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Using a Mixed Methods Approach to Explore Factors Associated with Evidence-Based Cancer Pain Management Practice Among Nurses

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INTRODUCTION

Patients with cancer pain often experience inadequate treatment despite availability of evidence-based clinical guidelines.^{1–3} Nurses' use of best pain management practices ensures that patients receive optimal pain treatment. Evidence-based pain management (EBPM) requires integrating evidence-based practices through detailed, attentive nursing care which may be impacted by both nurse-level and organizational-level factors.^{4,5} A lack of research exists on the impact of these factors on EBPM practice among nurses caring for patients with cancer. The purpose of this study was to identify nurse-level and organizational-level factors associated with evidence-based cancer pain management practice as indicated by nurse documentation in the electronic health record (EHR).

BACKGROUND

Nurse-level Factors

Evidence-based practice (EBP) is a clinical decision making approach that integrates best scientific evidence with clinician's expertise and patient's values and preferences.⁴ Nurses' beliefs about EBP and their ability to implement are related to delivery of evidence-based care.^{6,7} In addition, higher levels of education and certification are associated with intentions to use research in practice.^{6,8,9} Nurse-level factors that may be barriers to providing

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evidence-based care include lack of EBP knowledge and skills, negative attitudes toward research, perceived or real lack of support, and beliefs about organizational readiness for EBP.^{10,11}

EBPM in the inpatient setting is a complex process. To ensure safe delivery of analgesic therapy and assess its effectiveness, EBPM requires a detailed patient assessment using a reliable and valid assessment tool, implementation of evidence-based pharmacologic and nonpharmacologic treatments based on the best scientific evidence, reassessment of the patient's pain experience, maintenance or modification of analgesic therapy, management of adverse effects, addition of treatments, and communication with the healthcare team.¹²

Nurse documentation in the EHR provides evidence of the clinical decision making process for managing pain and can be used to evaluate EBPM practice. Documentation quality may be negatively related to a nurse's level of clinical expertise as indicated by a study that found poorer EBPM documentation among nurses with more clinical expertise.¹³ Hospitals accredited by The Joint Commission are required to follow specific standards to document pain assessment, intervention, and reassessment.¹⁴ These standards have influenced organizations to implement policies and procedures to ensure proper assessment and management of pain; however, achieving Joint Commission standards for pain management documentation is often challenging.^{13,15}

Organizational-level Factors

Organizational-level factors related to EBP include nursing unit culture,¹⁶ alliance with the organization's mission, and nursing leadership priorities.⁹ Healthcare organizations need to provide nurses with access to evidence-based resources, EBP skills training, and administrative support¹⁰ to enable EBP implementation. Examples of healthcare organizations that support EBP are those awarded Magnet designation through the American Nurses Credentialing Center's Magnet Recognition Program.¹⁷ Such hospitals demonstrate excellence in nursing practice and patient outcomes through evidence-based care.

Organizational-level factors that hinder EBP may be similar across different healthcare settings. Lack of authority to change patient care procedures, insufficient time to implement new ideas, and lack of time to read research were EBP barriers at both a community hospital¹⁸ and an academic medical center.¹⁹ However, a lack of research exists on the healthcare setting's impact on nurse EBPM practices in the oncology setting.

Understanding the factors that influence nurses' implementation of EBPM will inform strategies for sustaining EBPM practice in the inpatient oncology setting. This study sought to answer the following questions: (a) What nurse-level and organizational-level factors are associated with evidence-based cancer pain management practices? (b) What is the organization's EBP environment, and barriers to and strategies for adopting evidence-based cancer pain management practices among nurses?

METHODS

Setting

The study was conducted at two inpatient oncology units, one at a 450-bed academic medical center (AMC) and one at a 491-bed community-based regional medical center (CMC). 46 registered nurses (RNs) staffed the AMC's 28-bed medical-surgical oncology unit. 60 RNs staffed the CMC's 34-bed medical oncology unit specializing in end-of-life care. The University of Washington (UW) institutional review board approved all research procedures.

Design

A mixed methods, descriptive cross-sectional design was used for this study. Quantitative data were collected by questionnaire and medical record abstraction. Qualitative data were obtained through interview.

