Canadian Journal of Nursing Research, 1996, Vol. 28, No. 2, 37-57

Evaluating a Pediatric Pain Management Research Utilization Program

Suzanne L. Howell, Roxie L. Foster, Nancy O. Hester, Carol P. Vojir, and Karen L. Miller

Les innovations fondées sur la recherche en matière d'évaluation et de gestion de la douleur ne sont pas entièrement utilisées dans la pratique clinique des sciences infirmières. De ce fait, les enfants continuent de souffrir malgré des stratégies qui pourraient faire cesser ou réduire de façon importante leur douleur. Un programme pédagogique a été élaboré et mis en place afin d'intégrer les stratégies les plus révolutionnaires d'évaluation et de gestion de la douleur dans la pratique clinique des infirmières en pédiatrie. L'article procède à une évaluation du processus d'utilisation de la recherche au cours de l'élaboration et de la mise en place du programme qui comportait des cours théoriques, l'élaboration d'instruments pour évaluer la douleur et la documenter, des consultations suivies sur les stratégies de gestion de la douleur et la nomination d'une infirmière-ressource du service. Les résultats ont éclairé le processus par lequel le personnel infirmier d'un service en vint à connaître de nouvelles idées, à essayer ces mêmes idées dans leur pratique clinique, à réinventer certaines stratégies afin de mieux satisfaire à leurs besoins et, enfin, à adopter des innovations qui se sont révélées utiles à leur travail.

Research-based pain assessment and management innovations are not fully utilized in clinical nursing practice. Thus children continue to suffer despite strategies that could eliminate or significantly reduce their pain. An educational program was developed and implemented to integrate state-of-the-art pain assessment and management strategies into the clinical practice of pediatric nurses. This article reports on evaluation of the research utilization process during development and implementation of the program. The program included formal classes, development of instruments for pain assessment and documentation, ongoing consultation on pain management strategies, and designation of a unit-based staff nurse liaison. Findings illuminated the process through which nursing staff on one unit came to learn about new ideas, try those ideas in their clinical practice, re-invent certain strategies to better meet their needs, and, ultimately, to adopt innovations deemed helpful in their work.

Suzanne L. Howell, Ph.D., R.N., is Assistant Professor, Roxie L. Foster, Ph.D., R.N., is Assistant Professor, Carol P. Vojir, Ph.D., and Karen L. Miller, Ph.D., R.N., F.A.A.N., are Associate Professors, and Nancy O. Hester, Ph.D., R.N., F.A.A.N., is Professor, in the School of Nursing of the University of Colorado Health Sciences Center, Denver. Requests for reprints should be sent to: Suzanne L. Howell, Ph.D., R.N., School of Nursing, Box C-288, University of Colorado Health Sciences Center, 4200 East Ninth Avenue, Denver, CO 80262, U.S.A.

The proliferation of studies on pain over the past decade has advanced a scientific base for assessing and managing pain of various etiologies across the life span. The ultimate goal of research is to facilitate the transfer of scientific knowledge to clinical practice, thus improving patient outcomes (Briones & Bruya, 1990; Buckwalter, 1992). However, research utilization is a complex process, and disparity between research and practice is a common problem in any discipline (Ferrell, Grant, & Rhiner, 1990; Lindquist, Brauer, Lekander, & Foster, 1990). Kirchhoff (1982, 1991) suggests that research utilization lags are predictable when knowledge transfer is left to passive means like professional guidelines, journal articles, and scientific meetings. As Owen (1985, p. 182) notes, "Research studies only tell us what *is*. They do not tell us what to *do* or *how* to do it!" Although the results of pediatric pain research have been disseminated widely, researchers have documented a significant lag in the utilization of clinically applicable findings (Clarke et al., 1996; Foster & Hester, 1990), which is apparent in continued reports of underassessment and undertreatment (Rømsing, Møller-Sonnergaard, Hertel, & Rasmussen, 1996; Tesler, Wilkie, Holzemer, & Savedra, 1994). Thus, children continue to suffer despite innovations that could reduce their pain.

To facilitate the transfer of research-based knowledge for assessing and managing children's pain into the daily practice of pediatric nurses, we designed an educational program using guidelines commissioned by the U.S. Agency for Health Care Policy and Research, *Acute Pain Management in Infants, Children, and Adolescents: Operative and Medical Procedures* (American Pain Management Guideline Panel, 1992). This article reports on evaluation of the research utilization process of the educational program, which is part of a larger study entitled *Effects of a Policy for Managing Children's Pain* (Hester, Foster, Vojir, & Miller, 1992-1996). Two authors (S.H. and R.F.) assumed primary responsibility for the educational program and are referred to as the program educators.

Background and Significance

Integration of research findings into everyday clinical practice requires an active, focused, and systematic effort. In a comprehensive literature review of studies carried out in an attempt to improve physicians' prescribing behaviour in ambulatory settings, Soumerai, McLaughlin, and Avorn (1989) concluded that while educational materials are an important component of the process of change, they are of little value when used as the sole means of changing practice. Ford, Hunter, Diehr, Frelick, and Yates (1987) studied the influence of physician-developed, site-specific patient management guidelines in 17 community hospital

oncology programs. Guidelines were disseminated to all hospital departments and physicians and, in some cases, to physicians in the community. Copies of guidelines were attached to charts of all newly diagnosed cancer patients. Notably, the research concluded that production and dissemination of guidelines had little effect on clinical practice. Similar results were obtained by surveying hospitals and obstetricians across Ontario before and after dissemination of national consensus statement guidelines on Caesarean delivery (Lomas et al., 1989). While 87 to 94% of obstetricians were aware of the guidelines and 82 to 85% agreed with them, the rates of Caesarean delivery performed by these practitioners differed only slightly from pre-guideline data.

