Nurses and Midwives in the Digital Age
M. Honey et al. (Eds.)

doi:10.3233/SHTI210720

Developing Theoretical Underpinnings for Nursing Workaround Research Using a Mixed Method Approach

Jennifer BROWNE[a,1] and Carrie Jo BRADEN[b]
[a] *University of the Incarnate Word, San Antonio, Texas*
[b] *University of Texas Health Science Center, San Antonio, Texas*

Abstract. The use of health information technology (HIT) in acute care had an unexpected impact on nursing workflow. It often took a nurse extra steps or extra time to complete a process once documentation and medication administration was automated. In response to HIT problems, nurses developed workarounds. Research on workarounds has been hindered by a lack of variable definitions and research models. This paper presents results of a mixed methods study that proposes definitions for workarounds, associated variables and a multi-level model.

Keywords. Nursing workaround, health information technology workaround

1. Introduction

Evidence shows that the use of health information technology (HIT) in acute care may introduce new problems. Literature describes unintended consequences and errors exacerbated by HIT and their work processes. [1] Intended to improve patient safety, the impact that HIT use has on patient outcomes has returned mixed results. [2] Work activities unrelated to patient care have been found to increase with the use of HIT; increasing workload and reducing time at the bedside. [2,3] In response, nurses have developed workarounds. [4] The use of workarounds and concerns over patient safety have prompted a call for better insight into the nature and consequences of workarounds. Cited specifically is a need for theory development to inform interventions. [5,6] Although multidisciplinary models have often guided HIT inquiry, it remains important to study the uniqueness of the varying contexts, inquiry and practice of nursing. [7,8] This paper describes development of The HIT workaround (HITW) model that guided a mixed method study focusing on HIT nursing workarounds in intensive care (ICU). [9]

There is no accepted conceptual definition of a nursing workaround and most workaround research does not provide a definition. [6] Workaround research explores motives, characteristics, antecedents and consequences. Factors contributing to workaround use include interference with patient care, workflow or professional relationships. [6] Some research characterizes workarounds as occurring as a result of a workflow blocks or barriers, however the definition of block is arbitrary, and associated relationships poorly understood. Ill-defined concepts have limited our ability to draw

[1] Corresponding Author, Jennifer Browne, University of The Incarnate Word, Ila Faye Miller School of Nursing, 4301 Broadway, San Antonio, Texas 78209, USA; E-mail: browne@uiwtx.edu.

inferences between them and hinder replication of future studies. In order to develop sound research, concepts must clearly represent an object or idea. Our understanding of conceptual relationships is dependent upon their empirical adequacy.

2. Theory and Causal Framework

One common assumption is that HIT, used as intended, will achieve beneficial outcomes but because of added environmental influences this assumption is flawed.[10] HIT can introduce behaviors that threaten safety and quality. [11] It is important therefore to anticipate the impact that other systems elements might have in order to achieve safe, efficient applications of HIT.

Stinchcombe's functional approach to social theory construction (Fig1), was selected to frame relationship patterns in the workaround model. [12] Functional theories explain phenomena by looking at their consequences. Based on consequences, behaviors or social structures are reinforced or selected out. Structure (S) represents behaviors moving the system towards a homeostatic state. The homeostatic state (H), is equilibrium the system or actor is attempting to achieve and tension (T) represents influences stressing the system and moving the system away from equilibrium. [12]

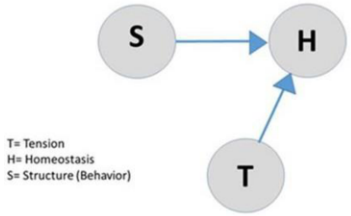

Figure 1. Stinchcombe functional explanation.

The HITW Model combines a Stinchcombe functional model with the complexity perspective of dynamic systems theory to depict workarounds from a multi-level perspective: the macro level describes organizational activity; the mezzo level describes nursing and the third level represents the micro or patient level.[12-13]

3. Methods

Development of the HITW model began with pre-study observational time in ICU to clarify nursing processes and behaviors. A pilot survey was developed, and website functionality tested. Initial observations guided placement of model variables (Figure 2).

The focus of this study was at the mezzo level to clarify the following variables: workload, safe patient care outcome, turbulence, HIT protocols, nurse adherence to HIT protocols, nurse characteristics, HIT barriers, intuitive workaround, and problem-solving workaround. Literature review informed definitions and proposed measures for the pilot study. Some definitions drawn from the literature were substantive and others were functional. In the case that no measures were found in the literature, preliminary measures were developed from open-ended qualitative survey questions.