Theoretical Framework

Roger's diffusion of innovations model²⁰ guided the selection of the study's instruments and development of the interview guide. In this model, nurses' adoption of new ideas and technologies is influenced by social network structures and specific individuals in these networks. Key components of innovation adoption are the attitudes and values of the target adopters, how they respond to the innovation, existing facilitators and barriers to adoption of the innovation, and how the barriers can be overcome.

Quantitative Methods

Research Question: What nurse-level and organizational-level factors are associated with evidence-based cancer pain management practices?

Sample: A convenience sample of RNs who provided direct care to patients with cancer pain were invited to participate in the study (a) at shift change by the investigator, (b) via flyers posted on the unit, and (c) through e-mail sent by the nurse manager or nurse researcher at the medical center. Nurses who were interested in learning more about the study were directed to the study Website, created in Catalyst. Potential participants provided consent for study participation by completing Web-based questionnaires.

Instrumentation: The *EBP Beliefs Scale* measures nurses' perceptions of the value of EBP and their ability to use it in nursing practice. It comprises 16 items using 5-point Likert scales. Examples of items include "I am sure that I can implement EBP," "I am sure that evidence-based guidelines can improve clinical care," and "I believe that I can search for the best evidence to answer clinical questions in a time-efficient way." The instrument has established face, content, and construct validity with internal consistency reliabilities typically greater than 0.85, and Cronbach's alpha greater than 0.90.²¹

The *EBP Implementation Scale* measures nurses' perceptions of the degree to which they have performed EBP activities in the past 8 weeks. It comprises 18 items using 5-point Likert scales. Activities include "Informally discussed evidence from a research study with a colleague," "Read and critically appraised a clinical research study," and "Used an EBP

guideline or systematic review to change clinical practice where I work.” The instrument has established face, content, and construct validity with internal consistency reliabilities and Cronbach’s alpha greater than 0.90.²¹

The *Carlson’s Prior Conditions Instruments* measure conditions that influence nurses’ decisions to use EBPM practices. It consists of 11 items that address nurses’ beliefs about how frequently they implement EBPM practices (previous practices subscale), 6 items on nurses’ perceptions of pain and pain management (perceived existing needs or problems subscale), 6 items on nurses’ aptness to make or adapt to change (innovativeness subscale), and 7 items on beliefs about nurse and physician colleagues’ pain management behaviors (social system norms subscale). All responses are indicated using 5-point Likert scales. The instrument has established construct validity and Cronbach’s alphas of 0.73 to 0.83.²² The scores for perceived existing needs or problems and social system norms were combined to provide one score to describe the unit’s EBPM culture. Examples of items addressing unit EBPM culture included “Pain is generally well controlled where I work,” “There is insufficient time to implement pain management strategies,” and “Nurses are often reluctant to administer opioid analgesics.”

The *Cancer Pain Practice Index* was used to evaluate nurse documentation. It measures 11 EBPM practices and has established content validity, and inter-rater reliability of 93%.²³ EBPM practices include: (1) initial pain assessment at admission, (2) pain assessment frequency, (3) use of a valid pain scale, (4) pain location, (5) pain characteristics, (6) functional assessment, (7) initiation or review of pain management care plan, (8) pharmacologic interventions, (9) non-pharmacologic interventions, (10) bowel regimen with opioid orders, and (11) analgesic side effect monitoring. Two indicators were added based on the centers’ pain management policies and procedures: (1) communication with physicians and (2) patient education. Each indicator was scored 0 (not met) or 1 (met). Indicators were not scored if not applicable (i.e., initial pain assessment is performed only upon admission). Indicator scores for each nurse documentation were summed and divided by the number of applicable indicators, yielding a total score ranging from 0–1.

