

Evaluation of Clinical Information Systems Expectations and Experience

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Overview

- Background/Purpose
- Method
- Results
- Implications

Background

- Implementing EHR and CPOE can act as drivers to change work processes and work flow.
- Question: How does EHR and CPOE implementation influence staff perceptions regarding work processes and flow, and quality?
- Needed is a measure to assess staff perceptions regarding EHR and CPOE expectations and experiences regarding changes in work flow and quality.
- This presentation describes an instrument designed to assess these expectations and experiences.

Instrument Development: Section I

- Perceptions of Changes in Work Process
- Brainstorming, face validity, pilot testing
- Five Focus Areas:
 - Provider-Patient Communication
 - Inter-Provider Communication
 - Inter-Organizational Communication
 - Work Life
 - Improved Care
- Scale: Much Worse (-3) to No Change (0) to Much Improved (+3)

Section I:

Pre vs. Post-Implementation Assessment

- **Pre**: “Please indicate the extent to which you think that the following areas *will be* either: **Worsened (-3, -2, -1)**, **Stay the Same (0)**, or be **Improved (+1, +2, +3)** after the new clinical information systems are implemented. In answering each item assume that you have been using the new clinical information systems for 3 months.”
- **Post**: “Please indicate the extent to which you think that the following areas *have* either: **Worsened (-3, -2, -1)**, **Stay the Same (0)**, or be **Improved (+1, +2, +3)** after the new clinical information systems were implemented. “

Instrument Development: Section II

- Two focus areas:
 - Implementation Strategy – 8 items
 - Nine Rights of Quality Patient Care – 9 items
- Scale: Strongly Disagree (1) to Strongly Agree (6)

Section II: Implementation Strategy & Quality

- Implementation Strategy: “Please indicate the extent to which you agree with the following statements”
- Quality: “Please indicate the extent to which you agree with the following statement. The new clinical information systems will improve our ability to give patient care:” ... Right Treatment, Patient, Time, Amount/Dose, Way, Person, Information, Location
- Questions phrased in future tense for Pre- and past tense for Post-Assessment use.

Method

- Participants
 - RNs from a large Midwestern rural referral hospital
 - N = 331 pre, 116 post
 - Mean of 16.3 (SD= 9.5) years experience in healthcare
 - 53 indicated previous experience with EMR or CPOE
 - Mean of 4.3 (SD = 4.8) years experience with EMR or CPOE
- Survey distributed pre- and post-EMR/CPOE implementation
 - Pre: first day of training
 - Focuses on Future State
 - Post: ~6 months after launch of technology
 - Focuses on Current / Past Experience

Results: Item Analysis

- Participants used full range of responses
- Pre-implementation items highly negatively skewed; post scores less skewed
 - Participants were optimistic about changes when considering future implementation
 - Example: Item 22 “Communication at the end of shift handoffs”
 - Pre: Mean = 4.90, Median = 5.00, Mode = 6.00
 - Post: Mean = 4.17, Median = 4.00, Mode = 4.00
- 12 items dropped from Section I because they cross-loaded onto other factors. Retained for other analyses .
- Final scale used for following analyses included 19 items in Section I and 17 items in Section II

