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Influence of Organizational Characteristics and Context on Research Utilization

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▶ ***Background:*** Despite three decades of empirical investigation into research utilization and a renewed emphasis on evidence-based medicine and evidence-based practice in the past decade, understanding of factors influencing research uptake in nursing remains limited. There is, however, increased awareness that organizational influences are important.

▶ ***Objectives:*** To develop and test a theoretical model of organizational influences that predict research utilization by nurses and to assess the influence of varying degrees of context, based on the Promoting Action on Research Implementation in Health Services (PARIHS) framework, on research utilization and other variables.

▶ ***Methods:*** The study sample was drawn from a census of registered nurses working in acute care hospitals in Alberta, Canada, accessed through their professional licensing body (n = 6,526 nurses; 52.8% response rate). Three variables that measured PARIHS dimensions of *context* (culture, leadership, and evaluation) were used to sort cases into one of four mutually exclusive data sets that reflected less positive to more positive context. Then, a theoretical model of hospital- and unit-level influences on research utilization was developed and tested, using structural equation modeling, and 300 cases were randomly selected from each of the four data sets.

▶ ***Results:*** Model test results were as follows—low context: χ^2 = 124.5, df = 80, $p < .001$; partially low: χ^2 = 144.2, $p < .001$, df = 80; partially high: χ^2 = 157.3, df = 80, $p < .001$; and partially low: χ^2 = 146.0, df = 80, $p < .001$. Hospital characteristics that positively influenced research utilization by nurses were staff development, opportunity for nurse-to-nurse collaboration, and staffing and support services. Increased emotional exhaustion led to less reported research utilization and higher rates of patient and nurse adverse events. Nurses working in contexts with more positive culture, leadership, and evaluation also reported significantly more research utilization, staff development, and lower rates of patient and staff adverse events than did nurses working in less positive contexts (i.e., those that lacked positive culture, leadership, or evaluation).

▶ ***Conclusion:*** The findings highlight the combined importance of culture, leadership, and evaluation to increase research utilization and improve patient safety. The findings may serve to strengthen the PARIHS framework and to suggest that, although it is not fully developed, the framework is an appropriate guide to implement research into practice.

▶ ***Key Words:*** context · hospital characteristics · PARIHS framework · research utilization · structural equation modeling

The need for theory to guide the choice of interventions that enhance research uptake in clinical practice is debated currently in the evidence-based practice literature. There are claims that the usefulness of implementation research is limited without underlying theory to propose which factors affect research utilization and how context influences both these factors and research utilization (Eccles, Grimshaw, Walker, Johnston, & Pitts, 2005). In this view, theory is necessary to examine thoughtfully the black box of implementation and to increase the understanding of how and why an intervention works (or not). Also there are claims that, rather than theory, common sense and more rigorous evaluations are needed to measure important outcomes (Oxman, Fretheim, & Flottorp, 2005). However, well-developed and tested theory is necessary to advance the study of research utilization. Many studies have shown that uptake of research findings in routine healthcare is an unpredictable process with haphazard outcomes (Bero et al., 1998; Grol, 2001; Thomas et al., 1998; Wallin, Bostrom,

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Harvey, Wikblad, & Ewald, 2000). What works in one setting does not necessarily work in another—a situation often attributed to contextual conditions that manifest in the specific setting (Dopson, FitzGerald, Ferlie, Gabbay, & Locock, 2002; Grol & Grimshaw, 2003; Kitson, Harvey, & McCormack, 1998).

The most recent systematic review of guideline implementation, where only 10% of included studies provided an explicit theoretical rationale for the intervention being evaluated (Grimshaw et al., 2004), supports claims that investigators use too little theory in this field. Authors of an earlier systematic review of nursing studies also found that theoretical underpinnings were uncommon (Estabrooks, Floyd, Scott-Findlay, O'Leary, & Gushta, 2003). In the study reported here, existing research utilization theory in nursing is extended by developing and testing a theoretical model. Specific goals were to (a) hypothesize a model of hospital characteristics that predict research utilization among nurses and (b) estimate this model using data sets reflecting four contexts (from less positive to more positive), defined by the Promoting Action on Research Implementation in Health Services (PARIHS) framework (McCormack et al., 2002).

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Literature Review

The history of nurse researchers contributing to the research utilization literature began in the 1970s, with marked increases in the production of empirical work since the 1990s (Estabrooks, Winther, & Derksen, 2004). In a synthesis of this literature, three general areas of research activity were identified: (a) descriptions of research utilization models, (b) studies examining individual determinants of research use, and (c) studies examining organizational characteristics influencing research use. Much of this literature is reviewed in earlier papers in this supplement (Estabrooks, Midodzi, Cummings, & Wallin), as well as extensive reviews in earlier published work (e.g., Estabrooks, Chong, Brigidear, & Profetto-McGrath, 2005; Estabrooks et al., 2003; Estabrooks, Rutakumwa et al., 2005; Meijers et al., 2006). This literature suggests that individual studies on research utilization in nursing have been based predominantly on bivariate correlational designs, therefore not accounting for interactions among factors influencing research utilization or permitting causal assertions. Advanced modeling of relationships among organizational characteristics, individual characteristics, and research utilization is necessary to understand better which factors influence research uptake in practice and to enable assertion of hypothesized causal mechanisms necessary to design robust research utilization interventions. In this presentation, only literature that describes research utilization models linked to the hypothesized model under investigation in this study is addressed.

Models of Research Utilization

More than 25 research utilization or evidence-based practice models are published in nursing, among them are the following: Conduct and Utilization of Research in Nursing (Horsley, Crane, & Bingle, 1978), Goode (Goode, Lovett, Hayes, & Butcher, 1987), Iowa model of research in practice (Titler et al., 1994), Ottawa model of research use (Logan & Graham, 1998), collaborative research utilization model (Dufault, 1995), Stetler/Marram model for application of research findings in practice (Stetler, 2001), and the framework for dissemination and utilization of research for healthcare policy and practice (Dobbins, Ciliska, Cockerill, Barnsley, & DiCenso, 2002). Generally, these models were developed to guide research implementation activities in clinical practice, not to test research frameworks that predict research use. Developing testable hypotheses from these models about relationships between various factors and research utilization is difficult. Consequently, few studies report model effectiveness, either to achieve more research use in practice or to identify predictors of research utilization. Many, if not all, of these models address individual factors influencing nurses' utilization of research (e.g., Titler et al., 1994). However, researchers (e.g., Stetler, 2003) have called for greater emphasis on organizational influences, such as leadership support for evidence-based practice culture, and organizational capacity and infrastructure to engage and sustain evidence-based practice.

Greenhalgh, Robert, Macfarlane, Bate, and Kyriakidou (2004) completed an extensive systematic review and developed a conceptual model of determinants of diffusion, dissemination, and implementation of innovation in health service delivery. Although innovation is a broader concept than research findings, this model offers information on a range of components of interest for research uptake in practice (e.g., innovation, adopter, system, and implementation process). The authors emphasized that "most studies concentrated on a few of the components in our depicted model and failed to take account of their different interactions and contextual and contingent features" (Greenhalgh et al., 2004, p. 614).

The PARIHS framework (Kitson et al., 1998; Rycroft-Malone et al., 2002) has gained attention recently and has been used as a theoretical framework in several studies (Owen & Milburn, 2001; Sharp, Pineros, Hsu, Starks, & Sales, 2004; Wallin, Profetto-McGrath, & Jo Levers, 2005). The PARIHS group argues that three major elements influence research implementation: (a) the nature of *evidence* used, (b) the quality of the *context* to cope with change, and (c) the type of *facilitation* needed to ensure successful change. *Evidence* is proposed to be constituted by the knowledge generated from four different sources: research, clinical experience, patients, and local context. The melding of these evidence bases occurs within a complex and multifaceted clinical environment (Rycroft-Malone et al., 2004).

The PARIHS group further defined *context* as "the environment or setting in which the proposed change is to be implemented" (Kitson et al., 1998, p. 150), arguing that context is composed of three dimensions: culture, leadership, and evaluation. These dimensions include a value-oriented learning *culture* that is receptive to change; clear, transformational *leadership* that supports teamwork and staff involvement in decision making; and *evaluation* of various levels of performance with effective feedback mechanisms using multiple methods (McCormack et al., 2002). In earlier work, a direct relationship was observed between positive contexts (reflecting positive culture, leadership, and evaluation) and research utilization among nurses, when context was measured according to PARIHS. The more positive the context, the higher the levels of reported research utilization (Wallin, Estabrooks, Midodzi, & Cummings, 2006).

The third major element—*facilitation*—can take various forms, varying from "providing help and support to achieve a specific goal to enabling individuals and teams to analyze, reflect and change their own attitudes, behaviors and ways of working" (Harvey et al., 2002, p. 580). A facilitator can be characterized as a change agent who predominantly uses a problem-solving, participatory, and enabling approach instead of prescribing and directing a set of actions. A recent qualitative work by Stetler et al. (2006) reported facilitation as a deliberate process of interactive problem solving and support through specific implementation interventions.

The purpose for undertaking this study was twofold: first, to develop and test a theoretical model of organizational influences on research utilization; and second, to assess the influence of less positive to more positive contexts on research utilization and other variables. In the first case, the following hypothesis was tested:

> H_1: $\Sigma = S$, where Σ is the covariance matrix implied by our theoretical model in Figure 1 and S is the corresponding estimated sample covariance matrix.