To have an impact on the problem of unresolved pain in hospitalized children, information about pain assessment and management must be transmitted to health-care providers, parents, and the children themselves. However, Manion (1993) notes, "Successful innovation is not magic or something that just happens when the synergy is right" (p. 41). Integrating research-based innovations to the advantage of patient care requires a special, systematic team effort from the researchers, the potential users (practitioners), administrators, and educators (Backer, 1988; Backer, Liberman, & Kuehnel, 1986; Bohannon & LeVeau, 1986; Chalmer, 1974; Edwards-Beckett, 1990; Ferrell et al., 1990; Ford et al., 1987; Hunt, 1981; Kirchhoff, 1982; Manion; Newman et al., 1989; Norr, 1994; Owen, 1985; Parboosingh, Lockyer, McDougall, & Chugh, 1984).

Theoretical Framework

"The challenge for research utilization is to understand the environment in which application takes place and to invent and carry out systematic strategies that increase the chances for successful innovation transfer" (Backer, 1988, p. 19). Rogers's (1995) innovation-decision process model, which has been developed and refined over the last 30 years, has provided a comprehensive framework for developing the educational program, integrating research-based pain assessment and management skills into practice, and evaluating the research utilization process. Rogers identifies integration as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p. 3). Theoretically, the innovation-decision process, an information-seeking and information-processing activity, progresses in five stages: knowledge, persuasion, decision, implementation, and confirmation.

Knowledge means exposure to the innovation. To avoid rejection or discontinuance of the innovation, three knowledge types are essential for development of the educational program: **awareness**-knowledge motivates individuals to seek "**how-to**"-knowledge, whereas **principles**-knowledge addresses the underlying essentials upon which the innovation is based.

Persuasion details the formation of an attitude toward the innovation. A favourable attitude is more likely to develop if the innovation displays (a) a relative advantage over current practice, (b) compatibility with existing values, past experiences, and needs of adopters, (c) simplicity, and (d) observable results. Research underscores the salience of these principles for integrating research-based pain management into practice. For example, clinicians value and use innovations that show a *relative advantage* in patient care (Gawlinski & Rasmussen, 1984; Lindquist et al., 1990; Lockyer, Parboosingh, McDougall, & Chugh, 1985; Newman et al., 1989; Norr, 1994). *Compatibility* with existing values and needs was a significant variant in nurses' decision to adopt research findings in their clinical practice (Champion & Leach, 1989). The role of compatibility has also been reflected in studies documenting the importance of administrative support and recognition for innovation (Ferrel, Grant, Ritchey, Rapchan, & Riviera, 1993; Funk, Champagne, Wiese, & Tornquist, 1991; Gawlinski & Rasmussen). Innovation-compatability information is sought by most individuals from those of their near-peers whose subjective opinion of the innovation is most convincing. Rogers (1995) describes the necessity for a unit liaison person to assist in development and implementation of the program.

Other research documents the importance of tools that are *simple* and clearly stated (Newman et al., 1989). The importance of *observable* results has been cited less frequently but may have contributed to the success of Ferrell and colleagues (1993) in implementing a program to prepare resource nurses in cancer pain management.

Decision encompasses activities that lead to adoption or rejection of the innovation. The role of the clinical pilot can be critical to decision-making (Edwards-Beckett, 1990; Horsley, Crane, Crabtree, & Wood, 1983; Lindquist et al., 1990; Soumerai & Avorn, 1990). In our own research, unit-based pilot projects substantially refined methods employed in our development and implementation of this educational program (Hester et al., 1995).

Implementation occurs as participants actually put the innovation to use. Some uncertainty remains throughout this stage, and *re-inven-*

tion is an important phenomenon. Through re-invention the innovation is modified to better meet the adopters' needs. Re-invention facilitates pride of ownership and thus increases the likelihood that an innovation will become a stable element of practice.

Confirmation involves seeking reinforcement for the decision to adopt the innovation. If participants encounter conflicting messages about the innovation at this stage, they may reverse their decision. This stage also highlights the time element. A lag usually exists between initial awareness and eventual adoption or rejection. The time required for adoption may be the most significant constraint to incorporating research findings into clinical practice (Newman et al., 1989).

The Educational Program

We developed the educational program to enhance awareness among pediatric nurses of state-of-the-art children's pain assessment and management practices and to provide support in the process of adapting and adopting effective pain-relief strategies. The following five principles of the American Pain Management Guideline Panel (1992) provided direction for educational content: (a) obtain a pain history from the child and/or parents at admission, (b) assess pain at regular intervals, (c) measure the child's pain using self-report and/or observation tools, (d) manage children's pain using both pharmacologic and nondrug strategies, and (e) document information about pain and intervention responses.

