

***Grant Final Report***

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## **HIT Support for Safe Nursing Care**

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# Abstract

**Purpose:** To determine if the electronically supported HANDS plan of care (POC) Method can universally assist a patient’s interdependent care team to hold a “Collective mind” or shared understanding of care. “Collective mind” is critically important because it is nearly impossible to ensure the continuity, safety, and quality of care without it.

**Scope:** The study protocol was implemented on 8 diverse units located in 4 different hospitals. Selection criteria: organization support, stable staffing, and agreement to require all RNs to use the HANDS Method for the entire study.

**Methods:** Multiple methods and measures (quantitative and qualitative) were used: surveys, observations of documentation and communication practices, interviews, focus groups, think alouds, term meaning reliability exercises, NOC outcome IRRs, and tracking of patterns of data entry and system use.

**Results:** Mindfulness + Heedful interrelating = Collective mind. Strong evidence of mindfulness; excellent rate of care plan submission (78-91%) and user satisfaction significantly increased over time ( $p < .001$ ). Expected level of compliance for “heedful interrelating” with POC at handoffs was not fully achieved, with users’ requesting better training and stronger administrative support.

**Key Words:** Electronic Health Record, nursing documentation, handoff communication, plan of care, nursing terminologies, standardization, outcome tracking, interoperability

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# Final Report

## Purpose

To determine if the HANDS plan of care (POC) Method can universally assist a patient's care team to hold a shared understanding or collective mind about care.

In the absence of a collective mind, it is nearly impossible to ensure the continuity, safety, and quality of care. "Collective mind" is a key attribute of organizations with strong safety cultures and few errors. This organization type, high reliability, is desirable for health care settings where errors can result in catastrophic circumstances. Members of high reliability organizations (HROs) are expected to be mindful when planning and carrying out interdependent tasks and to heedfully interrelate with team members in ways that maintain the team's collective mind. The intervention examined in this study was previously designed to help nurses and other members of a patient's care team hold a collective mind about a patient's care. The HANDS consists of a process and electronic plan of care documentation tool that assists nurses to a) mindfully plan care; 2) heedfully interrelate about care at every handoff; and c) maintain an up to date electronic representation of the team's collective mind about a patient's care. The following hypotheses were tested in a multi-site study that involved 8 diverse units in 4 different health care organizations:

- H1.** Our HIT supported intervention universally sustains nurse mindfulness in the POC processes.
- H2.** Our HIT supported intervention assists the nurses on the patient's team to heedfully interrelate about care at every handoff.
- H3.** Our HIT supported intervention supports the accurate and consistent representation of the team's collective mind in the HANDS application (electronic plan of care) across time.

## Scope

The plan of care (POC) component of both paper and electronic documentation systems (e.g. electronic health records EHRs) continues to be problematic. Though required by the Joint Commission, clinicians rarely find the POC useful in day to day practice for a variety of reasons. It is no wonder that the POC brings little value when it:

- Is difficult to access;
- Is out of date and inaccurate;

- Is cumbersome and time consuming to update;
- Provides information that is not useful;
- Is in a format that differs by user, unit, and organization;
- Does not assist the team to efficiently monitor the status of the care and progress toward outcomes;
- Does not clearly designate accountability and responsibility of the nurses who provide and coordinate team's plan of care at the front line.

Needed is a POC method that supports the nurse and other members of a patient's team to hold a collective mind about the patient's care and progress toward outcomes across time. In today's health systems, enabling a collective mind is no easy task given a patient's care can involve 10s of clinicians (doctors, nurses, dietitians, pharmacists etc.) whose actions are interdependent. The quality of the outcomes achieved, however, depends on the effectiveness of team members' interconnected actions. In an HRO optimal interdependency of members' actions is realized through what has been called "distributed cognition" (Hutchins,1990) and "collective mind" (Weick and Sutcliffe 2001). In health care organizations the "collective mind" simply means that members of a patient's interdependent team hold a shared understanding of the patient's care. The focus of this study is on enabling the "collective mind" since it is a vital precursor and the foundation to the continuity, safety, and quality of care. Without a collective mind the patient's care team is not operating with the reliable and valid information needed to make meaningful decisions about care.

## **HANDS Method (Study Intervention)**

The HANDS POC Method was previously developed and refined through eight years of research that spanned the continuum and included a real time pilot on one ICU unit. The Method consists of an electronic application (standardized data base and user interface), rules for data entry to create and update POCs in the application (what, how, when) and a standardized handoff procedure called SHARE. When the rules for data entry are invoked on a unit, a POC is either created or updated by the nurse who has served as the coordinator of a patient's care (on behalf of the entire team) during the period preceding a handoff. The nurse then uses the POC (following the SHARE protocol) to organize and communicate about care at the handoff in a way that facilitates the transfer of shared meaning. Individual nurse mindfulness is facilitated by the Method's rules for creating and updating POCs in HANDS. Heedfully interrelating is in turn facilitated by following the SHARE handoff protocol. The combination of creating the POC in the HANDS application according to the rules (individual nurse mindfulness) and following the SHARE process at handoffs (heedfully interrelating) are expected to ensure that the patient's POCs in HANDS is a valid and reliable representation of the team's collective mind.