Section I Factor Analysis Results

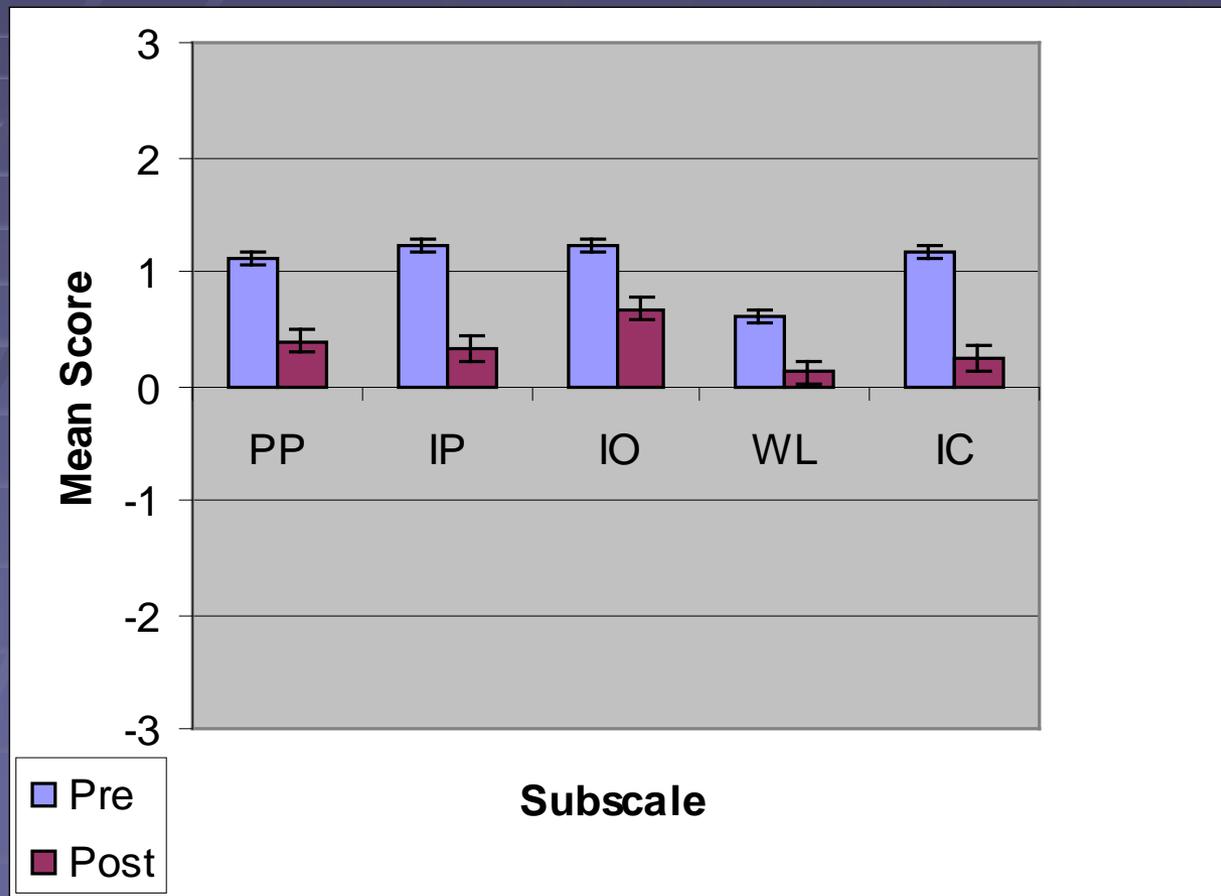
- Confirmatory factor analysis supported five-factor structure for 17 items in Section I
 - Proposed factors: Provider-Patient Communication (PP), Inter-Provider Communication (IP), Inter-Organizational Communication (IO), Worklife Changes (WL), Improved Care (IC)
- Weaker fit for pre-implementation data
 - $\chi^2 (142) = 666.58$, NNFI = .87, CFI = .89, RMSEA = .11
 - Non-normality of data tends to reduce fit
 - Projection into future / Expectations may have reduced fit
- Excellent fit for post-implementation data
 - $\chi^2 (142) = 151.47$, NNFI = .99, CFI = .99, RMSEA = .032
 - Based on 6 months of experience with the technology

Final Measure Section I – Perceptions of Changes in Work Process

- Provider-Patient Communication (3 items, pre $\alpha = .82$, post $\alpha = .81$)
 - “How often patients are asked the same questions”
- Inter-provider Communication (3 items, pre $\alpha = .86$, post $\alpha = .85$)
 - “Communication at the end of shift handoffs”
- Inter-Organizational Communication (2 items, pre $\alpha = .83$, post $\alpha = .83$)
 - “Communication when patients are transferred to other facilities”
- Worklife Changes (4 items, pre $\alpha = .88$, post $\alpha = .83$)
 - “The amount of professional satisfaction I get out of my job”
- Improved Care (7 items, pre $\alpha = .90$, post $\alpha = .91$)
 - “The timeliness with which patient care services are provided”