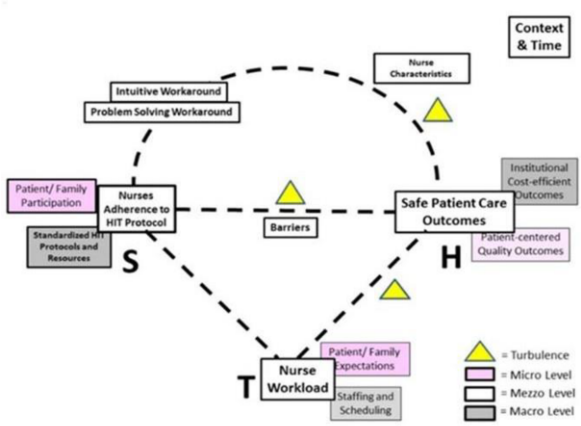

Figure 2. Pilot study HITW model.

Local chapter members of The American Association of Critical Care Nurses (AACN) took part in the pilot survey, deemed exempt by the University of Texas Health Science Center (UTHSCSA) Institutional Review Board (IRB). The survey consisted of 19 quantitative and 3 qualitative questions. Nurses described factors preceding the workaround and details about the workaround itself.

A mixed methods design was followed, preliminary quantitative measures were clarified and concurrently, qualitative survey items were used to confirm and expand the definitions. Descriptive and inferential analysis was performed on the quantitative data and coding and theme development performed on the qualitative data prior to merging of data. Three nurse experts reviewed narratives for credibility/ comprehensiveness resulting in an inter-rater reliability of .90.

The HITW model was updated from pilot findings with two groupings of workarounds that were not preceded by problems or barriers. In these cases, a workaround was either preceded with formal communication, as with a mandated administrative directive or with informal communication such as nurses sharing "tricks" with each other. These workarounds were not launched by barriers, but by communication, allowing the nurses to bypass barriers entirely.

After updates to the HITW Model and survey were complete, the primary study was approved by The UTHSCSA IRB and conducted in collaboration with AACN. A sample of 307 Registered Nurses voluntary responded to an email survey consisting of two qualitative open- ended questions followed by quantitative items measuring nurse characteristics, elements of nursing work, HIT problems, and patient safety. Multiple sources of data were used to compare, refine, and elaborate findings from both methods and procedures described by Browne and Braden were followed. [14] At each stage of the research, validity was enhanced with legitimation processes and checks.

4. Results

Respondents to the main study (n=307) were 87% female and 13% male and 58% of nurses were 45 years old or greater. Almost 50% of the nurses had a bachelor's degree in nursing, 20.6% an associate degree and 19.9% had a master's degree. Nurse

experience ranged between proficient and expert. ICU specialties included adult, pediatric and neonatal. Patient acuity was reported as: 61.8% critical, 28.7% guarded and 9.2% stable. Workload of the nurse was reported as heavy (40%) and moderate (58%). There was a wide range of software represented.

Problem-solving workarounds represented 43% of the workarounds, intuitive workarounds 20%, informal communication 23%, and formal communication 14%. All the descriptions categorized easily as one of the four workarounds with no outliers. The workaround types and sub codes were reported in all settings and across all demographics. In assessing the variables HIT barrier, workload, turbulence and HIT protocols, the quantitative analysis was in agreement with qualitative variable descriptions and the variable definitions were confirmed. (Table 1). Factor analysis was utilized to identify the factor structure of turbulence and HIT barriers and to create associated definitions.

Table 1. Variable definitions for health information technology workaround model.

Variable	Defintion
Problem Solving Workaround	The level of thoughtful, planned, or repetitive behaviors that address ways to remedy HIT barriers. A problem-solving workaround can act as a precursor to formal and informal communication workarounds.
Intuitive Workaround	The degree to which instantaneous choices are made when there exists little or no time between idea conception and execution. An intuitive workaround can act as a precursor to formal or informal communication workarounds.
Formal Communication Workaround	Written or oral communication that occurs through designated channels of the organization to address HIT systems issues (barriers) and disseminate protocol variations.
Informal Communication Workaround	Oral communication that bypasses formal organizational channels to share HIT protocol variations without addressing underlying systems issues. Informal communication workaround is a mediating variable occurring in a causal pathway and causing variation in the outcome variable.
Turbulence	The degree to which a nurse's attention to task is diluted or redirected by thought diversions, resource inadequacy, communication breakdowns and/ or interpersonal relationships".
Workload	the amount of work a nurse is required to perform in a defined period of time.
HIT Barrier	The degree to which a response to an exception in nursing workflow associated with Healthcare Information Technology is representative of a technical misalignment with practice, requires additional process steps, and/or poses additional practice or patient safety risk.
HIT Protocol or Resource	The extent to which any technology or its associated process, protocol, policy or technology adjunct that is incorporated into a healthcare delivery system contributes to improvements in safe patient care outcomes, patient centered quality outcomes and/ or cost-efficient care
Safe Patient Care Outcome	The extent to which there is an absence of preventable adverse events

5. Discussion and Conclusions

The HITW Model was updated to include all four types of nursing workarounds and the concept of turbulence was re-specified as a precursor to workarounds. (Figure 3). Nurses reported that workarounds were successful in 90% of the cases. The initial problem caused by HIT was perceived to create a safety hazard in 66% of the cases and in 39% of the workaround cases. Nurses reported the HIT problem to the organization 59% of the time and workarounds 34% of the time. Nurses described using workarounds in 47% of the cases to protect patient safety ($r = .338$, $n = 292$, $p = .000$).