The final estimated model is presented in Figure 2. In the second case, the interest was not only in relationships among context groups, research utilization, and other outcomes but also in what could be learned about underlying causal mechanisms by which context exerts a differential influence on both predictors and outcomes in the models. Exploratory techniques were used to understand these relationships, and the products of those explorations are represented in a series of graphs in Figures 3–5.

Methods

Sample

Secondary data from the 1998 Alberta Registered Nurse (ARN) study, a component of the larger International Hospital Outcomes Study (Aiken et al., 2001), were used for analysis. Detailed descriptions of the survey are published elsewhere (Giovannetti, Estabrooks, & Hesketh, 2002).

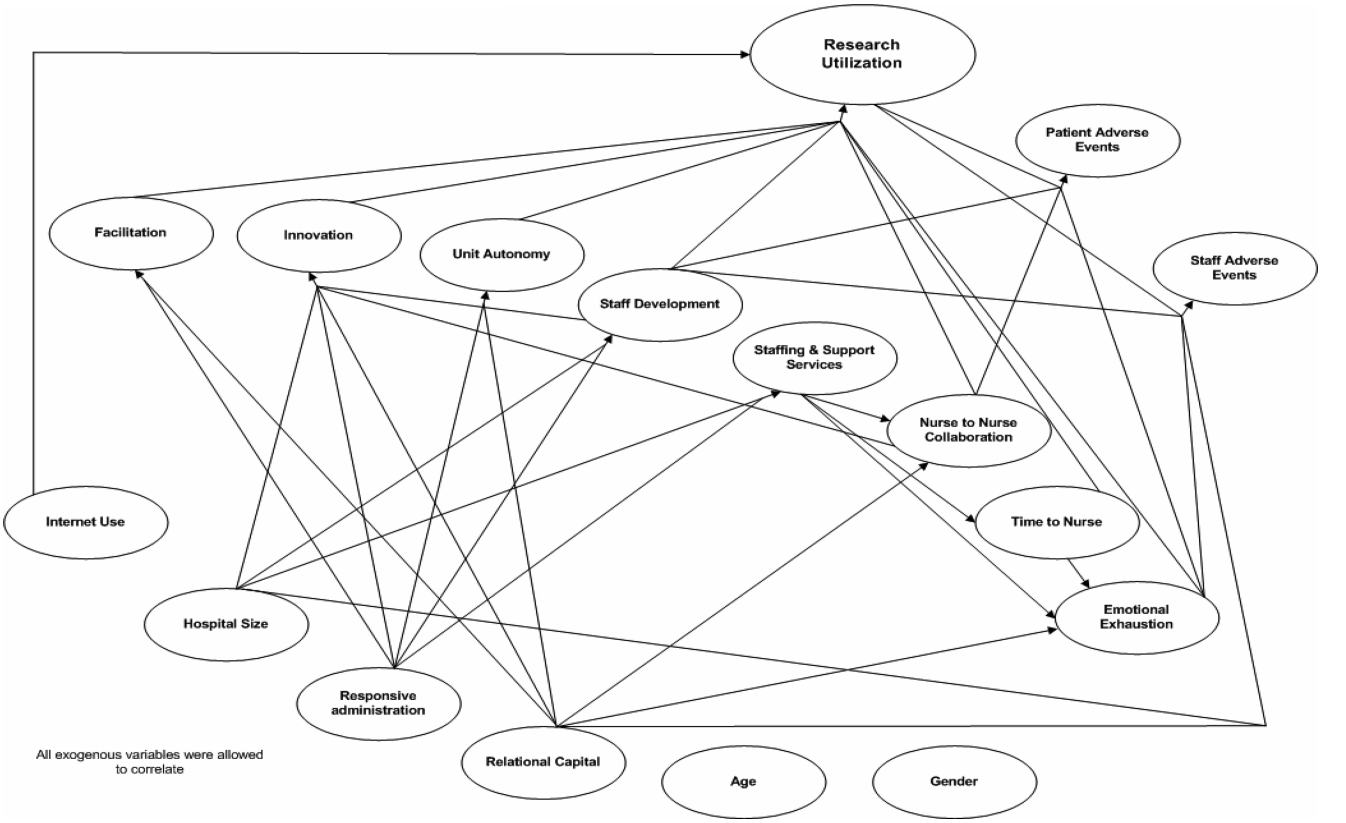

FIGURE 1. Initial estimated theoretical model. Age and gender were included as implicit control variables, where the absence of specification of effects and the absence of required model modification insertion of effects render these as statistically controlled variables.

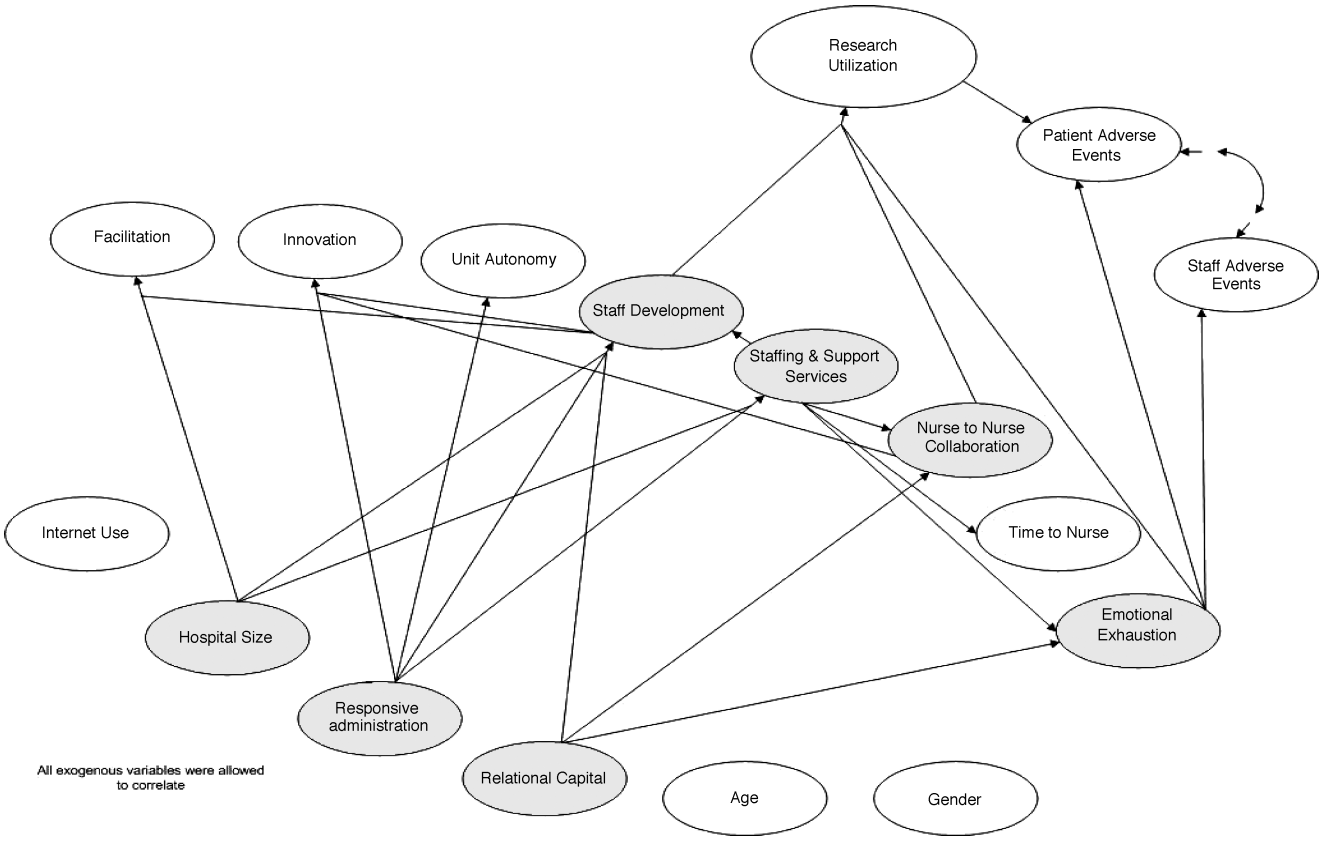

FIGURE 2. Final estimated theoretical model. Highlighted concepts are direct and indirect predictors of research utilization. Four modification-index-induced effects/coefficients were added to the original model. Only significant effects have been portrayed for simplicity, although all effects in the original model plus the additional four effects were estimated in this final model.

This study was a cross-sectional census survey of 12,332 registered nurses working in Alberta hospitals between September 1998 and February 1999. Of these, 6,526 useable questionnaires were returned, for a 52.8% response rate. The ARN survey was focused on different aspects of nursing work life, including work environment, structure, staffing, professional burnout, job satisfaction, quality of care, and workplace violence. Information on the following was collected: individual nurse characteristics; hospital structure, organization, and environment; and nurses' perception of the impact of these factors on patient care. The sample of registered nurses from the 1998 ARN database included all cases with no missing data on all study variables (n = 3,701). The characteristics of the sample were the following: mean age = 39.85 years (SD = 9.09 years); mean years of nursing experience = 15.2 (SD = 8.92); full-time status = 65.9%; baccalaureate education = 24.2%; and female = 97.6%. None of these varied significantly from the full 1998 ARN data set.