Results: Pre/Post Comparison

- Overall, scores were lower for post-implementation perception scores across all five subscales in Section I



PP = Provider-Patient Communication

IP = Inter-Provider Communication

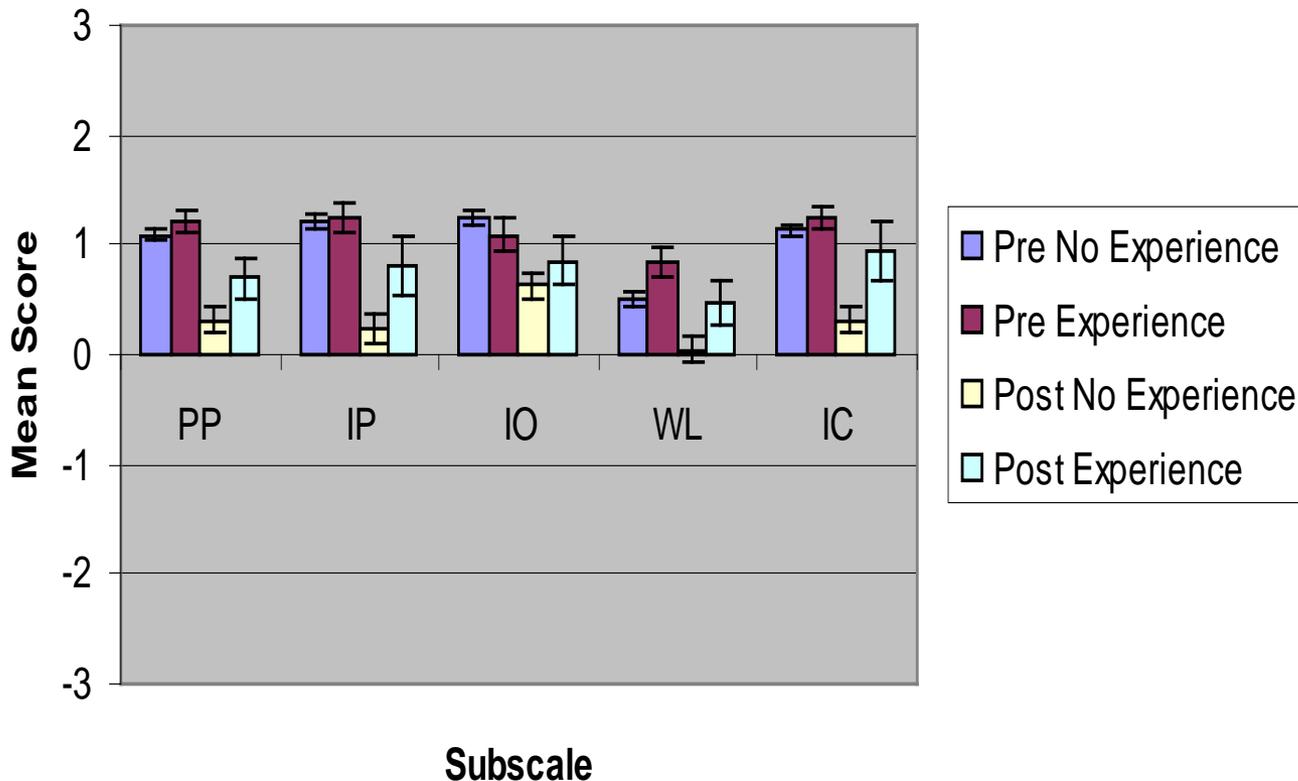
IO = Inter-Organizational Communication

WL = Work Life

IC = Improved Care

Results: Section I Pre/Post Experience with Technology

- Generally similar pre-implementation expectations re: future for those with vs. those without previous technology experience
- Post-implementation perceptions consistently lowest for those without previous technology experience