The user interface, database, and rules for use have been carefully refined over the years through iterative research. Information is chunked into meaningful units and displayed consistently showing the relationships among the parts. The HANDS design reduces cognitive load by providing an external memory aid that facilitates quick understanding of large amounts

of information. The standardized terminology concepts of NANDA, NOC, and NIC (NNN) provide the response sets for the three major chunks of information on the POC; diagnosis, outcomes and interventions. In addition, the application provides many other aids that support the nurse to quickly create or update the POC and ensure appropriate selection of the NNN terms. There is a link from each label to its information screen that contains the concept definition and defining attributes. The interrelationships of each NNN label to each other in the POC are graphically depicted using a consistent format and symbols. Finally, there are standardized training modules and competency assessment tools for the application and SHARE handoff.

### **Key Technical Features:**

- Web-based tool;
- Single architecture and user interface;
- Structured content (NANDA, NOC, NIC, ICD9);
- Central data repository;
- Application server provider (deployed) deployed;
- Can connect to any EHR through an HL7 ADT feed;
- HIPAA compliant;
- POC decision support:
  - Starter templates;
  - Mini add-on templates;
  - Five search modes for NNN terms;
  - Link to information screen for every NNN term;
  - Standard reports.
- Screen for supporting quick access to all patients' POCs (for SHARE).

### **Application User Rules/Requirements:**

- Unit level adoption (all nurses must use Method—no opting out);
- Completion of standardized training prior to use in practice (6-8 h/RN):
  - Application, terminology, SHARE handoff.

- Demonstration of basic competency prior to use in practice:
  - Application, terminology, SHARE handoff.
- Entry of an admission or update plan on all RNs patients at every handoff;
- Expected outcomes ratings are those expected at discharge from unit (not from hospital);
- Confirmation of shift/time period RN was responsible for each patient;
- POC scope that covers care needed to move patient to next level (e.g, step down unit, peaceful death);
- Updating POC by RN responsible to reflect actual changes (e.g., additions, resolutions, changes in status);
- Re-rating of active NOC outcomes at every handoff;
- Discharge of patient:
  - Provides destination information;
  - Reason any expected NOC ratings were not met.

**SHARE Handoff Rule/Requirements:**

- RNs give handoff at computer screen with current POC displayed;
- Follow the SHARE format when giving handoff:

**S—Sketch** Information: provide pertinent context information; patient name, age, gender, medical diagnoses, code status, allergies, and other;

**H—HANDS:** review “Plan of Care” history and current plan—on computer screen—insert only those details needed by the oncoming nurse;

**A—Aim:** discuss focus of care for next shift and patients to be discharged;

**R—Rationale:** explain your thinking;

**E—Exchange:** invite questions, debate, and dialogue.

In summary, the HANDS plan of care Method integrates the HRO characteristics of mindfulness, heedful interrelating, and collective mind. As part of the Method, the nurse is taught and expected to mindfully create and update a patient’s plan and heedfully interrelate about it at every handoff. When mindfulness and heedful interrelating about the POC are optimal

then the documentation of it in HANDS (plan of care component of the EHR) is a representation of the team's current "collective mind."

## Methods

The main research question for this study was: "does the previously piloted HANDS intervention (Keenan and Yakel 2005) successfully represent the "collective mind" of a patient's team in diverse settings across time? As conceptualized for this study, a collective mind cannot be assessed directly or by a single measure for two reasons. First, the collective mind is essentially a cognitive state shared by the many clinicians involved in a patient's care and is not accessible to direct observation. Second, shared understanding is dynamic and changes regularly in response to care while also involving different clinicians across time. Evaluating the reliability and validity of a concept like "collective mind" is difficult at best. We decided to tackle the problem by using a number of different lenses to examine our phenomenon similar to the approach we had used in our pilot. We utilized a variety of cross sectional and repeated measures (quantitative and qualitative) to assess both general (culture, trust, errors) and specific characteristics (mindfulness, heedful interrelating).