Development of Study Data Sets

The PARIHS description of *context* was used to create distinct data sets reflecting varying degrees of context. First, three survey items were chosen from the Nursing Work Index-Revised (Aiken & Patrician, 2000) in the ARN Survey that best reflected culture, leadership, and evaluation. Culture was operationalized by "freedom to make important patient care and work decisions"; leadership, by "a nurse manager or immediate supervisor who is a good leader or manager"; and evaluation, by "praise and recognition for a job well done." These items were scored originally on a 4-point Likert-type scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *agree*, 4 = *strongly agree*). Cases reporting *strongly disagree* or *disagree* were grouped into a low category, and *agree* or *strongly agree*, into a high category for each variable. The three variables were then placed onto a three-dimensional grid, with culture on the y-axis, leadership on the x-axis, and evaluation on the z-axis. This resulted in eight conceptually unique degrees of context, ranging from low to high on all three dimensions. Then, based on each nurse's responses to these three survey items, that nurse's data were placed into one of these eight groups (akin to a three-dimensional scatterplot), thereby creating eight discrete data sets reflecting varying degrees of contextual conditions, with no overlap of cases among them.

To obtain reasonably similar sample sizes in each data set and parsimonious theoretical distinction between data sets, the eight data sets were collapsed into four: one with high scores on all three contextual dimensions (culture, leadership, and evaluation; high); a second with high scores on two of three contextual dimensions (partially high); a third with high scores on only one of three dimensions (partially low); and a fourth with only low scores on all three contextual dimensions (low). These four groups were statistically different from each other when research utilization was compared among them using the Tukey pairwise

TABLE 1. Means (*SD*) of Three Variables Used to Distinguish Four Contexts

Variables	Low context[a]	Partially low context[b]	Partially high context[c]	High context[d]
Sample size (*n*)	622	1,060	1,008	1,011
Culture	1.74 (0.438)	2.42 (0.694)	2.93 (0.507)	3.24 (0.426)
Leadership	1.50 (0.500)	2.38 (0.927)	3.08 (0.690)	3.54 (0.499)
Evaluation	1.33 (0.472)	1.63 (0.590)	2.12 (0.713)	3.22 (0.416)

Note. All variables were recoded as necessary to ensure that the highest value reported more or a greater intensity of the term used to define and label the variable. The means were calculated on the recoded 4-point Likert scale: 1 = *strongly disagree*, 2 = *disagree*, 3 = *agree*, and 4 = *strongly agree.*
[a]Nurses in the low context group reported a work context reflecting none of the distinguishing dimensions. [b]Nurses in the partially low context group reported a work context reflecting one of the three distinguishing dimensions. [c]Nurses in the partially high context group reported a work context reflecting two of the three distinguishing dimensions. [d]Nurses in the high context group reported that their work context reflected all three distinguishing dimensions.

comparison in analysis of variance test. As expected given these procedures, the linear trend in the means of the variables defining the four data sets in Table 1 is obvious; however, the means, standard deviations, and sample sizes of the four data sets are presented for clarity. To further ensure comparability among the four data sets, 300 cases were sampled randomly from each group for final analysis using simple random sampling with equal probability of inclusion for each case. In structural equation modeling, a sample of 200 cases is usually sufficient for estimation and testing (Boomsman, 1987; Hu & Bentler, 1995), so the 300 cases per context group provided a comfortable formulation for model estimation.

Model Development

The process of developing a theoretical model to portray causal relationships from hospital variables (causal latent variables) to nursing unit characteristics (intervening variables) and then in turn to nurses' research utilization and staff and patient adverse events (outcome variables) was guided by the PARIHS framework, the literature, previous research, and administrative experience. Use of the secondary data constrained which components of the PARIHS framework could be measured. There were no data to measure evidence and only one indicator of facilitation. Therefore, the analysis was focused on examining the influence of context on nurses' research utilization. An illustration of the initial theoretical model is presented in Figure 1.

Latent concepts. Causal latent concepts included three hospital characteristics (responsive administration, relational capital, and hospital size) and three nurse demographic variables (use of the Internet, gender, and age). Responsive administration was defined as an administration that listens and responds to staff concerns. Relational capital was defined as a combination of positive and collaborative working relationships among staff who work together across departments and programs (physicians, registered and licensed practical nurses, and unlicensed assistive personnel). Age and gender were included in the background variables purely as controls.[1] Outcome variables were nurses' research utilization, patient adverse events, and staff adverse events. Intervening variables were focused on six unit-level concepts: staff development (opportunities and programs), unit autonomy, staffing and support services, (opportunities for) nurse-to-nurse collaboration, (support for) innovation, and facilitation, and on two individual nurse-level concepts: time to nurse (contrasted with time spent on nonnursing duties) and emotional exhaustion. Innovation was measured from a Likert response (4 = *strongly agree* to 1 = *strongly disagree*) to whether support for new and innovative ideas about patient care was present in their current job. Facilitation was measured (using the same Likert scale) on whether opportunity for staff to consult with clinical nurse specialists or expert nurse clinicians/educators was present in their current job.

Measurement indicators. Each latent concept in the theoretical model was indexed to a single indicator from the ARN survey, some of which were developed from a scale or the mean of several variables. Survey items used to operationalize each latent concept are presented in Table 2. The derivation and validation procedures of the research utilization score are reported elsewhere and are summarized (see Figure 1 in Estabrooks' article in this supplement). In summary, the regression coefficients of predictor variables available in a similar 1996 ARN survey were mapped to the 1998 ARN survey as a dependent variable to create a research utilization score for each case in the 1998 ARN survey. The derived research utilization scores ranged from 2 to 20; the highest score indicated more research utilization in practice, and lower scores indicated less research utilization in clinical practice. In that analysis, scores were standardized about the sample mean. The central score was 0, representing average research usage in the study sample. Positive (or negative) scores indicated research utilization above (or below) the sample population average (Wallin et al., 2006).

Based on the judgment of how accurately each indicator reflected its corresponding underlying latent concept, an adjustment was made for the quality of each

[1]Two conditions have to be met for a control variable to alter the effect estimate of another predictor variable: The control variable must be correlated with that other predictor variable and must be causally effective at producing the dependent variable (Hayduk, 1987, pp. 46–48). Age and gender were asserted to have no effects (thereby excluding one of the "necessary conditions"), and it was verified that there was no stable indication of effects via the modification indices attached to these fixed zero effects.

TABLE 2. Measurement Error Specification for Latent Variables in the Structural Equation Model

	Latent variable	Survey item(s)	% Assessed as measurement error	Variance (high context)*	Measurement error variance (high context)
Intervening variables	1. Facilitation	Opportunity for staff to consult with clinical nurse specialists or expert nurse clinicians/educators (4-point Likert scale)	10	0.719	0.072
	2. Innovation	Support for innovative ideas (4-point Likert scale)	5	0.398	0.020
	3. Staffing and support services	Mean of responses to two questions (4-point Likert scale) Adequate support services allow me to spend time with my patient. Enough staff to get the work done	10	0.504	0.050
	4. Unit autonomy	Each patient care unit determines its own policies and procedures (4-point Likert scale).	5	0.704	0.035
	5. Nurse-to-nurse collaboration	Enough time and opportunity to discuss patient care problems with other nurses (4-point Likert scale)	20	0.556	0.111
	6. Time to nurse	Sum of positive responses to eight questions Which of the following tasks did you perform during your last shift? 1. Delivering and retrieving food trays 2. Ordering, coordinating, or performing ancillary services (e.g., physio and ordering laboratory work) 3. Starting IVs 4. Arranging discharge referrals and transportation (including to nursing homes) 5. Performing ECGs 6. Routine phlebotomy 7. Transporting of patients 8. Housekeeping duties (e.g., cleaning patient rooms)	10	3.411	0.341
	7. Emotional exhaustion (These items represent one of the sub scales of the Maslach Burnout Inventory which is a copyrighted scale.)	Maslach Burnout Inventory Emotional Exhaustion subscale (mean of responses; 0 = *never* to 6 = *everyday*) Example item: I feel frustrated by the job	15	1.159	0.174
	8. Staff development	Mean of responses to three questions (4-point Likert scale) A good orientation program for newly employed nurses Active staff development or continuing education program for nurses A preceptor program for newly hired RNs	10	0.360	0.036
Outcome variables	9. Research use	Individual derived scores of research utilization	20	0.660	0.132
	10. Patient adverse events	Mean of responses to four questions asking occurrence (4-point scale: *never* to *frequently*) Patient received wrong medication or dose Nosocomial infections Complaints from patients or their families Patients fall with injuries.	5	0.375	0.019

(*continues*)

TABLE 2. (continued)

	Latent variable	Survey item(s)	% Assessed as measurement error	Variance (high context)*	Measurement error variance (high context)
	11. Staff adverse events	Mean of responses to two questions (4-point scale: *never* to *frequently*)	5	0.528	0.026
		Work-related injuries to employees			
		Incidence of verbal abuse directed toward RN			
Causal variables	1. Use of the Internet	How many hours per week in total would you spend on the Internet getting information that would assist you in your practice? (hours)	10	0.728	0.073
	2. Age, years	What is your age (in years)?	1	88.445	0.884
	3. Gender	What is your gender (male/female)?	1	0.013	< 0.001
	4. Responsive administration	Administration that listens and responds to staff concerns (4-point Likert scale)	10	0.541	0.054
	5. Relational capital	Mean of responses to four questions (4-point Likert scale)	5	0.198	0.010
		Physicians and nurses have good working relationships.			
		Good working relationships with other hospital departments or programs			
		RNs and LPNs have good working relationships			
		RNs and UAP have good working relationships.			
	6. Hospital size	Log_e (number of beds)	10	1.551	0.155