PP = Provider-Patient Communication

IP = Inter-Provider Communication

IO = Inter-Organizational Communication

WL = Work Life

IC = Improved Care

Section II Factor Analysis Results

- Confirmatory factor analysis supported two-factor structures
- Proposed factors: Implementation Strategy (IM) and Nine Rights of Quality Patient Care (NR)
- Excellent fit for pre-implementation data
 - $\chi^2 (47) = 54.50$, NNFI = .99, CFI = .99, RMSEA = .022
- Excellent fit for post-implementation data
 - $\chi^2 (47) = 54.24$, NNFI = .99, CFI = .99, RMSEA = .039

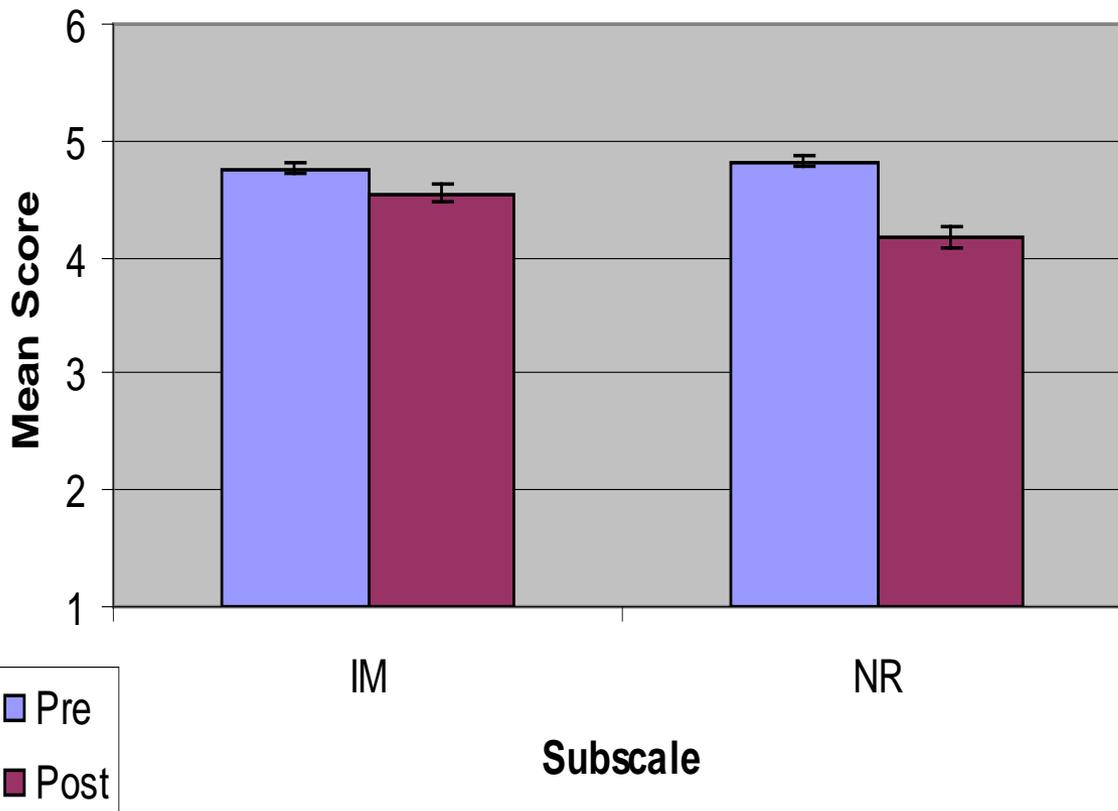
Final Measure Section II – Implementation Strategy and Quality

- Implementation Strategy (8 items, pre $\alpha = .88$, post $\alpha = .87$)
 - “I support the planned change in current clinical information systems”
- Nine Rights of Quality Patient Care (9 items, pre $\alpha = .99$, post $\alpha = .97$)
 - “The new clinical information systems will improve our ability to give patient care...”
 - “To the Right Patient”

■ $\alpha =$ Cronbach’s Alpha

Results: Pre/Post Comparison

- Overall, scores were lower for post implementation perceptions / experience scores across both Section II subscales