The ability to quantify workarounds allowed us to explore relationships between variables. For example, logistic regression allowed us to predict the type of workarounds a nurse might use, based on patient safety risk. When the severity of safety risk increased by 1 unit, a nurse was 1.5 times more likely to use an intuitive workaround and for every 1 unit increase in time pressure, 5 times more likely to use a workaround.

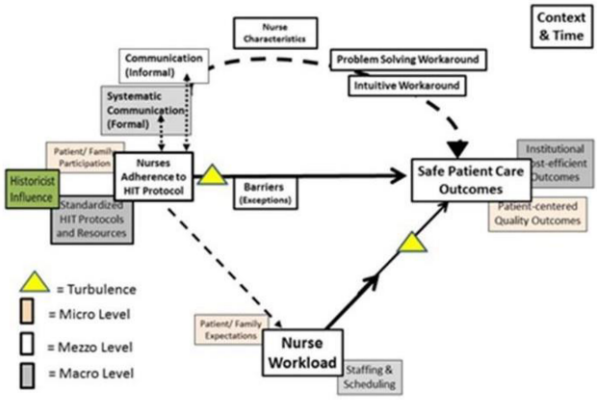

Figure 3. Health Information Technology workaround model.

Using the four workaround types allowed categorization of all behaviors, even if the HIT or workaround changed. By utilizing the HITW model we were able to visualize the potential impact that turbulence may have on nursing workload, workarounds and patient safety. The overarching plan for future HITW research will be to continue refinement and validation of variable relationships and explore the model in medical-surgical units to further extend our understanding of workarounds in complex systems.

References

[1] Gephart SM, Bristol A, Dye JL, Finley BA, Carrington JM. Validity and reliability of a new measure of nursing experience with unintended consequences of electronic health records. CIN 34 (2016), 436-447.
[2] Kaplan B, Harris-Salamone KD. Health IT success and failure: Recommendations from literature and an AMIA workshop. J Am Med Inform Assoc 16 (2009), 291-299.
[3] Carayon P, Karsh BT, Cartmill R. Incorporating health information technology into workflow redesign-summary. AHRQPublication No. 10-0098-EF, (2010).
[4] Browne J, Braden C. Definition and relational specification of work-around. AMIA. 11th International Nursing Informatics Congress (2012).
[5] Halbesleben JR, Wakefield DS, Wakefield BJ. Workarounds in health care settings: Literature review and research agenda. Health Care Manage R 33 (2008), 2-12.
[6] Debono DS, Greenfield D, Travaglia JF et al. Nurses' workarounds in acute healthcare settings: Ascoping review. BMC Health Serv Res. 13 (2013), 175.
[7] Smith MJ, Liehr PR. Middle range theory for nursing (4th ed.). Springer. New York, 2018.
[8] Blijleven V, Koelemeijer K, Wetzels M, Jaspers M. Workarounds emerging from electronic health record system usage: Consequences for patient safety, effectiveness of care, and efficiency of care. MIR Hum Factors. 4 (2017), e27.
[9] Browne JA. Evaluation of the health information technology workaround model in intensive care [dissertation]. San Antonio: University of Texas Health Science Center; (2016).
[10] Jordan J, Lanham HJ, Anderson RA, McDaniel RR. Implications of complex adaptive systems theory for interpreting research about healthcare organizations. J Eval Clin Pract 16(1) (2010), 228-231.
[11] McDaniel RR, Lanham HJ, Anderson, RA. Implications of complex adaptive systems theory for the design of research on health care organizations. Health Care Manage Rev 34(2) (2009)191-199.
[12] Stinchcombe AL. Constructing social theories. Harcourt, Brace & World. New York, 1968.
[13] Maliski SL, Holditch-Davis D. Linking biology and biography: Complex nonlinear dynamical systems as a framework for nursing inquiry. Complexity and Chaos in Nursing, 2(1) (1995), 25-35.
[14] Browne JA, Braden CJ. Nursing turbulence in critical care: Relationships with nursing workload and patient safety. AJCC 29(3) (2020) 182-191.