Note. ECG = electrocardiogram; UAP = unlicensed assistive personnel.
*The same procedure for calculating measurement error was completed for each context. Measurement error is the product of the assessed percentage and the variance of the variable obtained from the covariance matrix of each specific database.

indicator by assigning 1% to 20% of its variance as error (Hayduk et al., 2007). Measurement error percentages were determined by examining carefully how closely each latent variable in the theoretical model was being measured by its indicator in the data sets. The percentage measurement error assigned to each indicator is shown in Table 2. It was thus possible to compensate for problematic wordings, lack of clarity in some questions, and other measurement concerns. The means and standard errors of the variables in the four data sets are presented in Table 3; these are included because these data were used to develop the graphs in Figures 3–5.[2]

Model Estimation and Testing Results

The same theoretical model was estimated for each of the four contextual data sets using LISREL 8.54 maximum likelihood estimation as described by Joreskog and Sorbom (1996). The chi-square (χ^2) for the four models ranged from 269.70 ($df = 84$, $p < .001$) to 330.76 ($df = 84$, $p < .001$), indicating substantial inconsistencies between the models and data sets (Hayduk, 1987). The four models were examined carefully to locate model modifications that were tenable theoretically and that could be made uniformly across all four models. Three criteria had to be met before any changes were made to the theoretical model: The change had to be theoretically reasonable, modification indices for relevant coefficients had to be greater than 10 in three of four models, and reciprocal effects that would have resulted in underidentified models were avoided. Any modifications made were applied to all the models, not only those with substantial modification indices. This consistency minimized the likelihood of capitalizing on chance sampling fluctuations that might have existed across the four data sets. Four additional coefficients were freed for estimation using these decision rules. The χ^2 for the final four models ranged from 124.50 ($df = 80$, $p < .001$) to 157.33 ($df = 80$, $p < .001$), which indicated that there were still some inconsistencies between the models and data sets (Sellick, McKinley, Botti, Kingsland, & Behan, 1996). The results of the initial and final model estimations are shown in Table 4. Some results reported below suggest modes of assessment that would permit additional, model-specific modifications. The above criteria for limiting model modification, although somewhat stringent, served to permit discovery of new criteria that can be used in the future.

Results

The analysis occurred in two stages. First, coefficients were estimated for relationships among hospital and nursing-unit

[2]The covariance matrices for all four contextual databases may be obtained from the corresponding author at carole.estabrooks@ualberta.ca.

TABLE 3. Means (Variance) of the Study Variables Across the Four Context Groups

	Variables	Low	Partially low	Partially high	High	p^a
Intervening variables	1. Facilitation	1.78 (0.605)	2.28 (0.664)	2.46 (0.818)	2.82 (0.719)	<.001
	2. Innovation	1.88 (0.541)	2.23 (0.584)	2.62 (0.438)	2.99 (0.389)	<.001
	3. Staffing	1.78 (0.458)	2.06 (0.532)	2.31 (0.549)	2.71 (0.504)	<.001
	4. Unit autonomy	2.04 (0.707)	2.39 (0.780)	2.51 (0.752)	2.65 (0.704)	<.001
	5. Nurse-to-nurse collaboration	1.92 (0.552)	2.09 (0.627)	2.46 (0.577)	2.79 (0.556)	<.001
	6. Time to nurse	4.25 (3.827)	4.34 (3.100)	4.70 (3.179)	4.98 (3.411)	<.001
Outcome variables	7. Emotional exhaustion	2.98 (1.491)	2.63 (1.287)	2.31 (1.270)	1.88 (1.159)	<.001
	8. Staff development	2.12 (0.423)	2.42 (0.418)	2.67 (0.404)	2.94 (0.360)	<.001
	9. Research utilization (normalized)	−0.78 (0.722)	−0.24 (0.766)	0.13 (0.659)	0.59 (0.660)	<.001
	10. Patient adverse events	2.31 (0.496)	2.19 (0.478)	2.09 (0.443)	2.05 (0.375)	<.001
	11. Staff adverse events	2.82 (0.578)	2.69 (0.561)	2.47 (0.606)	2.42 (0.528)	<.001
Causal variables	1. Internet use	0.29 (0.596)	0.29 (0.526)	0.32 (0.733)	0.34 (0.728)	.895
	2. Age, years	40.1 (66.674)	39.9 (75.492)	38.8 (91.671)	40.0 (88.445)	.268
	3. Gender (male = 0, female = 1), %	0.97	0.96	0.97	0.99	.311[b]
	4. Responsive administration	1.58 (0.432)	1.95 (0.532)	2.33 (0.584)	2.77 (0.541)	<.001
	5. Relational capital	2.65 (0.292)	2.84 (0.257)	3.00 (0.209)	3.16 (0.198)	<.001
	6. Hospital size	5.53 (1.545)	5.59 (1.393)	5.61 (1.459)	5.39 (1.551)	.133

Note. [a]The *p* values were obtained from the analysis of variance test for differences between context groups, except for gender. [b]The *p* value for gender was obtained from the χ^2 test for differences between context groups.

characteristics, research utilization, and adverse events across all contexts (effects regardless of context). Second, the influence of context on research utilization, its predictors, and adverse events (i.e., differences between contexts) was analyzed.

The Influence of Hospital Characteristics on Nursing and Research Utilization Outcomes

The direction and significance of hospital and individual nurse characteristics on nursing unit variables and outcome variables are reported in Table 5. More responsive administration led to nurse reports of greater unit-level autonomy, increased staffing and support services, and support for innovation. Increased relational capital led to greater nurse-to-nurse collaboration about patient care issues and lower nurse emotional exhaustion. Hospital size had a positive relationship with opportunities for staff development, staffing and support services, and facilitation.

The direction and significance of causal relationships among the outcome variables are reported in Table 6. Higher staffing and support services displayed the most consistently significant effects—by producing more staff development, more nurse-to-nurse collaboration, more time to nurse, and less emotional exhaustion. Staff development opportunities led to increased support for innovation and facilitation. Opportunities for nurse-to-nurse collaboration and staff development had positive significant influences on nurses' research utilization. Greater emotional exhaustion led to less research utilization. Staff development was related significantly to reduced patient and staff adverse events. More research utilization was related to fewer patient adverse events. The final theoretical model showing only significant effects for ease of visualization is depicted in Figure 2. The six shaded latent concepts (hospital size, responsive administration, relational capital, opportunities for staff development and nurse-to-nurse collaboration, staffing and support services, and emotional exhaustion) were significant predictors of research utilization, patient or staff adverse events across all contexts, or both. Two unit characteristics that had no significant influence on research utilization were facilitation and support for innovation.

Effect of Context on Research Utilization, Predictors, and Outcomes

The degree to which significant predictors (shaded in Figure 2), effects on research utilization, and effects on patient or staff adverse events varied, depending on context, was examined to determine the influence of context on the outcome variables. This analysis was enabled by graphing the effect coefficient from the four model estimations (each context) with the means of the two variables contributing to that particular effect. Each of the shaded results in Tables 5 and 6 was graphed in this manner. The influence of hospital characteristics on staff development, staffing and support services, nurse-to-nurse collaboration, and emotional exhaustion is presented in Figure 3. Following is a discussion of Figure 3.1 in detail and then a summary of the remaining figures.

The slope of each of the four lines depicted in Figure 3.1 is the estimated effect coefficient of relational capital on staff development for nurses in each context. These show that more relational capital led to reported increases in

TABLE 4. Fit of the Initial and Final Estimated Models

	Low	Partially low	Partially high	High
Initial model				
χ^2	269.70	281.19	350.17	330.76
Significance	$p <$ .001	$p <$ .001	$p <$ .001	$p <$ .001
df	84	84	84	84
AGFI	.836	.826	.799	.801
RMSEA	.082	.085	.096	.095
Final model				
χ^2	124.50	144.20	157.33	146.01
Significance	p = .001	$p <$ .001	$p <$ .001	$p <$ .001
df	80	80	80	80
AGFI	.912	.898	.892	.894
RMSEA	.042	.051	.055	.054
N	300	300	300	300
R^2 for RU variable	33.0%	29.6%	19.2%	12.9%

Note. AGFI = adjusted goodness-of-fit index; RMSEA = root-mean-square error of approximation; RU = Research Utilization.

opportunities for staff development for all nurses surveyed. However, the placement of each line is determined by the means of both variables (relational capital and staff development) for each specific context and illustrates the degree to which the outcome variable (staff development) differed by context. Therefore, the differences between the four lines are the impact of context on the relationship between relational capital and staff development. As relational capital increased, so did nursing staff development opportunities. This increase was more marked in partially high and high (i.e., in the more positive) contexts.

Relational capital had a differential effect on reducing nurses' emotional exhaustion and increasing nurse-to-nurse collaboration depending on the context within which nurses worked (Figures 3.2 and 3.3). Likewise, greater responsiveness by administration increased opportunities for staff development and for staffing and support services (Figures 3.4 and 3.5). Larger hospitals with high or partially high contexts were able to provide more staffing and support services and opportunities for staff development than did smaller hospitals, but, perhaps more importantly, large hospitals with low or partially low (i.e., less positive) contexts provided less staffing and support services and fewer opportunities for staff development than did smaller hospitals with more positive contexts (Figures 3.6 and 3.7).