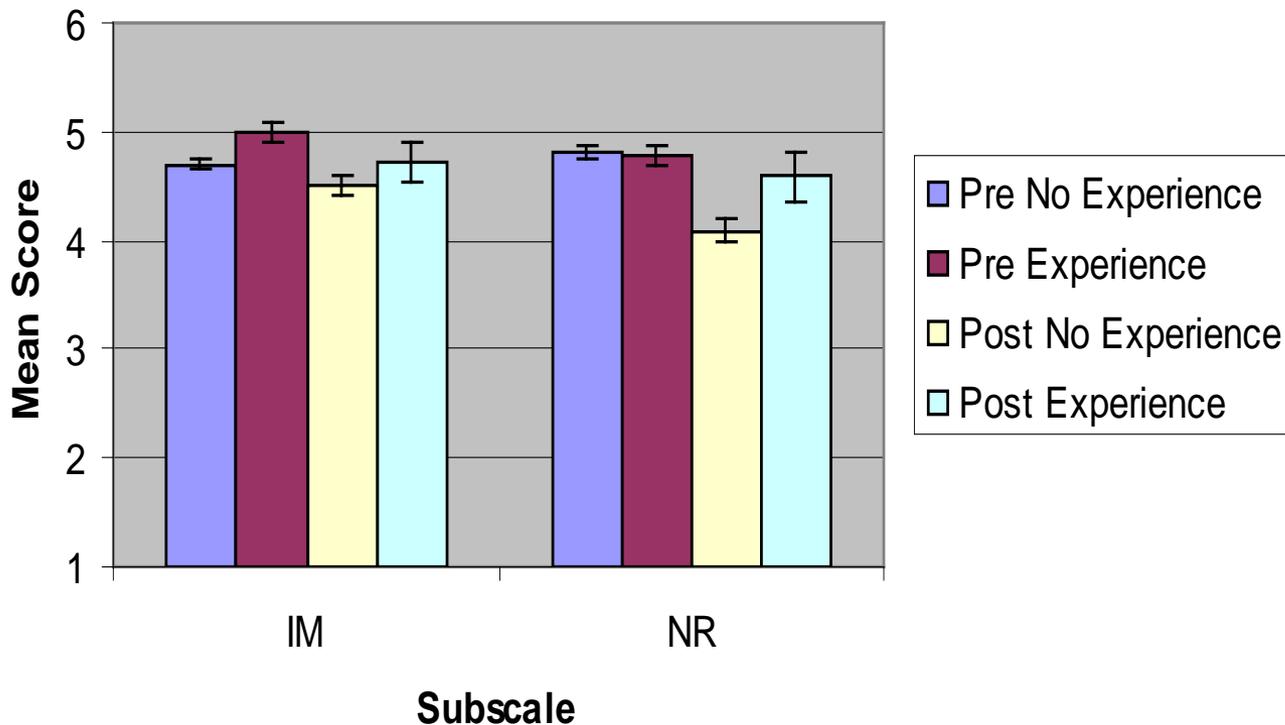


IM = Implementation Strategy

NR = Nine Rights of Quality Patient Care

Results: Section II Pre/Post Experience with Technology

- Generally similar pre-implementation expectations re: future for those with vs. those without previous technology experience
- Post-implementation perceptions lower for the NR subscale for those without previous technology experience



IM = Implementation Strategy

NR = Nine Rights of Quality Patient Care

Implications

- Measure offers a potential mechanism for assessment of expectations and experiences with clinical technology implementation
- Useful for health management/informatics researchers seeking to test theories of technology adoption and reaction

Management Implications

- Maybe useful for organizations seeking to assess changes as a result of technology implementation and target areas for training and work redesign
- For example, expectations for the future for Inter-Provider Communication were much higher than perceptions related to experiences
 - Suggests Inter-Provider Communication as an area to target through implementation and beyond in order to meet initial levels of expected improvement
- Worklife changes were lower than other factors both pre- and post-
 - Suggests an area of improvement to develop higher expectations and better experiences

Limitations

- Small sample size, particularly for post-implementation data
- Limited to one study site
- Single occupational group

Future Research

- Further examination of measure's psychometric properties
- Replication in additional samples
- Effectiveness as a tool to guide technology implementation in organizations has not been tested

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