Prior to development of the current program, a pilot project was conducted to determine the clinical feasibility of selected pediatric pain assessment and documentation instruments (Hester et al., 1995). The findings of the pilot project provided direction for further selection, refinement, and/or development of tools. With assistance from the hospital nursing administrators, the following children's pain-related instruments were approved by the institution as permanent medical records:

Pain Experience History (PEH), with parallel forms for child and parent, asks open-ended questions to assess the child's understanding of the word "pain," previous experiences of pain, ways of communicating pain, and preferences for treatment (American Pain Management Panel, 1992; Hester & Barcus, 1986).

Poker Chip Tool (PCT), a well-validated instrument, measures children's self-report of pain on a 0-to-4 scale using four red plastic chips

referred to as "pieces of hurt" (Hester, 1979; Hester, Foster, & Kristensen, 1990).

Pain Observation Scale (POS), a nine-item instrument to assess behavioural cues associated with pain, was developed for this program. Items include nurses' impression of overall pain and anxiety, pain associated with movement, and facial indicators of discomfort. Internal consistency was supported by Cronbach's alphas of .79 to .87. Concurrent validity correlations with the PCT averaged $r = 0.47$.

Pain Flow Sheet (PFS), also developed for this program, incorporates assessment date and time, child and/or parent pain ratings, nurse's judgement of pain intensity, and interventions administered (see Figure 1). The PFS is unique in providing a record of non-pharmacologic interventions used by nurses or parents, information that is usually poorly documented (Clarke et al., 1996).

The entire program was planned to occur over an 11-month period; six months for the focused educational program and five months for assisted implementation follow-up. Program development incorporated essentials from Rogers's (1995) innovation-decision process stages.

Knowledge

Over an eight-week period, the program educators delivered awareness-knowledge and how-to-knowledge content areas through five formal 30-minute classes conducted on the unit for all staff nursing personnel. Principles-knowledge, derived from the 1992 Federal AHCPR Guidelines, was integrated into all content areas. Classes were videotaped for nurses unable to attend at the scheduled times. The first class incorporated use of the PEH and the PFS. Nurses were asked to practise using the PFS by recording their judgements of children's pain intensity. Other sections of the PFS were incorporated in succeeding weeks to correspond with educational session content. Staff were given two weeks to implement the information from each class before the next formal educational session.

The second class addressed the gate-control theory (Melzack & Wall, 1965), pain management principles, and use of non-pharmacologic strategies. The third class included pharmacologic pain management principles, emphasizing pharmacokinetics and pharmacodynamics of frequently used opioids and nonopioids. The fourth class focused on instructing the nurses to use the POS. The fifth class focused on pain assessment using the PCT, the program educator incorporating a role-

Figure 1
Pain Flow Sheet

Time						
PCT-Child						
PCT Parent						
Child Pain Interview **1. Location?** **2. Want?**	**1.** **2.**	**1.** **2.**	**1.** **2.**	**1.** **2.**	**1.** **2.**	**1.** **2.**
Parent Pain Interview **1. Location?** **2. Want?**	**1.** **2.**	**1.** **2.**	**1.** **2.**	**1.** **2.**	**1.** **2.**	**1.** **2.**
Nurse Judge 0-4						
Analgesic						
Comfort Hold/Rock Stroke/Soothe Be with	**N** **P**	**N** **P**	**N** **P**	**N** **P**	**N** **P**	**N** **P**
Environment Temperature/Light Noise/Smell	**N** **P**	**N** **P**	**N** **P**	**N** **P**	**N** **P**	**N** **P**
Teach Pain concepts Cognitive/Behaviour Medications	**N** **P**	**N** **P**	**N** **P**	**N** **P**	**N** **P**	**N** **P**
Physical Position/Splint Heat/Cold Massage/TENS	**N** **P**	**N** **P**	**N** **P**	**N** **P**	**N** **P**	**N** **P**
Cognitive/Behaviour Music/Imagery Distract/Relax	**N** **P**	**N** **P**	**N** **P**	**N** **P**	**N** **P**	**N** **P**
Comments						

playing scenario to demonstrate comprehensive assessment, management, and documentation of children's pain.

Our goals were to prepare staff to use the information with their patients and to develop pain assessment and management aids that would be helpful in their clinical practice. Program educators responsible for the "how-to" implementation were on-site three to four days a week to role-model desired behaviours, consult with nursing staff, encourage discussions about nurses' experiences with the program, and reinforce examples of desired behaviour. The formal classes were supplemented by ongoing education in the form of posters, distraction materials (e.g., toys, books, music), case-study handout, and literature.

Persuasion

The program educators recognized the value of recruiting a unit-based nurse to function as liaison. Staff nurses participating in the study had sometimes been reluctant to question investigators about pain assessment and management protocols or to openly express issues and concerns. They were much more likely to be candid when one of their peers had been appointed staff nurse liaison and could then relay the information to the educators.

Decision, Implementation, and Confirmation

During these stages, the staff had opportunities to try out all aspects of the program with assistance from the program educators. The program educators also encouraged staff to exercise their option to decide what was helpful and what was not helpful in their own clinical situations, with assistance in using knowledge and re-inventing the instrument formats.