The relationships were graphed among unit and individual characteristics and their ability to predict research utilization (Figure 4). Similarly, staffing and support services had a differential influence on nurse-to-nurse collaboration, staff development, and nurses' emotional exhaustion, depending on the nurses' context (Figures 4.1, 4.2, and 4.3). Each predictor (nurse-to-nurse collaboration, staff development, and nurses' emotional exhaustion) also had differential significant effects on nurses' research utilization, depending on the nurses' context (Figures 4.4, 4.5, and 4.6).

The influence of nurses' emotional exhaustion and research utilization on patient and staff adverse events by context is illustrated in Figures 5.1 to 5.4. Context had little influence on the effect of emotional exhaustion on patient and staff adverse events. The impact of context on the relationship between research utilization and adverse events is more evident in low and partially low contexts.

Discussion

Organizational Characteristics and Research Utilization

Three hospital characteristics—responsive administration, relational capital, and hospital size—positively, but indirectly, influenced nurses' research utilization by acting through staff development, opportunities for nurse-to-nurse collaboration, and staffing and support services.

Responsive Administration By listening and responding to staff concerns, a responsive administration provides a form of *resonant* leadership that supports nursing practice by providing resources, removing barriers, and promoting professional autonomy (Cummings, 2004). By providing opportunities for staff development and nurse-to-nurse collaboration and sufficient nurse staffing and support services, administrations make investments that result ultimately in better quality care for patients.

Relational Capital The definition used here of collaborative relationships among clinicians who work together is similar to the concept of social capital, in which bridging, bonding, and linking structures support human interaction (Szreter & Woolcock, 2004; Woolcock, 2001). Relational capital is "the time, patience, teaching, etc, that individuals 'invest' in each other in relatively closely knit social groups and peers" (Gopee, 2002, p. 609). Dopson et al. (2002) concluded that a receptive context is highly dependent on good quality of social interactions. Three extensive literature reviews on organizational factors that impact research use have been used to suggest that relationships and social interaction are important (Estabrooks et al., 2003; Fleuren, Wiefferink, & Paulussen, 2004; Greenhalgh et al., 2004). However, here, relational capital had an indirect influence on research utilization by increasing staff development and reducing nurses' emotional exhaustion.

Hospital size has been reported as a predictor of innovation and research utilization (Baskerville & LeTouze, 1990; Brett, 1989; Damanpour, 1987, 1991; Varcoe & Hilton, 1995). Large, mature, functionally differentiated, specialized organizations are believed to have more capacity to adopt innovations (as suggested here), although others (Estabrooks, 2003; Rogers, 1995) have suggested

TABLE 5. Estimated Effects of the Exogenous Variables

	Responsive administration	Relational capital	Hospital size	Internet use	Age	Gender
1. Facilitation	0.067	0.208	0.249*			
	0.138	−0.009	0.177*			
	0.073	−0.044	0.162*			
	0.123	0.030	0.142*			
2. Innovation	0.126*	0.124	−0.070*			
	0.107	−0.026	−0.025			
	0.145*	0.225*	−0.055			
	0.245*	0.079	−0.068			
3. Staffing and support services	**0.189***		**0.171***			
	0.254*		**0.100***			
	0.296*		**0.094***			
	0.221*		**0.073***			
4. Unit autonomy	0.360*	0.118				
	0.191*	0.100				
	0.286*	0.005				
	0.149	0.127				
5. Nurse-to-nurse collaboration		**0.191***				
		0.212*				
		0.069				
		0.171*				
6. Time to nurse						
7. Emotional exhaustion		**−0.375***				
		−0.143				
		−0.027				
		−0.323*				
8. Staff development	**0.084**	**0.370***	**0.066***			
	0.200*	**0.286***	**0.102***			
	0.070	**0.107**	**0.065**			
	0.191*	**0.048**	**0.110***			
9. Research use				0.052		
				0.108		
				0.116		
				0.083		
10. Patient adverse events						
11. Staff adverse events		−0.018	0.033			
		0.058	0.013			
		−0.137	0.019			
		−0.130	0.054			

Note. Each cell reports the effect coefficients for four contexts in the following order: high, partially high, partially low, and low. Coefficients that are depicted in Figures 3–5 are in bold font.

*Significant coefficient as it exceeds more than 2 standard errors.

that size functions as a surrogate or proxy for other unmeasured variables.

Nurses' Emotional Exhaustion

Nurses' emotional exhaustion has a negative effect on research utilization. Here, the emotional exhaustion subscale from the Maslach Burnout Inventory (Maslach, Jackson, & Leiter, 1996) was captured. Emotional exhaustion used in this way describes "feelings of being emotionally overextended and exhausted by one's work" (Maslach et al., 1996, p. 10). Emotional exhaustion was associated with poorer outcomes (i.e., greater patient and nurse

TABLE 6. Estimated Effects of the Mediating Concepts in the Theoretical Model

Endogenous variables acting as causes	1	2	3	4	5	6	7	8	9	10	11
1. Facilitation								0.342*			
								0.450*			
								0.447*			
								0.425*			
2. Innovation					0.127*			0.344*			
					0.286*			0.012			
					0.319*			0.187*			
					0.031			0.410*			
3. Staffing and support services											
4. Unit autonomy											
5. Nurse-to-nurse collaboration			**0.551***								
			0.563*								
			0.596*								
			0.571*								
6. Time to nurse			0.632*								
			0.618*								
			0.535*								
			0.775*								
7. Emotional exhaustion			**−0.668***			−0.001					
			−0.637*			−0.052					
			−0.663*			−0.141*					
			−0.897*			−0.035					
8. Staff development			**0.121***								
			0.134*								
			0.210*								
			0.249*								
9. Research use	0.091	0.012		0.076	**0.080**	−0.016	**−0.109***	**0.243***			
	0.030	0.022		0.085	**0.186***	0.014	**−0.191***	**0.084**			
	0.069	0.135		0.106	**−0.014**	−0.008	**−0.334***	**0.112**			
	0.038	0.120		0.021	**0.250***	0.036	**−0.251***	**0.059**			
10. Patient adverse events					−0.036		**0.129***	−0.156*	**−0.055**		
					0.022		**0.154***	−0.068	**−0.048**		
					0.097		**0.104***	−0.056	**−0.172***		
					0.045		**0.097***	−0.022	**−0.148***		
11. Staff adverse events							**0.175***	−0.083	**−0.102**		
							0.227*	−0.024	**−0.089**		
							0.194*	−0.060	**−0.121**		
							0.108*	0.004	**−0.194***		

Note. Each cell reports the effect coefficients for four contexts in the following order: high, partially high, partially low, and low. The column variable is the cause; the row variable is the effect. Coefficients that are depicted in Figures 3–5 are in bold font.
*Significant coefficient as it exceeds more than 2 standard errors.

adverse events). High levels of emotional exhaustion have been linked to poorer patient outcomes (Aiken et al., 2001; Aiken, Clarke, Sloane, Sochalski, & Silber, 2002; Brown, Upchurch, & Acton, 2003; Cummings, Hayduk, & Estabrooks, 2005). When nurses have the time and opportunity to provide monitoring and surveillance of patient conditions, as well as the emotional and mental energy to do so, they have more opportunity to apply their professional knowledge and research to improve outcomes. A growing body of research demonstrates the central role