Nurse documentations were reviewed in the EHRs of adult patients with any level of cancer-related pain who one or more of the study participants cared for during the 2 months prior to study enrollment. A waiver of written consent was approved by the IRB in order to obtain verbal consent from patients by telephone prior to data abstraction. Two researchers reviewed pain management documentations that included the RNs’ notes, the medication administration record, pain assessment flow sheet, and the care plan. Patient age, sex, race, diagnosis, and treatment data were also collected during medical record abstraction. Inter-rater reliability for this study for a randomly selected group of 10 documentations was 95%.²⁴

Analysis: Questionnaire and EHR data analysis used SPSS version 21.0. Nurse-level factors, perceived unit culture, patient demographics, and *Cancer Pain Practice Index* scores (EBPM practice) were summarized using descriptive statistics. *T*-tests and Chi-square tests were calculated to determine if data differed between the centers.

Hierarchical linear modeling (HLM)²⁵ was used for analysis to partition variance in EBPM practices into two components – patient-level and nurse-level. HLM accounted for the dependent variable (EBPM practice) being nested within patients and nurses. The analysis of EBPM practice has 2 levels: within persons (Level 1) and between persons (Level 2). At Level 1, the outcome is conceptualized as varying within patients and is a function of person-specific change parameters (demographics and treatment) plus error. At Level 2, person-specific change parameters are multivariate outcomes that vary across nurses. Variation among nurses was calculated using intra-class correlation. All analyses were exploratory in nature.

Qualitative Methods

Research Question: What is the organization's EBP environment, and barriers to and strategies for adopting evidence-based cancer pain management practices among nurses?

Sample: A purposive sample from each medical center of 3 RNs with high EBPM documentation performance and 3 RNs with low performance determined by the *Cancer Pain Practice Index* (12 total RNs) were invited to participate in an interview.

A second purposive sample was also invited to participate in an interview: (a) two nurse managers responsible for the unit's daily operations and management of the participating nurses, (b) Advanced Practice RNs (APRNs): three clinical nurse specialists (CNSs) and one nurse educator employed in positions that supported evidence-based decision making, and (c) two chief nursing officers (CNOs) knowledgeable about the EBP organizational infrastructure.

Procedures: Participants were invited by the investigator in person, by email, or through both methods. Two staff nurses who were contacted stated that they were too busy and declined to participate; everyone else who was invited agreed to be interviewed. Individual semi-structured interviews were conducted by telephone or in person, were digitally recorded with consent, and lasted from 30 to 45 minutes. RNs were asked what tools or resources help EBPM implementation and what barriers make it difficult to implement EBPM.²⁶ Questions for the nurse managers, APRNs, and CNOs addressed the EBP environment including perception of the extent RNs practiced EBP and how this was monitored and evaluated, and barriers to and strategies to support nurses' EBPM practices.

Analysis: Interviews were transcribed verbatim by a transcriptionist and entered into ATLAS.ti.²⁷ EBP environment and barriers and strategies to sustain EBPM practices were described using content analysis.²⁸ Each transcript was read by two research team members to identify codes for text that capture key thoughts or concepts. Codes were then organized by theme to provide an understanding of organizational-level factors related to EBPM adoption and implementation by nurses. Direct quotes exemplifying key ideas and concepts were identified.

FINDINGS

Quantitative Findings

Nurse-level and Organizational-Level Factors—Questionnaires were completed by 40 RNs (22 = AMC, 18 = CMC). Demographic characteristics did not differ significantly between the two groups of nurses except for (1) more part-time nurses at the CMC ($p = .033$) and (2) more CMC nurses with an associate degree in nursing ($p = .013$) (Table 1). Scores for the *EBP Beliefs Scale*, *EBP Implementation Scale*, and the *Carlson's Prior Conditions Instruments* did not differ significantly between the two groups of nurses (Table 2).

EBPM Practices—On average, 10 pain management documentations were assessed for each nurse (range = 2–16) for a total of 403 pain management documentations (229 = AMC, 174 = CMC). The AMC nurses (mean 0.90, SD 0.13) scored significantly higher than the CMC nurses (mean 0.55, SD 0.18) for the *Cancer Pain Practice Index*: $t(401) = 22.56, p < .001$. Indicators most commonly not documented were pain reassessment after pharmacologic interventions (41% of documentations), pain characteristic assessment (35%), analgesic side effect monitoring (30%), use of an appropriate assessment scale (16%), and pain location assessment (15%). The CMC's care plan review documentation was consistently incomplete.