Evaluation Design and Methodology

Research utilization involves the implementation and evaluation of a proposed change in practice, systematically evaluated over time (Buckwalter, 1992). An evaluation to determine a time-ordered sequence of events (process) is quite different from an experimental design that investigates the expected impact of the innovation (independent variable) on patient outcomes (dependent variable) (Norr, 1994; Rogers, 1995). Process evaluation, which is most needed in the initial implementation phases of a recently developed program, is designed to describe a program, its effects, and how it is implemented, and to assure that a plan

is executed – or, if not, determine why it failed (Green & Lewis, 1986; Ingersoll, Bazar, & Zentner, 1993; King, Morris, & FitzGibbon, 1987; Mohr, 1992; Rossi & Freeman, 1993). When establishing an innovation in clinical practice, "it is essential to know whether it continues to be effective and how it is integrated into and affects the health care setting. Negative impacts affecting factors such as work efficiency, morale, or costs, especially if unanticipated, can lead to the abandonment of an otherwise promising innovation" (Norr, p. 109). The program educators anticipated that variations in the process of adopting (or rejecting) the innovation would be affected by interactions among themselves, the nursing staff, and the clinical agency. Congruent with Green and Lewis's view of process evaluation, key aspects were identifying and understanding the systematic and predictable variations within the pediatric unit while monitoring the integrity of program implementation.

Participants

Participants included all nursing personnel on the unit. When the program was begun, the staff comprised 11 RNs, nine licensed practical nurses (LPNs), and six nursing assistants (NAs). However, during the 11-month period, a total of 39 staff members (16 RNs, 11 LPNs, 12 NAs) participated in all or part of the program. To facilitate process evaluation during periods of substantial staff turnover, program educators identified a core staff group consistently assigned to the unit during the six-month implementation period: 12 RNs, seven LPNs, and two NAs ($n = 21$), ranging in age from 20 to 47 years ($M = 30$ years, $SD = 9.1$). Most participants were white; one was Hispanic; one was African-American. All but one RN held a baccalaureate degree in nursing. Years of employment as a nurse ranged from one to 28 years ($M = 7$ years, $SD = 8.4$).

Data Sources

Data generation was multi-method and multi-source. The following sources provided process evaluation data:

Anecdotal data were essential to developing a more comprehensive view of the innovation-decision process in the participants' own words. Informal interviews with nursing staff and patients and participant observation on the pediatric unit were planned to take place three to four times weekly throughout the course of the program. The program educators' field notes documented each encounter on the unit. Soon after the structured educational sessions had been completed, staff were

invited to anonymously submit written comments, via an informal open-ended survey, concerning the feasibility of implementing the program. Near the end of the program, additional formal, in-depth, tape-recorded interviews were held with the program educators, staff nurse liaison, and nursing administrators.

Study forms adopted by the unit as part of the medical record (PEH, POS, PFS) were completed in duplicate. The carbon copy was returned to the program educators for identification of pain assessment and management activity trends.

Feasibility Rating Scale (FRS), developed for this program, was used to anonymously query participants about the utility of this program for clinical practice. Items addressed nurses' perceptions of preparation through the five formal classes, helpfulness of pain assessment and management aids, efficacy of the pain management program, and positive and negative aspects of the program. (See Figure 2.) Additionally, for each content area, respondents were asked whether they had been prepared in class or via videotape. Content validity was established by expert review.

Focus group interview (conducted by an interviewer not involved with the educational program) was conducted near the end of implementation. Three staff nurses, whose anonymity was guaranteed, were asked, "How did this research program change your practice?" Focus group interviewing is an especially beneficial way to elicit prevailing philosophies, group norms, perceptions, and receptivity to the innovation (Green & Lewis, 1986; Kingry, Tiedje, & Friedman, 1990; Krueger, 1988; Norr, 1994).

Data analysis

Analysis of data generated for this study sought to inductively verify Rogers's (1995) innovation-decision model. Beginning with the existing model, the data were searched for examples of how the model applied to integration of this innovative program. Anecdotal and focus-group data were transcribed to facilitate chronological, content, and thematic analysis. Carbon copies of the PEH, POS, and PFS were coded for frequency of use.

Frequency distributions with measures of central tendency and standard deviations were used to portray feasibility rating patterns. Cronbach's alpha reliabilities were computed to estimate internal consistency of the FRS and subscales (Preparation, Helpfulness, and Efficacy). Comparative statistics were used, when appropriate, to suggest trends.

Figure 2

Feasibility Rating Scale

How well did each *class/videotape* prepare you to use the information with your patients?

	Not at all Prepared	Somewhat Prepared	Moderately Prepared	Completely Prepared
1. Pain Experience History and Pain Flow Sheet	1	2	3	4
☐ Participated in class				
☐ Viewed videotape				
☐ Have not completed				
2. Non-Pharmacologic Strategies	1	2	3	4
☐ Participated in class				
☐ Viewed videotape				
☐ Have not completed				
3. Pharmacologic Strategies	1	2	3	4
☐ Participated in class				
☐ Viewed videotape				
☐ Have not completed				
4. Observation of pain indicators	1	2	3	4
☐ Participated in class				
☐ Viewed videotape				
☐ Have not completed				
5. Poker Chip Tool	1	2	3	4
☐ Participated in class				
☐ Viewed videotape				
☐ Have not completed				

To what extent will the following aids to pain *assessment* be helpful in your practice?