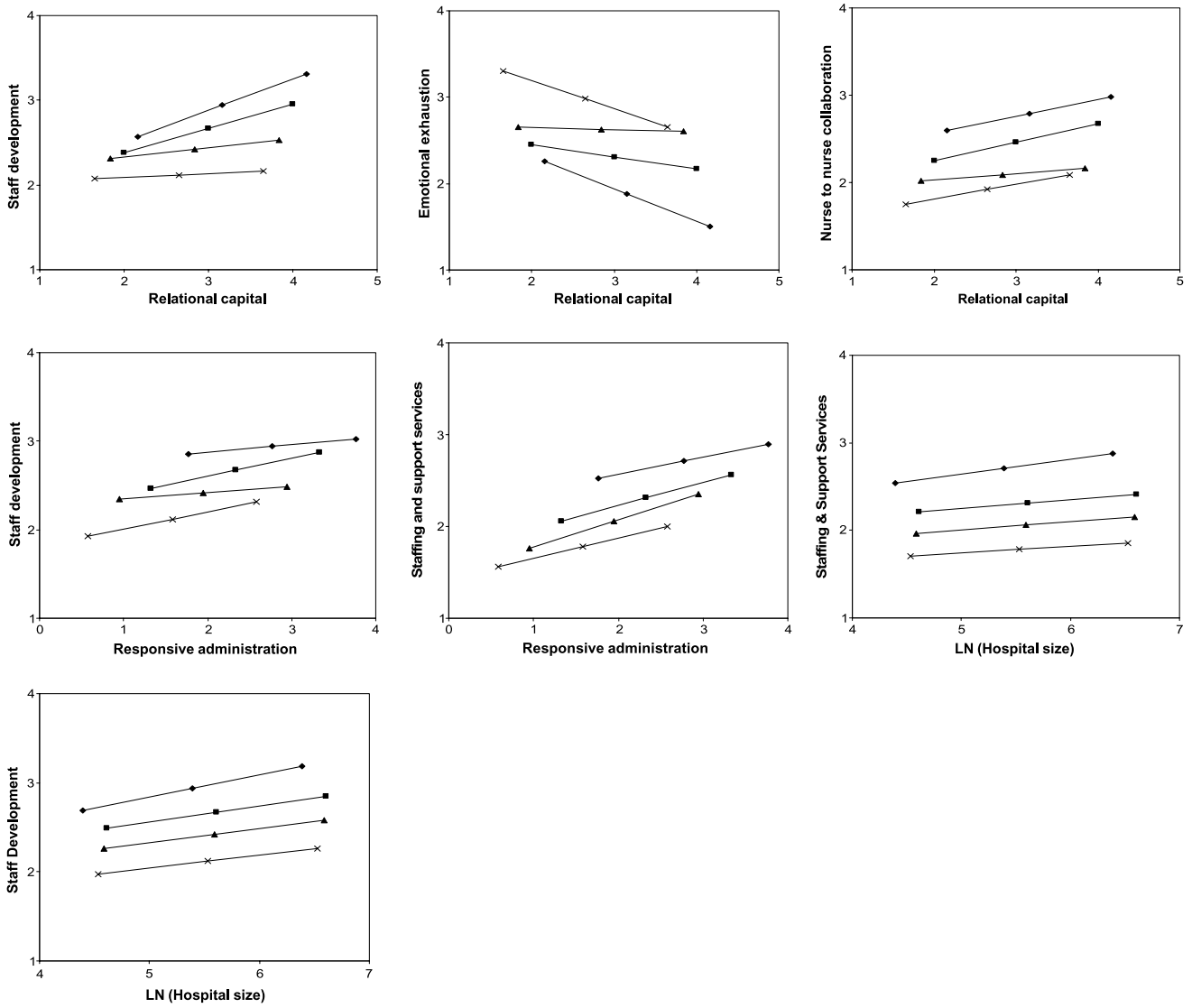

FIGURE 3. Examples of impact of hospital characteristics on unit and individual characteristics differentiated by context. The center point of each graph was obtained from the mean of each variable contributing to the effect. The left and right ends of each line segment were obtained by plotting the increase or decrease in the predicted value of the dependent variable arising from a unit increase (or decrease) in the causal variable. —◆—, High; —■—, partially high; —▲—, partially low; —×—, low.

that nurses play in preventing and reducing adverse patient events, such as medication errors, falls, nosocomial infections that increase risk for patient safety, and mortality (Aiken et al., 2002; Blegen, Goode, & Reed, 1998; Clarke, Sloane, & Aiken, 2002; Doran, 2004; McGillis Hall, Doran, & Pink, 2004).

Influence of Context

This research supports the initial working hypothesis and the assertions of the PARIHS framework—that *context matters* to nurses, to research use, and to outcomes for patients and staff. A parsimonious approach was used to measure a complex theoretical construct (context). However, it was sufficient to classify the hospital work environments into four categories of context based on nurses' perceptions of leadership and evaluation that they received and the culture within which they worked. Nurses working in *better* contexts (i.e., contexts characterized by a positive culture, good leadership, and positive evaluation or performance feedback) reported significantly more research utilization, more staff development, and lower rates of patient and staff adverse events than did nurses working in less positive contexts in regard to culture, leadership, and evaluation.

Two unanticipated findings were that the concepts of *innovation* and *facilitation* had no significant influence on nurses' research utilization. Perhaps, they were not operationalized ideally, even though the best available indicators were used; a generic measure of research utilization rather than specific evidence or implementation may not be related to facilitation as operationalized; innovative ideas and facilitation, as operationalized here, do not exert

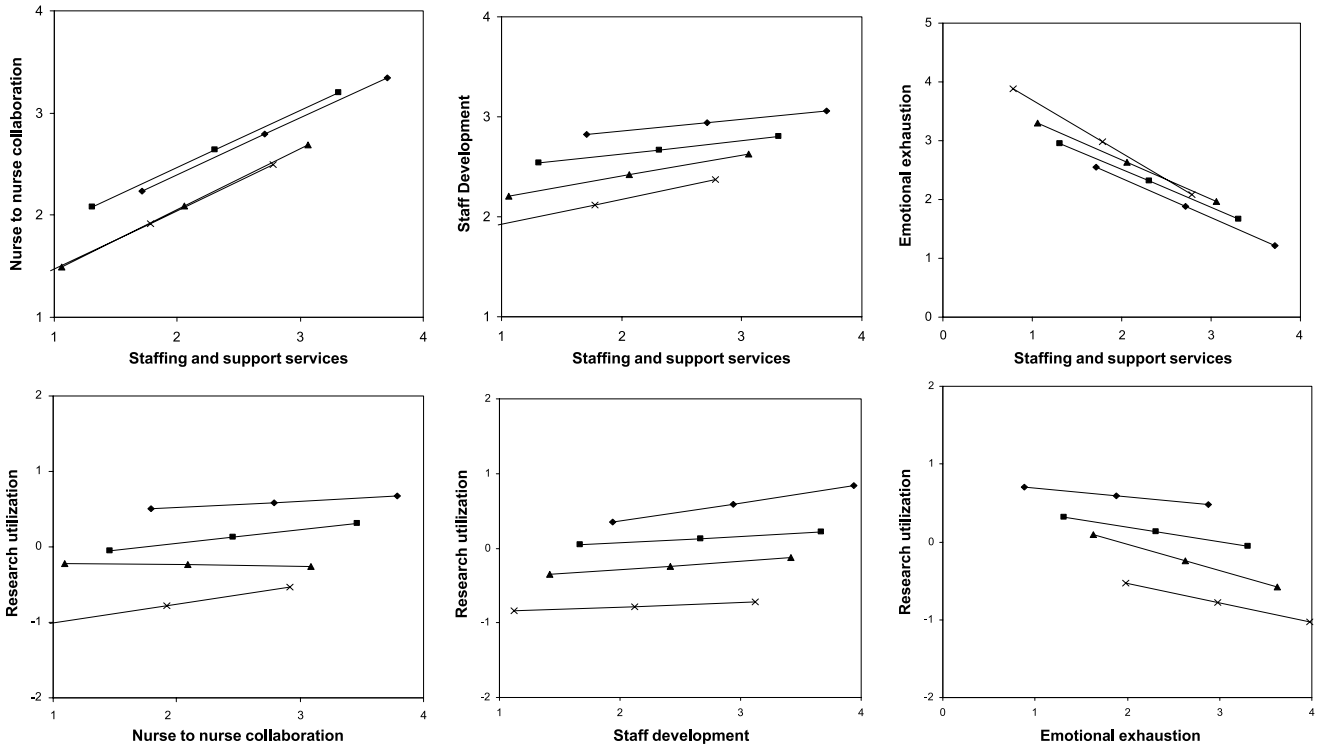

FIGURE 4. Examples of impact of unit and individual characteristics on research utilization differentiated by context. The center point of each graph was obtained from the mean of each variable contributing to the effect. The left and right ends of each line segment were obtained by plotting the increase or decrease in the predicted value of the dependent variable arising from a unit increase (or decrease) in the causal variable. —◆—, High; —■—, partially high; —▲—, partially low; —×—, low.

causal effects as strongly as anticipated in the real world; or, in the case of facilitation, its effects may not be theorized adequately yet.

Model Estimation and Other Forms of Assessment

Estimation results of the final theoretical model show inconsistencies between theory and data, reflected by the significant χ^2 results of model estimation. A nonsignificant χ^2 suggests that differences between the model and data sets could be argued to arise from sampling fluctuations. It was determined that the remaining inconsistencies could be pursued with a more refined set of model-modification criteria that refer not only to modification indices but also to features now focally relevant due to an understanding of differences between contexts made apparent by Figures 3–5.

Various segments of Figures 3 and 4 suggest two new modes of diagnostic assessment that permit the introduction of additional, more finely tuned model modifications that both potentially improve model fit and enhance understanding of differences between the four nursing contexts. The first new style of assessment is to consider introducing effects—even in a single context—that would enhance the consistency of some results. There is a consistent and significant impact of relational capital on nurse-to-nurse collaboration in three of four contexts, with the low context group displaying a weaker and insignificant effect (Figure 3.3, Table 5). The new diagnostic criteria considers whether some additional effect renders the effect of relational capital on nurse collaboration for the low context to become more consistent with the effects in the other three groups. If controlling for some reasonable, but not estimated, effect both improves model fit and makes the relational capital-to-nurse collaboration effect consistent with effects in other contexts, it provides an across-model justification for making a model-specific change. The only model modifications made were changes required across a majority of contexts. Changing a specific model parameter in one group (here a coefficient in the low group) might increase consistency between all groups on *another* model parameter (Figure 3.3). That is, effects could be introduced unique to one group if it led another parameter or parameters to display consistency or systematicity across groups. This mode of assessment applies to several parameters (Figures 3.2, 3.4, 3.5, 4.3, 4.4, and 4.6), and careful consideration has to be given to specifically which group coefficient(s) might be changed to result in the most understandable across-context pattern (e.g., Figure 3.2).