Pain management documentation data were collected from 58 patients' EHRs. Patients were predominately female (55%) and Caucasian/white (79%). Mean age was 60.5 years (range = 24–85 years). Urological cancer was most common (25.9%), followed by uterine/cervical (12.1%), lung (12.1%), hematological (8.6%), and all other solid tumors (20.7%). Treatments included surgery (43.1%); palliative care (24.1%); medical management, such as treatment for dehydration or sepsis (20.7%); and chemotherapy or radiation (12.1%).

Significant variables related to EBPM practice (medical center, years of nursing practice, and highest nursing degree) were included in the HLM model, controlling for patient race and treatment. The HLM model showed type of medical center as the significant factor ($\beta = -0.377, SE = .042, p < .001$) with patients hospitalized at the AMC receiving a higher level of EBPM care compared to patients at the CMC. The intra-class correlation indicated that only 4% of the variance in EBPM practice can be attributed to differences among nurses, i.e., years of nursing practice and highest nursing degree.

Qualitative Findings

Five themes described the organizations' EBP environment:

National Recognition—Interest in obtaining Magnet designation indicated an EBP supportive environment. The AMC had Magnet designation, while the CMC was applying for it. An AMC APRN described how Magnet designation influenced EBPM practice: “I think Magnet really has that drive, having some of these things hardwired, like decision making and how do we go about doing our policies...and hiring, paying for the school of nursing faculty member to participate in our nurse groups to bring nursing research continually before us.”

Facilitation of Best Pain Practices—At both centers, nurses were educated about pain management policy and procedures at orientation. Embedding evidence into policies and procedures was described by a community center APRN as “intellectually dragging everybody down the road” of EBP. This facilitated EBPM practice rather than requiring nurses to implement the EBP process, i.e., to search for and critically analyze the evidence.

CNOs perceived differences in how nurses practiced EBP. The academic center CNO believed nurses practiced EBP at a “fairly high level,” but recognized that “there is always room for us to improve.” The community center CNO felt EBP was not practiced “as much as it should be” and was based on whether or not nurses followed evidence-based policies and procedures.

Measurement of Success—Interview data suggested that the medical centers’ mechanisms for measurement and sharing of nurse-sensitive outcomes was important to EBPM adoption. These mechanisms were led by nurse practice and leadership councils supported through a shared governance structure. Chart audits were the primary mechanism of collecting outcomes data. Outcomes such as patient fall data were often posted on staff bulletin boards.

Fiscal Commitment to Human Resources and Technology—Both CNOs explained that employing APRNs was a primary way fiscal resources were used to support EBP. The AMC employed a pain management CNS and the CMC previously employed an oncology CNS who was a pain management champion. The APRNs and nurse managers viewed CNSs and nurse educators as clear points of contact for nurses to obtain research evidence. Web-based resources, which allow nurses to get “quick, easy access to current evidence,” were recognized by the community center’s CNO as a fiscal investment supporting the EBP process.

Evidence-Based Practice Evaluation—Evidence-based decision making was not appraised during performance evaluations at either center. Instead, it was evaluated by incidents reported to the nurse manager, such as if a nurse was not following a policy or procedure.

The most common barrier to practicing EBPM was lack of time for finding best practices and using the EBP process to determine if it should be implemented. As this academic center RN illustrates: “If you know this is what I’ve done in the past and it worked, you’re just going to do that because you’re so busy with everything else.” Although the computer system was designed to identify best practices at both centers, it could be difficult to navigate to information quickly.

Both centers identified the following strategies for sustaining EBPM: web-based resources which included policies and procedures; consulting with APRNs, pharmacists, pain management and palliative care teams; reference books; and pain management education. APRNs educated nurses through posters, one-to-one teaching, and patient rounds.

A strategy for facilitating EBPM at the AMC was the Pain Resource Nurse (PRN) Program.²⁹ Six nurses on the unit received additional pain management training and provided their peers education and consultation. Besides PRNs, consulting with peers was a common strategy for identifying pain management interventions. This was illustrated by a CMC nurse who said: "...I value the experience of others, I would seek that before I would seek written information."