	Not Helpful	Somewhat Helpful	Moderately Helpful	Very Helpful	Don't Know Haven't Used
6. Pain Experience History	1	2	3	4	?
7. New Staff-Revised Pain Flow Sheet	1	2	3	4	?
8. Poker Chip Tool	1	2	3	4	?

Figure 2 (cont'd)

Feasibility Rating Scale

To what extent will the following aids to pain *management* be helpful in your practice?

	Not Helpful	Somewhat Helpful	Moderately Helpful	Very Helpful	Don't Know Haven't Used
9. Class on analgesic administration	1	2	3	4	?
10. Class on non-drug approaches (e.g., distraction)	1	2	3	4	?
11. Distraction materials left on unit (e.g., toys books, music, Walkman)	1	2	3	4	?
12. Booklets about pain (e.g., Guidelines for Acute Pain Management, EMLA)	1	2	3	4	?
13. What Would You Do? Quiz	1	2	3	4	?

14. What did you need that you didn't have? _____

15. Have you needed assistance with any of the aids to pain assessment or management? ☐ No ☐ Yes, with _____

16. Was help available when you needed it?
☐ Yes ☐ No. Why? _____
☐ Not applicable

	No Increase	Some Increase	Moderate Increase	Great Increase
17. To what extent do you think this educational program has increased your effectiveness in *assessing* children's pain?	1	2	3	4
18. To what extent do you think this educational program has increased your effectiveness in *managing* children's pain?	1	2	3	4

	Not at all Beneficial	Somewhat Beneficial	Moderately Beneficial	Completely Beneficial
19. To what extent do you think this educational program has been beneficial for the children on your unit?	1	2	3	4

Figure 2 (cont'd)

Feasibility Rating Scale

	No Fit	Some Fit	Moderate Fit	Complete Fit
20. To what extent do you think this educational program fits in with existing unit policies?	1	2	3	4
21. To what extent do you think this educational program fits in with existing ways in which nurses on your unit practise?	1	2	3	4

22. What was the *best* part of this educational program?

_____

23. What was the *hardest* part of this educational program?

_____

24. Do you have any additional comments?

_____

Evaluation adequacy criteria

Guba and Lincoln (1989) established four criteria (credibility, dependability, confirmability, and transferability) for judging the adequacy of a process evaluation. *Credibility* refers to adequate representation and accurate interpretation of the participants' experiences. Persistent observation and prolonged engagement were used to identify and assess salient characteristics of the process. By maintaining contact with the unit staff over 11 months, the program educators built trust with some staff members, the staff nurse liaison, and administrators, and became familiar with the contexts of the implementation experiences of staff members. To strengthen credibility, data from multiple sources were compared and integrated.

Dependability meant that other program evaluators could reach similar conclusions from reading the analysis. *Confirmability* meant that the findings were determined by the participants and the study context, and not by the biases of the program educators (Guba & Lincoln, 1989). In follow-up interviews with the staff nurse liaison and selected administrators, the program educators clarified, validated, and elaborated their interpretations of staff experiences. The program educators also addressed dependability and confirmability by clearly documenting

their findings with data indicators so that others could reach comparable conclusions.

Transferability refers to the extent to which the findings have applicability in other contexts or with other participants. Although a process evaluation may be valid only for its participants, an accurate description of findings can predict processes and outcomes in similar situations.

Findings

Process evaluation focused on staff nurses' integration of the program into their pediatric practice and illuminated the conditions and experiences (both anticipated and unexpected) that affected their utilization of pain assessment and management strategies. Since findings support each of Rogers's (1995) five stages of innovation-decision, the theory provides a useful framework for presentation of findings.

Stage 1: Knowledge

Of the core group, 14 staff members (67%) (nine RNs, four LPNs, one NA) completed all five educational sessions; four (two RNs, two LPNs) finished four sessions; two (one RN, one LPN) completed three sessions; and the remaining NA finished two sessions. Fifteen core staff members (71%) completed the FRS. Reliabilities for the total scale and three subscales (Preparation, Helpfulness, and Efficacy) were strong (a = .94, .90, .84, and .93, respectively). On a four-point scale, with a higher number being a more positive response, the average Preparation subscale item mean was 3.0, or "moderately well prepared." Because staff members were expected to attend classes on their own time, often following a 12-hour shift, the majority obtained the information by viewing the videotaped sessions (range 60-87% per session). In comparison, independent group *t*-tests suggested no significant differences between ratings given by those who attended the class and those who viewed the videotape. However, given the small group numbers, results must be interpreted cautiously.

Anecdotal data further supported change, at this stage, in the innovation-decision process. For example, one nurse commented, "I've had an awful lot of nurses tell me they think [the program] has made them more aware and has brought more attention to pain." Staff also requested additional information about drugs (ketorolac, EMLA) and asked for case studies of pain problems. Themes emerging from comments on the FRS were increased knowledge and skills and increased understanding of the individualized nature of children's pain.

Stage 2: Persuasion

The program educators were surprised to encounter difficulties in communicating with unit staff. Many nurses on this unit were new baccalaureate nursing graduates who appeared intimidated by the older, more experienced educators. This made it difficult to impart information and elicit candid responses. Thus the staff nurse liaison, an enthusiastic young woman who was respected by her peers and by unit administrators, provided vital communication between staff and program educators, identified issues with program elements, and worked with educators to resolve problems as they developed.

