Implementation and Evaluation of a High-Dose Cytarabine Neurologic Assessment Tool

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Patients receiving high-dose cytarabine as part of their chemotherapy regimen have a chance of experiencing neurotoxicities. Prompt identification of signs and symptoms can greatly reduce the chance of patients sustaining permanent neurologic damage. This article describes the development and successful implementation of an evidence-based, standardized neurologic assessment and documentation tool that was evaluated using a clinical utility questionnaire and an adherence audit.

At a Glance
- Use of a standardized neurologic assessment and documentation method can aid in minimizing patient harm during chemotherapy administration.
- An inpatient medical oncology unit formally assessed its clinical practices, identified deficiencies, and developed new assessment and documentation processes.
- A clinical utility and knowledge questionnaire that involved the staff assessed existing practices, guided the development and evaluation of new assessment and documentation practices, and was helpful in successful implementation of a complex practice change.

Patients undergoing standard treatment for acute leukemia typically receive high-dose cytarabine as part of their induction and consolidation regimens. Cytarabine, also known as arabinofuranosyl cytidine (Ara-C), is an antimitabolite, or a cell-cycle-specific drug that inhibits DNA synthesis, halting cell division. Several serious adverse effects have been identified in patients receiving high-dose cytarabine (doses of 1 g/m² or greater), including keratitis and possible dose-limiting myelosuppression. However, the cause for greatest concern is the possibility of irreversible neurotoxicities.

Patients receiving high-dose cytarabine have a 7%–28% incidence of neurotoxicity, which can be reversible if identified early (Lundquist & Holmes, 1995). These toxicities include gait and balance disturbances, alterations in fine motor skills, headache, memory loss, peripheral neuropathy, and seizures (Nielsen & Brant, 2002). Several risk factors have been identified, including a cumulative dose effect, age older than 60 years, and decreased renal or hepatic function (Baker, Royer, & Weiss, 1991). Prompt identification and reporting of adverse effects by nurses is imperative to ensure that permanent neurotoxicities do not occur (Amen, 2007). For this reason, Brown (2010) suggested the use of a standardized neurologic assessment tool during the administration of high-dose cytarabine.

The University of Maryland Greenebaum Cancer Center (UMGCC) Nursing Clinical Practice Council (NCPC) undertook a two-year project to improve nursing practices associated with high-dose cytarabine. The NCPC assessed nurses’ knowledge and existing practices using a knowledge and clinical utility questionnaire and then developed a new standardized neurologic assessment guide and documentation tool to facilitate practice change. The council sought feedback from stakeholders to help shape and improve the innovation, with the goal of making the practice change more acceptable. Throughout, the council was mindful that the nursing staff’s impression of the clinical utility of the new processes and tools (i.e., ease of use, time commitment, and clinical helpfulness) is crucial to ensure a successful, sustainable implementation (Polgar, Reg, & Barlow, 2002; Smart, 2006). Following implementation, the same clinical utility questionnaire was used to evaluate nurses’ knowledge and perceptions of the new clinical processes, then responses were compared with the preimplementation questionnaire. Adherence to the practice change was also assessed.

Methods

An informal review of the current practices revealed that orders for neurologic assessments varied by prescriber. A consistent, formal method of assessing, documenting, and reporting abnormal neurologic findings by nurses also was lacking. Typically, nurses were instructed only to assess a patient’s signature, which was not obtained on a hospital form and, therefore, not transferred into the medical record.

A literature review was performed, and a questionnaire was developed to assess...
knowledge and current practices regarding high-dose cytarabine administration. Several open-ended questions tested nurses’ knowledge of how to perform evidence-based cerebral and cerebellar assessments. Nurses also were asked to provide comments or concerns regarding current practices in open text boxes. The questionnaire also contained 10 five-point Likert-type scale items ranging from “strongly disagree” to “strongly agree” about utility of the current practices, including documentation, comfort level with performing assessments and communicating abnormal results, and consistency of neurologic assessment orders. The questionnaire was administered via SurveyMonkey®. The survey results and a review of the literature were shared with nursing staff to demonstrate the need for practice change and to inform the development of an assessment guide and documentation tool.

The new neurologic assessment guide and documentation tool was developed based on elements from existing tools and contained 10 items assessing patients’ cerebral and cerebellar function, including assessment of gait, handwriting, tremors, nystagmus, point-to-point testing, rapid alternating movements, and the Romberg test. The documentation tool facilitates notation of normal and abnormal findings, including the prescriber’s name to whom abnormal results were reported. To help nurses become acclimated to using the new tools and processes, educational in-services were provided one-on-one or in small groups. The education sessions focused on the use of high-dose cytarabine and its complications. They also included an introduction to the assessment guide and documentation tool, including demonstrations of assessment processes.

The same online questionnaire was administered three months after the implementation of the new tools and processes to assess utility and acceptability of the nursing staff. Results from the preimplementation and postimplementation questionnaire were assessed using a Mann-Whitney U test. A significance level of p < 0.05 was used. Adherence was determined using percentages.