DISCUSSION

The study's mixed methods approach expands nursing knowledge about nurse-level and organizational-level factors related to evidence-based cancer pain management practices among nurses. The quantitative findings indicated that the type of medical center was the only significant factor associated with EBPM practices. The qualitative findings identified three features unique to the AMC that may positively facilitate EBPM adoption and implementation among nurses: pain management APRN, PRN program, and Magnet designation.

The Rogers's Diffusion of Innovations Model provides a structure for understanding organizational-level factors and EBPM. The healthcare organization as a social network plays a critical role in hiring individuals who can influence nurses to adopt and implement EBPM. In our study, APRNs were these individuals. This is in concordance with a previous study in the inpatient oncology setting demonstrating APRN facilitation of the use of evidence-based pain guidelines among oncology nurses.³⁰ APRNs are "knowledge brokers" in that they play an essential role in ensuring the uptake of best practices by nurses;³¹ thus, closing the gap from research to practice. The PRN Program is another institutional initiative that gives nurses access to expert pain management resources on the unit who are their peers. This program, present at the AMC, has been shown to facilitate EBPM practice among nurses.³²

The Institute of Medicine has set a goal that by 2020, 90% of clinical decisions will be evidence-based;³³ therefore, healthcare organizations must have processes in place to make sure that nurses are practicing EBPM. By meeting the criteria for Magnet designation (i.e., infrastructure and resources to support EBP, integration of EBP and research into clinical and operational processes), healthcare organizations can provide a positive environment for EBPM practice. Wilson and Colleagues⁸ found in a recent survey that nurses who practice in a Magnet designated hospital experience fewer barriers to EBP than nurses employed in non-designated medical centers. Magnet designation in addition to APRNs and the PRN program are organizational-level factors to consider for facilitating and sustaining EBPM practices.

An unexpected result was that nurse-level factors such as years of nursing practice and highest nursing degree were not associated with EBPM practice. One reason for this may be that this study was not powered to detect additional contributing factors. Similar to other EBP nursing studies,^{7,9,34} generally most nurses believed in EBP, but their perceived implementation of the EBP process was low. This may be related to the barriers of lack of time and ease in accessing best practice information. Lack of time is a barrier which is well

documented in the literature and needs to be addressed through institutional strategies so EBPM becomes standard practice. The APRNs in our study used strategies to bring EBPM to the unit such as posters with evidence-based information, patient rounds, and one-to-one teaching to nurses on the unit.

EBPM evaluation was not a component of the nurse's annual performance review. Chart audits was the primary measurement of success for nursing practice at both centers and unit outcomes were shared with staff. Healthcare organizations need monitoring and evaluation processes in addition to strategies that provide nurses with knowledge about a practice change and encourages them to use it. Educational strategies in combination with best practice champions, audit and feedback, or nursing rounds have shown success in improving oncology nurses' implementation of pain management clinical practice guidelines.^{35–37} Computerized decisional support systems and pain consultation services also improve oncology nurses' EBPM practice.¹

As evident by this study, factors associated with EBPM practices are complex. This study fills a gap in nursing knowledge by identifying organizational-level factors associated with evidence-based cancer pain documentation by nurses. Future research should examine the pain management APRN, the PRN program, and Magnet designation as predictors for EBPM practice in the inpatient oncology setting.

LIMITATIONS

Despite both centers' facilitation of best practices through evidence-based policies and procedures, EBPM indicators were not always documented in the EHR. These indicators included reassessment after pharmacologic interventions, monitoring analgesic side effects, and use of appropriate assessment scales. Although using documentation as a proxy for behavior may underestimate the care provided by the nurse, the absence of these same indicators has been reported in other inpatient oncology studies.³⁸ The EHR platform is a factor that can deter documentation if nurses are not able to easily document care.

Caution should be taken in generalizing these findings to other healthcare settings or nurses as this was a study of only two medical centers. We did not include nurses' pain management knowledge as a potential factor associated with evidence-based cancer pain management practices. In addition, we only reviewed pain management documentations for each participating nurse for a two month period. This resulted in variability in the number of documentations (range 2–16) for each nurse which may have inadequately represented EBPM practices for those nurses with fewer documentations.