Process evaluation data supported change at the level of Rogers's *persuasion* stage. On the FRS Helpfulness subscale, nurses were asked about the extent to which pain assessment and management aids made available through the program would be helpful to them in their practice. The average item mean on the Helpfulness subscale was 3.1 or "moderately helpful." The PEH received the highest rating for assessment aids ($M = 3.3$, $SD = .7$), while the distraction materials left on the unit ($M = 3.5$, $SD = .8$) and the class on analgesic medications ($M = 3.4$, $SD = .7$) received the highest ratings for pain management aids.

Further indicators of the process of change were provided by selected items on the FRS Efficacy subscale, which asked nurses the extent to which the program was beneficial for children on the unit and was compatible with existing unit policies and practices. The average Efficacy subscale item mean was 2.9, or "moderate," on four-point scales for each item. Ratings of the program's benefit for children were among the highest ($M = 2.9$, $SD = .9$). The benefit to children also emerged as a theme from written comments on the FRS.

Perceived benefit from pain management innovations appeared to be influenced in part by professional development. For example, one experienced nurse said she was familiar with the content of the education program because she had kept up with the literature. In contrast, unit administrators indicated that new graduates among the staff had benefited substantially.

Stage 3: Decision

This stage of the process was supported by evidence that staff were evaluating the innovation material and deciding which aspects were of value for their practice. Again, the FRS supplied important indicators. Selected items on the Efficacy subscale queried participants about the extent to which the educational program had increased their effective-

ness in assessing and managing children's pain: effectiveness in *managing* pain ($M = 2.7$, $SD = 1.0$) received the lowest rating, while effectiveness in *assessing* pain ($M = 2.9$, $SD = .8$) was among the highest.

Anecdotal data further supported change at this stage. For example, one nurse commented, "We're using a lot more distraction with the children and it really works." A unit administrator said, "I want you to know we're changing the PCA pump because of the questions you raised."

Stage 4: Implementation

During the implementation stage, staff nurses put the educational program to use on the unit. Evidence of use included carbon copies of the pain assessment and documentation forms (PEH, POS, and PFS); copies retrieved by the program educators provide only a conservative estimate of the forms used, since some copies may not have been recovered. Frequencies for use of the forms were compiled for the 15-week period immediately following the classes and for the 26-week period of the assisted implementation follow-up. Nurses' use of the tools in the 15 weeks following the classes was expected to be somewhat higher because of the educators' presence on the unit, whereas educators predicted that in the next 26-week period it would decline. Interestingly, overall usage of pain management forms increased by 77% in the follow-up period. Nurses used the forms with 58 children during the 15-week post-education period and with 178 children in the 26-week follow-up period. (Average census on this 25-bed pediatric unit was estimated to be 40-50%.) PEH usage increased 129% in the follow-up stage, whereas POS and PFS usage increased 7% and 16%, respectively.

Nurses' PEH and POS use surprised program educators, because these tools were among the most time-consuming aspects of the program. Apparently, the information obtained through these forms justified the time expenditure. For example, educators predicted that nurses who used the PEH would usually obtain data from the parent but omit the section requiring an interview with the child. However, PEH carbon copies revealed that nurses were seven times more likely to obtain historical data from both parent and child in the follow-up period than in the immediate post-education period. Nurses indicated the POS provided a systematic way to record observations they made routinely but rarely documented. Further, the tool was appropriate for preverbal and nonverbal children, a population for which assessment is much more difficult.

The length of time required to use the POS and PFS was addressed by staff nurses' re-invention of tool format. The staff nurse liaison and members of the unit staff collapsed categories within the POS and PFS to a new one-page flow sheet that included documentation of verbal report, behavioural assessment, and non-pharmacologic interventions. Other examples of re-invention were evident:

> I don't think we used the Poker Chip Tool as much as the educators would have liked. But I think we used that concept. I know one of the LPNs talked in report about a little post-op ortho patient and she had asked him how many "pieces" or how many "fingers" of pain he had. And so, we tried to do it that way; it wasn't so purely scientific – but we really tried to make it workable for us.

Stage 5: Confirmation

Change at the level of Rogers's (1995) confirmation stage became increasingly more evident in the year following completion of the educational program. Confirmation implies stability in the decision to adopt an innovation and can best be viewed through extended contact with the participants. One indicator of change at the level of confirmation is that unit staff continue to use the re-invented PFS. Additionally, two nurses who left the unit for positions in other locations requested permission from the educational team to implement the pain management program in their new locations. These are indicators of support for the stability of practice changes inspired by the educational program.

Discussion

The educational program to integrate into practice state-of-the-art children's pain assessment and management information produced changes that corresponded to a leading change theory (Rogers, 1995). Because few pain management intervention studies are recorded in the literature and fewer still incorporate a process evaluation component, this paper is among the first to document the manner in which nursing staff come to learn about, try out, and adopt or reject pain assessment and management innovations. Illumination of the change *process* can guide succeeding attempts to integrate pain management research into clinical practice.