• Was the form completed and signed before each dose?
• Was the form filled out correctly and completely?
• Were abnormal results reported to physicians?

Sample
All nurses in the UMGCC who administer high-dose cytarabine were asked by email (two mailings) to complete an anonymous questionnaire. About half of the nurses participated in the preimplementation questionnaire (35 of 66) and postimplementation questionnaire (29 of 65). Of the nurses who participated, years of experience ranged from 1–29 years as an oncology nurse, with the median being about four years of experience.

Analysis
Responses to knowledge-based, open-ended questions (e.g., “How do you perform a Romberg test?”) were categorized and scored based on comprehensiveness. Content analysis was used to assess comments in open text boxes. All open-ended responses (knowledge and comments) were assessed by the authors, and agreement was reached. Prequestionnaire and postquestionnaire results (Likert-scaled items and open-ended question results) were compared using a Mann-Whitney U test. A significance level of p < 0.05 was used. Adherence was determined using percentages.

Results
Presurvey results revealed that one of four nurses felt that he or she had received inconsistent information about what neurologic assessments to perform. One of five nurses reported that assessments and documentation were not easy to complete. About one of two nurses reported that current assessments were not comprehensive. These findings informed the development of the documentation tool.

Several nurses commented that initiating high-dose cytarabine during the middle of the night was not ideal because patients were reluctant to get out of bed for gait assessments. Nurses also feared that assessments would be abnormal from the patients being sleepy rather than from true neurologic deficiencies. A consensus was reached to initiate high-dose cytarabine only during waking hours whenever possible.

After the assessment guide and documentation tool were implemented, a comparison of prequestionnaire and post-questionnaire results revealed that nurses significantly increased their knowledge of the proper steps for assessing gait (X̄ = 1.11 presurvey, X̄ = 0.58 postsurvey) and arm tremors (X̄ = 0.58 presurvey, X̄ = 1.46 postsurvey). Items addressing the comprehensiveness of the documentation tool and the amount of time necessary to complete assessments had significantly higher means after implementation of the assessment tool and guide. The item addressing ease of nursing documentation approached significance using a conservative analysis.

Adherence was assessed with chart audits of the 238 doses of cytarabine given in the three months following the implementation of the form. Evidence from the chart audit demonstrated that 178 (75%) of the documentation forms were completed at the 90% level or higher. The most frequently missed items were consistent and included (a) providing nurses’ initials at the top of form, (b) circling “yes” or “no” for evidence of headache or seizure, and (c) marking the checkbox next to “see previous form for baseline signature.” None of the assessments showed abnormal findings resulting in suspension or termination of high-dose cytarabine.

Discussion
A standardized evaluation of clinical practice using a clinical utility questionnaire with open-ended knowledge questions and comments can be extremely useful for assessing the need for practice change and evaluating the results. It has the benefit of providing guidance for improvements, creating an opportunity for staff to provide input about practice change, and identifying new issues. The results informed the development of a comprehensive assessment guide and documentation tool to facilitate best practice. Postsurvey results showed increased knowledge of neurologic assessments. Comments from the staff prompted additional practice changes, including the addition of neurologic assessments to all standardized high-dose cytarabine.
preprinted order sets. Also, high-dose cytarabine now is administered during waking hours whenever possible to ensure accurate assessments, as well as to increase patient comfort and satisfaction by minimizing sleep disturbances.

A clinical utility questionnaire also can be used to evaluate staff perceptions of new practice changes. Although few items reached significance, this may be because of a conservative analytic approach. Regardless, the new assessment and documentation processes were widely accepted and commended by nursing staff. An overwhelming majority of the nursing staff initiated the form and used it as designed, although assessment and documentation were more comprehensive and time-consuming. To sustain the practice change, new-hire orientation classes held twice yearly incorporate information about assessment and documentation for patients receiving high-dose cytarabine.

Conclusion

Although neurologic toxicities of high-dose cytarabine were nonexistent in this small series, nurses must be vigilant in assessing patients to prevent possible irreversible events. The findings suggest that neurologic toxicities associated with high-dose cytarabine may not be as common as noted in the early literature. With the increase in knowledge about high-dose cytarabine’s side effects, some practitioners may have become more reluctant to administer it to older adult patients, patients with impaired renal and hepatic function, and others at high risk for toxicity.

When the UMGCC NCPC determined that high-dose cytarabine was an important safety concern, the committee repeatedly engaged with staff members, using questionnaires, inservices, and small group meetings. Questionnaires that assess knowledge and clinical utility (e.g., ease and thoroughness of documentation, comfort level with performing assessments and communicating abnormal results, consistency in assessment orders) can be helpful to assess current practices and evaluate new ones. Repeated staff engagement can improve staff participation in practice changes and ensure that staff nurses’ feedback will help shape and improve innovations.

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