IMPLICATIONS FOR PRACTICE

Health care organizations need to continue to strive for EBPM practice by nurses so that all patients receive optimal pain management care. The results of this study highlight the importance of the organization in facilitating EBPM practice among nurses. Nurses in the inpatient oncology setting are busy and typically unable to implement the EBP process to identify best pain management practices for patients with unrelieved cancer pain. If nurses are expected by their healthcare organization to implement the EBP process, they should be

given the time do so. In today's cost-saving healthcare environment this maybe challenging. Thus, APRNs are a valuable fiscal investment that nurse leaders should consider supporting. Another potentially prudent fiscal investment is the PRN program. PRNs are easily accessible for consultation with their nurse peers. APRNs and PRNs should be involved in establishing the organization's EBPM policies and procedures. Nurse leaders should make it a priority to employ these type of individuals who can influence nurses to adopt and implement EBPM.

If nurses are implementing EBPM, but not adequately documenting it, policies and procedures need to be clear regarding pain management documentation requirements. In addition, the EHR platform must provide easy access to the sections of the medical record where nurse documentation of EBPM is required. It is recommended that nurse leaders gather information from nurses to determine what improvements are needed to make the EHR platform user-friendly and then to facilitate these changes. Also, if time is an issue for documenting EBPM practice adequately, nurse leaders may want to consider the use of hand-held devices, so nurses can document at the bedside. Lastly, to make it a reality that patients with cancer pain receive adequate treatment, healthcare organizations must have an infrastructure and resources in place that facilitate the adoption and implementation of EBPM practice among nurses.

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Highlights

- This study fills a gap in nursing knowledge by identifying organizational-level factors associated with evidence-based cancer pain documentation by nurses.
- Healthcare organizations must have an infrastructure and resources in place that facilitate the adoption and implementation of evidence-based pain management (EBPM) practice among nurses.
- Three features that may positively facilitate EBPM adoption and implementation among nurses: pain management APRN, Pain Resource Nurse (PRN) program, and Magnet designation.

Table 1

Nurse Demographics by Medical Center

	<u>AMC Nurses (<i>n</i> = 22)</u>	<u>CMC Nurses (<i>n</i> = 18)</u>
Demographics	<i>n</i> (%)	<i>n</i> (%)
Sex		
Female	21 (95%)	16 (89%)
Age range		
20–30 years	13 (59%)	4 (22%)
31–40 years	6 (27%)	2 (11%)
41–50 years	2 (9%)	7 (39%)
51 + years	1 (5%)	5 (28%)
Ethnicity/Race		
Caucasian/White	20 (90%)	17 (94%)
Asian	1 (5%)	0
Black/African American	1 (5%)	0
Other	0	1 (6%)
Highest Nursing Degree		
Associate Degree	6 (27%)	12 (67%)
Bachelor's Degree	12 (73%)	6 (33%)
Years Employed at Workplace		
1–2	6 (27%)	2 (11%)
3–5	10 (46%)	9 (50%)
6–10	6 (27%)	6 (33%)
11–15	0	1 (6%)
Employment Status		
Full-time	17 (77%)	8 (44%)
OCN Certification		
Yes	5 (23%)	5 (28%)
	mean (<i>SD</i>)	mean (<i>SD</i>)
Years in Nursing Practice	4.73 (3.9)	9.5 (7.8)

Abbreviations: AMC, academic medical center; CMC, community medical center; OCN, Oncology Certified Nurse

Table 2

Mean Questionnaire Scores of Nurses by Medical Center

	<u>AMC Nurses (<i>n</i> = 22)</u>	<u>CMC Nurses (<i>n</i> = 18)</u>
	mean (<i>SD</i>)	mean (<i>SD</i>)
Nurse Characteristics		
EBP Beliefs	3.73 (0.46)	3.79 (0.48)
EBP Implementation	1.74 (0.83)	1.55 (0.45)
Previous Practices	4.19 (0.41)	4.18 (0.40)
Innovativeness	3.47 (0.57)	3.36 (0.54)
Unit Culture		
Existing Needs/Problems	3.40 (0.72)	3.27 (0.70)
Social System Norms	3.36 (0.61)	3.41 (0.48)

Abbreviations: AMC, academic medical center; CMC, community medical centerw