This process evaluation highlighted several elements of change that were important to the success of the program. Designation of the pain assessment and documentation tools as official elements of the medical

record was a major impetus for change. The tool/record at once signified administrative support for the educational program and implied administrative intent to produce lasting change. By providing for documentation of assessment and management activities, each tool/record encouraged nurses to try the new strategies. Further, the fact that the tool/record eliminated the need for duplicate entries acknowledged nurses' concern for time constraints. A unit administrator said, "Having the forms might change practice even if it doesn't completely change attitudes." Notably, although the pain assessment, management, and documentation strategies of the educational program were integrated into care, staff nurses did not use the tools as frequently as the program educators had hoped.

The staff nurse liaison was a critical element in the process of change on this unit. Her enthusiasm for the project was infectious and her ready availability to staff encouraged them to experiment with all elements of the program. The designation of a staff nurse liaison communicated to staff the program educators' concern for their support in this process and encouraged open and honest communication about their feelings, concerns, and ideas. Unexpectedly, the liaison herself became an agent for change, initiating re-invention of the PFS in response to staff concerns about the large amount of paperwork. Thus the liaison role significantly enhanced the strength of the innovation.

Another key element in the success of this process of change was the willingness of the educators to let staff modify valid and reliable assessment instruments to better meet unit needs. Without Rogers's (1995) theory to illuminate the value of re-invention, we might have been less flexible. Re-invention was a critical factor in staff decisions to adopt the principles of pain assessment and management.

Interestingly, changes occurred on this unit despite substantial organizational changes. The unit was undergoing an unusually high rate of staff turnover and, during this time, the pediatric residency program closed, affecting the number and diagnostic mix of patients. Lowered census threatened job security, and staff morale suffered as a result. Evidence of change in light of organizational upheaval presents a compelling invitation for additional context-laden studies.

The authors wish to emphasize the long-term nature of clinical change. Although time constraints forced termination of our formal process evaluation, ongoing contact with several staff members leads us to conclude that this change is still in progress.

References

American Pain Management Guideline Panel. (1992). *Acute pain management in infants, children, and adolescents: Operative and medical procedures. Quick reference guide for clinicians.* AHCPR Pub. No. 92-0020. Rockville, MD: Department of Health and Human Services. Public Health Service, Agency for Health Care Policy and Research.

Backer, T.E. (1988). Research utilization and managing innovation in rehabilitation organizations. *Journal of Rehabilitation, 54*(2), 18-22.

Backer, T.E., Liberman, R.P., & Kuehnel, T.G. (1986). Dissemination and adoption of innovative psychosocial interventions. *Journal of Consulting and Clinical Psychology, 54*(1), 111-118.

Bohannon, R.W., & LeVeau, B.F. (1986). Clinicians' use of research findings. *Physical Therapy, 66*(1), 45-50.

Briones, T., & Bruya, M.A. (1990). The professional imperative: Research utilization in the search for scientifically based nursing practice. *Focus on Critical Care, 17*, 78-81.

Buckwalter, K.C. (1992). Research utilization awards: Utilization versus dissemination? *Reflections, 18*, 8.

Chalmer, T.C. (1974). The impact of controlled trials on the practice of medicine. *Mt. Sinai Journal of Medicine, 41*, 753-759.

Champion, V.L., & Leach, A. (1989). Variables related to research utilization in nursing: An empirical investigation. *Journal of Advanced Nursing, 14*, 705-710.

Clarke, E.B., French, B., Bilodequ, M.L., Caspasso, V.C., Edwards, A., & Empoliti, J. (1996). Pain management knowledge, attitudes and clinical practice: The impact of nurses' characteristics and education. *Journal of Pain and Symptom Management, 11*(1), 18-31.

Edwards-Beckett, J. (1990). Nursing research utilization techniques. *JONA, 20*(11), 25-30.

Ferrell, B.R., Grant, M.M., & Rhiner, M. (1990). Bridging the gap between research and practice. *Oncology Nursing Forum, 17*, 447-448.

Ferrell, B.R., Grant, M., Ritchey, K.J., Ropchan, R., & Rivera, L.M. (1993). The pain resource nurse training program: A unique approach to pain management. *Journal of Pain and Symptom Management, 8*(8), 549-556.

Ford, L.G., Hunter, C.P., Diehr, P., Frelick, R.W., & Yates, J. (1987). Effects of patient management guidelines on physician practice patterns: The community hospital oncology program experience. *Journal of Clinical Oncology, 5*(3), 504-511.

Foster, R.L., & Hester, N.O. (1990). The relationship between pain ratings and pharmacologic interventions for children in pain. *Advances in pain research and therapy*, Vol. 15 (pp. 31-36). New York: Raven Press.

Funk, S.G., Champagne, M.T., Wiese, R.A., & Tornquist, E.M. (1991). Barriers: The barriers to research utilization scale. *Clinical Methods, 4*, 39-45.

Gawlinski, A., & Rasmussen, S. (1984). Improving documentation through the use of change theory. *Focus on Critical Care, 11*, 12-17.

Green, L.W., & Lewis, F.M. (1986). *Measurement and evaluation in health education and health promotion*. Palo Alto, CA: Mayfield.

Guba, E.G., & Lincoln, Y.S. (1989). *Fourth generation evaluation*. Newbury Park, CA: Sage.

Hester, N.O. (1979). The preoperational child's reaction to immunizations. *Nursing Research, 28*, 250-254.

Hester, N.O., & Barcus, C.S. (1986). Assessment and management of pain in children. *Pediatrics: Nursing Update, 1*(14), 1-8.