The second new mode of assessment also depends on systematic progressions across contexts but permits model modifications, including effects with smaller modification indices and even some insignificant effects. For example, the coefficient in Figure 3.1 is insignificant in two of four contexts and hence would not have met the criteria for data-prompted inclusion had this coefficient not been in the initial model. The small modification indices and the lack of significance for two of four contexts rendered this

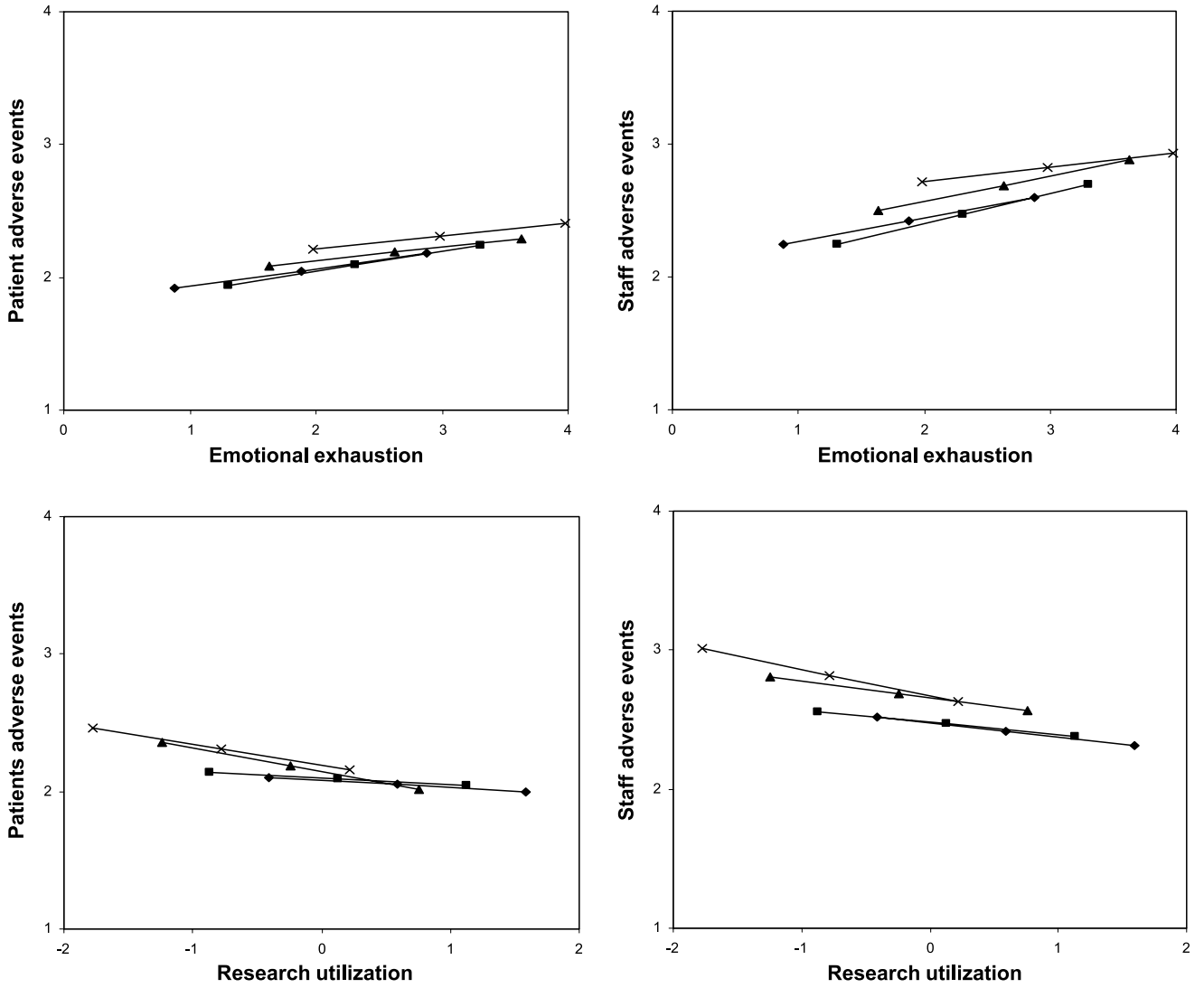

FIGURE 5. Impact of unit and individual characteristics and research utilization on adverse events differentiated by context. The center point of each graph was obtained from the mean of each variable contributing to the effect. The left and right ends of each line segment were obtained by plotting the increase or decrease in the predicted value of the dependent variable arising from a unit increase (or decrease) in the causal variable.—■—, High; —◆—, partially high; —▲—, partially low; —×—, low.

coefficient *not freed* by the model-modification criteria used. The new mode of assessment grants substantial importance to progressive changes across the four contexts, even if some effects were individually weak or even insignificant. That is, context-relevant progression in effects could be incorporated usefully into more fine-grained reassessment of model modifications.

The construction of some indicators of latent concepts might have contributed to the model's ill-fit. Using sums of subscales or means of several variables to form single indicators reduced the precision of the indicator measurement of some latent concepts in the theoretical model. Each question in a subscale may be used to measure a slightly different concept. Choosing the single best indicator of a concept might provide cleaner measures for some modeled concepts. However, breaking up the initial database into four data sets reflecting varying degrees of positive context demonstrated clear systematic progressions in results across the four data sets (see variable means in Table 3 and graphs in Figures 3–5). These patterns help to understand that the real world of nursing work environments, context, and knowledge application to change outcomes is complex.

Another limitation of this study was the use of retrospective secondary data for analysis. A prospective study to test the model is needed. The results reported here add to an understanding of the possible reasons why the model failed to fit the data and are being used by the research team to guide the construction of current and future studies.

Implications

This study sheds light on the relationships between nurses' emotional exhaustion and research utilization and between

research utilization and patient outcomes. Support of the hypothesis that increased research utilization would reduce adverse patient events provides additional validity to the derived measure of research use (Wallin et al., 2006) and a belief that research utilization improves patient outcomes. These findings support the context component of the PARIHS framework. However, other components of the framework were not supported (facilitation and innovation as predictors of research utilization). More theoretical work is needed around the nature and mechanism of facilitation, as well as additional methodological and empirical investigation.

Future research is needed to (a) establish a consistent set of contextual measures to compare across a variety of healthcare settings, (b) measure research utilization related to particular implementation practices, and (c) examine context as a covariate to determine modifiable contextual factors (e.g., leadership practices).

Conclusion

These findings highlight the importance of two organizational characteristics (responsive administration and relational capital) in influencing unit-level characteristics that influence nurses' research utilization. Improvements in these two areas may lead to increased research utilization, thereby improving staff and patient safety. The combined importance of culture, leadership, and evaluation, as dimensions of context defined by PARIHS, influences not only research utilization but also its predictors. Context does matter. Furthermore, some predictors of research utilization in the model, such as emotional exhaustion, are not found in the PARIHS framework, suggesting fruitful avenues for further theoretical development. ▼

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References

Aiken, L. H., Clarke, S. P., Sloane, D. M., Sochalski, J. A., Busse, R., Clarke, H., et al. (2001). Nurses' reports on hospital care in five countries. *Health Affairs, 20*(3), 43–53.

Aiken, L. H., Clarke, S. P., Sloane, D. M., Sochalski, J., & Silber, J. H. (2002). Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *JAMA, 288*, 1987–1993.

Aiken, L. H., & Patrician, P. A. (2000). Measuring organizational traits of hospitals: The revised nursing work index. *Nursing Research, 49*, 146–153.

Baskerville, B., & LeTouze, D. (1990). Facilitating the involvement of Canadian health care facilities in health promotion. *Patient Education and Counseling, 15*, 113–125.

Bero, L. A., Grilli, R., Grimshaw, J. M., Harvey, E., Oxman, A. D., & Thomson, M. A. (1998). Closing the gap between research and practice: An overview of systematic reviews of interventions to promote the implementation of research findings. The Cochrane Effective Practice and Organization of Care Review Group. *BMJ, 317*, 465–468.

Blegen, M. A., Goode, C. J., & Reed, L. (1998). Nurse staffing and patient outcomes. *Nursing Research, 47*, 43–50.

Boomsman, A. (1987). The robustness of maximum likelihood estimation in structural equation models. In P., Cuttance & R., Ecobs (Eds.), *Structural equation modeling by example* (pp. 160–188). New York: Cambridge University Press.

Brett, J. L. L. (1989). Organizational integrative mechanisms and adoption of innovations by nurses. *Nursing Research, 38*, 105–110.

Brown, S. A., Upchurch, S. L., & Acton, G. J. (2003). A framework for developing a coding scheme for meta-analysis. *Western Journal of Nursing Research, 25*, 205–222.

Clarke, S. P., Sloane, D. M., & Aiken, L. H. (2002). Effects of hospital staffing and organizational climate on needlestick injuries to nurses. *American Journal of Public Health, 92*, 1115–1119.

Cummings, G., Hayduk, L., & Estabrooks, C. (2005). Mitigating the impact of hospital restructuring on nurses: The responsibility of emotionally intelligent leadership. *Nursing Research, 54*, 2–12.

Cummings, G. G. (2004). Investing relational energy: The hallmark of resonant leadership. *Canadian Journal of Nursing Leadership, 17*, 76–87.

Damanpour, F. (1987). The adoption of technological, administrative, and ancillary innovations: Impact of organizational factors. *Journal of Management, 13*, 675–688.

Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal, 34*, 555–590.

