the atraumatic needle. A total of 80% of residents attended at least one didactic session. At the end of the 6-month study period, all of the residents who had the opportunity to perform at least one lumbar puncture (12 out of the 20) had used the atraumatic needle. These 12 residents consisted of 4 PGY-4 level residents, 6 PGY-3 level residents, and 2 PGY-2 level residents. The residents reported having used the cutting needle for prior lumbar punctures anywhere from 8 to 50 times before the study period. The reported mean number of lumbar punctures performed using the cutting needle prior to the study period was 25.

Twenty-five percent of residents who used the atraumatic needle reported that using the introducer that accompanied the needle was “extremely easy” and 60% reported that using the introducer was “very easy.” About 80% of residents reported that successfully inserting or positioning the atraumatic needle was at least “just as easy” as inserting the cutting needle. All 10 residents who successfully obtained CSF reported that collecting CSF through the atraumatic needle was at least “just as easy” as collecting CSF through the cutting needle. Of the 2 residents who did not successfully obtain CSF using the atraumatic needle, after switching to the cutting needle one successfully collected CSF and the other did not. When

asked why they believed they were not successful using the atraumatic needle, one resident endorsed difficulty with placement or positioning of the needle, one resident endorsed poor patient cooperation with the procedure, and both residents endorsed that the anatomical landmarks on the patients were not easily palpable prior to the procedure. One of the 2 residents who did not initially successfully use the atraumatic needle was successful using the atraumatic needle during subsequent lumbar punctures. Eleven residents (92%) who used the atraumatic needle said they would use it again for future lumbar punctures. The most common reasons cited for wanting to continue to use the atraumatic needle were to prevent PLPH, to choose the cost-effective option, and to stay up-to-date with changes in practice.

DISCUSSION The traditional teaching paradigm in medicine is from the top down, i.e., knowledge from attending physicians is handed down to residents. The limited number of physicians who use the atraumatic needle is an obstacle to its widespread implementation. Few examples exist in the literature of practicing neurologists attempting to introduce the atraumatic needle into routine practice. At one institution, atraumatic needles were introduced and made available to staff conducting lumbar punctures. Over the course of 1 year, atraumatic needle use increased from 0% to 37% of lumbar punctures.⁵ In our study of residents, over the course of 6 months, use of the atraumatic needle increased from 0% to 60%. A collaborative effort between attending physicians and residents to learn how to use the atraumatic needle would likely benefit all and increase implementation within the specialty.

Our study utilized a lumbar puncture simulator for teaching lumbar puncture technique. In regards to teaching procedural technique, the status quo of top-down teaching by attending physicians and observation-based learning by residents may lead to inferior skill acquisition compared to simulation-based learning. This was recently demonstrated in the acquisition of lumbar puncture technique in particular.⁷ By providing learners with a safe environment to practice procedural skills and receive feedback, simulation technology increases skill acquisition.⁸ The incorporation of simulation-based training in teaching lumbar puncture technique may further facilitate implementation of the atraumatic needle.

Residents in this study indicated they would continue to use the atraumatic needle for multiple reasons, including choosing the cost-effective option. Teaching physicians at some academic centers may not prioritize the teaching of cost-effective models of care due to the belief that resident learning requires some tolerance of inefficiency. Also, teaching of cost-

effective care models may be perceived as conflicting with centers' research and education missions.⁹ However, these missions are at odds with values defined by the Accreditation Council for Graduate Medical Education (ACGME). The ACGME has named 6 Core Competencies on which residents are regularly evaluated and are expected to achieve to complete residency. Providing cost-effective care falls under the umbrellas of 2 of the core competencies. Competency in "systems-based practice" is defined as an awareness of and responsiveness to the larger context of the health care system and the ability to effectively call on system resources to provide care. At the heart of this competency is a fundamental understanding of how patient care relates to the overall health care system. Second, the competency of "practice-based learning and improvement" evaluates residents' use of evidence-based medicine and best-available evidence. The incorporation of cost-effective care education and cost-saving technologies such as the atraumatic needle into residency educational programs would allow for compliance with and mastery of both core competencies.

This study was limited by the relatively small number of survey participants at only one residency program. The results of this study are based on self-reports from participants, which allows for possible reporting bias. Future studies involving a larger sample population would be helpful in clarifying whether these results can be generalized to a larger population.

Neurology residents can successfully adopt the atraumatic needle as standard of care for lumbar punctures. This study demonstrates residents' preference for the atraumatic needle over the cutting needle in order to prevent PLPH, to choose the cost-effective option, and to stay up-to-date with changes in practice. The

limited experience of teaching neurologists regarding the atraumatic needle should not prevent neurology residents from its use. A change in practice among all neurologists may occur if neurology residents continue to learn to use the atraumatic needle.

STUDY FUNDING

No targeted funding reported.

DISCLOSURE

The author reports no disclosures. Go to Neurology.org for full disclosures.

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Neurology 2013;80:e180-e182

DOI 10.1212/WNL.0b013e31828f1866

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