Hester, N., Foster, R., Johnson, C., Howell, S., Cleaveland, M.J., Wood, S., Stevens, R., & Jones, J. (1995). Changing practice through a pain assessment and documentation program: Clinical issues. In S.G. Funk, E.M. Tornquist, M.T. Champagne, L.A. Copp, & R.A. Wiese (Eds.), *Key aspects of caring for the acutely ill: Technological aspects, patient education, and quality of life* (pp. 163-178). New York: Springer.

Hester, N.O., Foster, R.L., & Kristensen, K.L. (1990). Measurement of pain in children: Generalizability and validity of the Pain Ladder and the Poker Chip Tool. *Advances in pain research and therapy*, Vol. 15 (pp. 79-84). New York: Raven Press.

Hester, N.O., Foster, R.L., Vojir, C.P., & Miller, K.L. (1992-1996). *Effects of a policy for managing children's pain*. Grant funded by NIH, NINR, #R01 NR02919.

Horsley, J.A., Crane, J., Crabtree, M.K., & Wood, D.J. (1983). *Using research to improve nursing practice: A guide*. New York: Grune & Stratton.

Hunt, J. (1981). Indicators for nursing practice: The use of research findings. *Journal of Advanced Nursing, 6*, 189-194.

Ingersoll, G.L., Bazar, M.T., & Zentner, J.B. (1993). Monitoring unit-based innovations: A process evaluation approach. *Nursing Economics, 11*, 137-143.

King, J.A., Morris, L.L., & FitzGibbon, C.T. (1987). *How to assess program implementation*. Newbury Park, CA: Sage.

Kingry, M.J., Tiedje, L.B., & Friedman, L.L. (1990). Focus groups: A research technique for nursing. *Nursing Research, 39*, 124-125.

Kirchhoff, K.T. (1982). A diffusion survey of coronary precautions. *Nursing Research, 31*(4), 196-201.

Kirchhoff, K.T. (1991). Who is responsible for research utilization? *Heart and Lung, 20*, 308-309.

Krueger, R.A. (1988). *Focus groups: A practical guide for applied research*. Newbury Park, CA: Sage.

Lindquist, R., Brauer, D.J., Lekander, B.J., & Foster, K. (1990). Research utilization: Practical considerations for applying research to nursing practice. *Focus on Critical Care AACN, 17*, 342-347.

Lockyer, J.M., Parboosingh, J.T., McDougall, G.M., & Chugh, U. (1985). How physicians integrate advances into clinical practice. *MOBIUS, 5*(2), 5-12.

Lomas, J., Anderson, G.M., Domnick-Pierre, K., Vayda, E., Enkin, M.W., & Hannah, W.J. (1989). Do practice guidelines guide practice? The effect of a consensus statement on the practice of physicians. *New England Journal of Medicine, 321*(19), 1306-1311.

Manion, J. (1993). Chaos or transformation? Managing innovation. *JONA, 23*(5), 41-48.

Melzack, R., & Wall, P.D. (1965). Pain mechanisms: A new theory. *Science, 150*, 971- 979.

Mohr, L.B. (Ed.). (1992). *Impact analysis for program evaluation.* Newbury Park, CA: Sage.

Newman, L.S., Beattie, S., Harris, A.M., Farrar, J., Simko, L.M., & Appel-Hardin, S. (1989). Critical care voices: Application of research in clinical practice. *Dimensions of Critical Care Nursing, 8*, 364-365.

Norr, K. (1994). Using quantitative and qualitative methods to assess impact on practice. In E.V. Dunn, P.G. Norton, M. Stewart, F. Tudiver, & M.J. Bass (Eds.), *Disseminating research/changing practice* (pp. 109-126). Thousand Oaks, CA: Sage.

Owen, G.M. (1985). Janforum: Innovation in nursing – the role of higher education in relation to nursing practice. *Journal of Advanced Nursing, 10*, 179-183.

Parboosingh, I.J.T., Lockyer, J.M., McDougall, G.M., & Chugh, U. (1984). How physicians integrate advances into clinical practice. *MOBIUS, 5*(2), 5-12.

Rogers, E.M. (1995). *Diffusion of innovations* (4th ed.). New York: Free Press.

Rømsing, J., Møller-Sonnergaard, J., Hertel, S., & Rasmussen, M. (1996). Postoperative pain in children: Comparison between ratings of children and nurses. *Journal of Pain and Symptom Management, 11*(1), 42-46.

Rossi, P.H., & Freeman, H.E. (Eds.) (1993). *Evaluation: A systematic approach* (5th ed.). Newbury Park, CA: Sage.

Soumerai, S.B., & Avorn, J. (1990). Principles of educational outreach ("academic detailing") to improve clinical decision making. *Journal of the American Medical Association, 263*(4), 549-556.

Soumerai, S.B., McLaughlin, T.J., & Avorn, J. (1989). Improving drug prescribing in primary care: A critical analysis of the experimental literature. *Milbank Quarterly, 67*(2), 268-317.

Tesler, M.D., Wilkie, D.J., Holzemer, W.L., & Savedra, M.C. (1994). Postoperative analgesics for children and adolescents: Prescription and administration. *Journal of Pain and Symptom Management, 9*(2), 85-95.

Acknowledgements

Grant funded by NIH, NINR, #R01 NR02919

Date accepted: June 1996