Dobbins, M., Ciliska, D., Cockerill, R., Barnsley, J., & DiCenso, A. (2002). A framework for the dissemination and utilization of research for health-care policy and practice. *Online Journal of Knowledge Synthesis for Nursing, 9*, 7.

Dopson, S., FitzGerald, L., Ferlie, E., Gabbay, J., & Locock, L. (2002). No magic targets! Changing clinical practice to become more evidence based. *Health Care Management Review, 27*(3), 35–47.

Doran, D. (2004). Enhancing continuity of care through outcomes measurement. *Canadian Journal of Nursing Research, 36*(2), 83–87.

Dufault, M. (1995). A collaborative model for research development and utilization: Process, structure, and outcomes. *Journal of Nursing Staff Development, 11*, 139–144.

Eccles, M., Grimshaw, J., Walker, A., Johnston, M., & Pitts, N. (2005). Changing the behavior of healthcare professionals: The use of theory in promoting the uptake of research findings. *Journal of Clinical Epidemiology, 58*, 107–112.

Estabrooks, C. A. (2003). Translating research into practice: Implications for organizations and administrators. *Canadian Journal of Nursing Research, 35*(3), 53–68.

Estabrooks, C. A., Chong, H., Brigidear, K., & Profetto-McGrath, J. (2005). Profiling Canadian nurses' preferred knowledge sources for clinical practice. *Canadian Journal of Nursing Research, 37*(2), 118–140.

Estabrooks, C. A., Floyd, J. A., Scott-Findlay, S., O'Leary, K. A., & Gushta, M. (2003). Individual determinants of research utilization: A systematic review. *Journal of Advanced Nursing, 43*, 506–520.

Estabrooks, C. A., Rutakumwa, W., O'Leary, K., Profetto-McGrath, J., Milner, M., Levers, M., et al. (2005). Sources of practice knowledge among nurses. *Qualitative Health Research, 15*, 460–476.

Estabrooks, C. A., Winther, C., & Derksen, L. (2004). Mapping the field: A bibliometric analysis of the research utilization literature in nursing. *Nursing Research, 53*, 293–303.

Fleuren, M., Wiefferink, K., & Paulussen, T. (2004). Determinants of innovation within health care organizations: Literature review and Delphi study. *International Journal for Quality in Health Care, 16*, 107–123.

Giovannetti, P., Estabrooks, C. A., & Hesketh, K. L. (2002). *Alberta nurse survey final report* (Report No. 02-01-TR). Edmonton, AB: Faculty of Nursing, University of Alberta.

Goode, C., Lovett, M. K., Hayes, J. E., & Butcher, L. A. (1987). Use of research based knowledge in clinical practice. *Journal of Nursing Administration, 17*(12), 11–18.

Gopee, N. (2002). Human and social capital as facilitators of life-long learning in nursing. *Nurse Education Today, 22*, 608–616.

Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: Systematic review and recommendations. *Milbank Quarterly, 82*, 581–629.

Grimshaw, J. M., Thomas, R. E., MacLennan, G., Fraser, C., Ramsay, C. R., Vale, L., et al. (2004). Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technology Assessment, 8*(6), 1–72.

Grol, R. (2001). Successes and failures in the implementation of evidence-based guidelines for clinical practice. *Medical Care, 39*, II-46–II-54.

Grol, R., & Grimshaw, J. (2003). From best evidence to best practice: Effective implementation of change in patients' care. *Lancet, 362*, 1225–1230.

Harvey, G., Loftus-Hills, A., Rycroft-Malone, J., Titchen, A., Kitson, A., McCormack, B., et al. (2002). Getting evidence into practice: The role and function of facilitation. *Journal of Advanced Nursing, 37*, 577–588.

Hayduk, L. A. (1987). *Structural equation modeling with LISREL: Essentials and advances*. Baltimore, MD: John Hopkins University Press.

Hayduk, L. A., Pazderka-Robinson, H., Cummings, G. G., Boadu, K., Verbeek, E. L., & Perks. T. A. (2007). The weird world, and equally weird measurement model: Reactive indicators and the validity revolution. *Structural Equation Modeling,* 14(2), 280–310.

Horsley, J. A., Crane, J., & Bingle, J. D., (1978). Research utilization as an organizational process. *Journal of Nursing Administration, 8*(7), 4–6.

Hu, L. T., & Bentler, P. (1995). Evaluating model fit. In R. H., Hoyle (Ed.), *Structural equation modeling. Concepts, issues, and applications* (pp. 76–99). London: Sage.

Joreskog, K., & Sorbom, D. (1996). *LISREL 8: Users reference guide*. Chicago: Scientific Software International.

Kitson, A., Harvey, G., & McCormack, B. (1998). Enabling the implementation of evidence based practice: A conceptual framework. *Quality & Safety in Health Care, 7*, 149–158.

Logan, J., & Graham, I. D. (1998). Toward a comprehensive interdisciplinary model of health care research use. *Science Communication, 20*, 227–246.

Maslach, C., Jackson, S. E., & Leiter, M. P. (1996). *The Maslach Burnout Inventory* (3rd ed.). Palo Alto, CA: Consulting Psychologists Press.

McCormack, B., Kitson, A., Harvey, G., Rycroft-Malone, J., Titchen, A., & Seers, K. (2002). Getting evidence into practice: The meaning of "context." *Journal of Advanced Nursing, 38*, 94–104.

McGillis Hall, L., Doran, D., & Pink, G. H. (2004). Nurse staffing models, nursing hours, and patient safety outcomes. *Journal of Nursing Administration, 34*(1), 41–45.

Meijers, J., Janssen, M., Cummings, G. G., Wallin, L., Estabrooks, C. A., & Halfens, R. (2006). Assessing the relationships between contextual factors and research utilization in nursing: Systematic literature review. *Journal of Advanced Nursing, 55*, 622–635.

Owen, S., & Milburn, C. (2001). Implementing research findings into practice: Improving and developing services for women with serious and enduring mental health problems. *Journal of Psychiatric and Mental Health Nursing, 8*, 221–231.

Oxman, A. D., Fretheim, A., & Flottorp, S. (2005). The OFF theory of research utilization. *Journal of Clinical Epidemiology, 58*, 113–116, 117–120.

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

Rycroft-Malone, J., Kitson, A., Harvey, G., McCormack, B., Seers, K., Titchen, A., et al. (2002). Ingredients for change: Revisiting a conceptual framework. *Quality & Safety in Health Care, 11*, 174–180.

Rycroft-Malone, J., Seers, K., Titchen, A., Harvey, G., Kitson, A., & McCormack, B. (2004). What counts as evidence in evidence-based practice? *Journal of Advanced Nursing, 47*, 81–90.

Sellick, K., McKinley, S., Botti, M., Kingsland, S., & Behan, J. (1996). Victorian hospital nurses' research attitudes and activity. *Australian Journal of Advanced Nursing, 13*(4), 5–14.

Sharp, N. D., Pineros, S. L., Hsu, C., Starks, H., & Sales, A. E. (2004). A qualitative study to identify barriers and facilitators to implementation of pilot interventions in the Veterans Health Administration (VHA) Northwest Network. *Worldviews on Evidence-Based Nursing, 1*, 129–139.

Stetler, C. B. (2001). Updating the Stetler Model of research utilization to facilitate evidence-based practice. *Nursing Outlook, 49*, 272–279.

Stetler, C. B. (2003). Role of the organization in translating research into evidence-based practice. *Outcomes Management, 7*, 97–105.

Stetler, C. B., Legro, M. W., Rycroft-Malone, J., Bowman, C., Curran, G., Guihan, M., et al. (2006). Role of "external facilitation" in implementation of research findings: A qualitative evaluation of facilitation experiences in the Veterans Health Administration. *Implementation Science, 1*, 23.

Szreter, S., & Woolcock, M. (2004). Health by association? Social capital, social theory, and the political economy of public health. *International Journal of Epidemiology, 33*, 650–667.

Thomas, L. H., McColl, E., Cullum, N., Rousseau, N., Soutter, J., & Steen, N. (1998). Effect of clinical guidelines in nursing, midwifery and the therapies: A systematic review of evaluations. *Quality in Health Care, 7*, 183–191.

Titler, M. G., Kleiber, C., Steelman, V., Goode, C., Rakel, B., Barry-Walker, J., et al. (1994). Infusing research into practice to promote quality care. *Nursing Research, 43*, 307–313.

Varcoe, C., & Hilton, A. (1995). Factors affecting acute-care nurses' use of research findings. *Canadian Journal of Nursing Research, 27*(4), 51–71.

Wallin, L., Bostrom, A. M., Harvey, G., Wikblad, K., & Ewald, U. (2000). National guidelines for Swedish neonatal nursing care: Evaluation of clinical application. *International Journal for Quality in Health Care, 12*, 465–474.

Wallin, L., Estabrooks, C. A., Midodzi, W. K., & Cummings, G. G. (2006). Development and validation of a derived measure of research utilization by nurses. *Nursing Research, 55*, 149–160.

Wallin, L., Profetto-McGrath, J., & Levers, M. J. (2005). Implementing nursing practice guidelines: A complex undertaking. *Journal of Wound, Ostomy, and Continence Nursing, 32*, 294–300.

Woolcock, M. (2001). The place of social capital in understanding social and economic outcomes. *ISUMA, Canadian Journal of Policy Research, 2*, 11–17.