**Sample.** A convenience sample of was selected for this study consisted of eight diverse acute care units located in four organizations. Units were chosen to represent a wide range (representative set) of patient types (medical-surgical, neurology, neurosurgery, thoracic surgery, progressive care, older adult/stroke, cardiac, and acute care elderly) organization types, geographic locations, unit physical setups (large, small, ICU, step down, regular), cultures, nurse characteristics, and staffing patterns. In addition, units had stable staffing levels, a strong desire to participate in the study, and agreed to that all RNs employed on a unit would use HANDS as POC Method for the duration of the study (See Tables 1 and 2).

The consent process took place at the beginning of the first pre-go live training sessions and for new hires at the start of the first training session when a project research assistant was present. Once the consent was signed, the subject automatically became a member of the pool of potential subjects for all future facets requiring consent (surveys, focus groups, think-alouds, observations, and interviews). The consent covered all waves of data collection requiring consent although the consented was always given the choice to opt out at any point. Consent was not required for all analysis conducted on the anonymous transaction log data gathered from HANDS.

**Table 1. Units, episodes, plans of care, % compliance with POC submissions**

Unit	HANDS mos.	Org <sup>c</sup>	# Beds	Av # pt episodes/mo	Av # POCs /mo	Av # POCs/ episode	POC submits compliance <sup>i</sup>
1 <sup>a</sup>	24	A	32/48	271	2391	8.8	88%
2	24	B	42	315	3213	10.2	85%
3	24	C	22	139	1345	9.7	91%
4	24	D	28	170	976	5.7	83%
5 <sup>b</sup>	12	A	60/44	311	2879	9.3	84%
6	12	B	42	308	2572	8.4	85%
7	12	B	10	72	570	7.9	81%
8	12	C	23	102	1098	10.8	78%

<sup>a</sup> unit increased number of beds in second twelve months; <sup>b</sup> unit decreased beds in first twelve months; <sup>c</sup> A = university hospital, city 1, B = large community hospital; city 2, C= large community hospital city 3, D= small community hospital, city 4; <sup>d</sup> range of % of 12 hour shifts for monthly time periods L= low, M=medium, H=high

<sup>i</sup> % of submitted plans of care for total number shifts possible for all time period data (T1 – T5)

**Table 2. RN characteristics**

Unit	Usual # RNs employed	% 12h shifts/mo <sup>d</sup>	Total RNs pre go live	Total Consents Signed	Total # RNs w 1 or more HANDS POCs	% RN BSN or higher	Yrs Hosp Exp M(SD)	Yrs RN Exp M(SD)
1 <sup>a</sup>	60/71	36-54 (M)	82	89	156	37	4.4 (7.0)	10.0 (10.3)
2	48	3 – 7 (L)	53	68	76	49	1.6 (3.7)	10.7 (10.1)
3	32	60-76 (H)	32	49	53	62	2.9 (4.7)	6.3 (8.2)
4	26	1 – 9 (L)	32	41	57	49	1.4 (4.3)	13.1 (11.0)
5 <sup>b</sup>	120/93	51-68 (H)	130	175	193	53	2.9 (4.2)	6.7 (8.1)
6	79	49-53 (M)	88	102	105	60	4.1 (5.3)	9.1 (10.2)
7	36	37-38 (M)	31	46	44	62	7.0 (7.0)	13.3 (9.2)
8	22	45-46 (M)	22	22	24	63	2.3 (3.4)	9.0 (8.6)
Tot.			470	592	708			

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<sup>i</sup> % of submitted plans of care for total number shifts possible for all time period data (T1 – T5)

## Results

In addition to the training and competency assessments the pre-go live period consisted of observations of each study unit’s documentation and communication practices at baseline. Other variables were examined at one point in time or by repeated measurement. The baseline survey was offered to all nurses employed at the formal pre-go live training session and was repeated again at 24 months for our by our four Y1 units and at 12 months for our four Y2 units.

## Observations

**Method.** Eighteen nurses were observed for entire shifts (10 on our 2 year units and 8 on our 1 year units) to learn the baseline written and verbal communication and verbal, practices of each of our eight study units. At least two nurses were shadowed per unit (1 expert and 1 novice) and observations spanned the 24 hour work day. A protocol was used to guide observations that began at the start of the nurse subject’s incoming shift report and was concluded after the end of a shift after off going report. The observers documented all communication activities and the

time and duration of all events and gathered copies of all artifacts used by the nurse for written and verbal communication (e.g., scraps, paper forms, nurses' notes, medication sheets, etc). Patient identifiers were removed from all forms gathered before the observer left a subject's unit. Debriefing sessions were held with the principal investigators shortly following the observations to create a narrative of each observation and ensure consistency in the observation and data collection process across each unit.

**Results Observations.** The full description and qualitative analysis of these observations will be reported in a forthcoming publication. In summary, the units differed dramatically in the types, forms, content, and manner of communication. All of our units utilized the computer for some form of documentation or communication with the extent ranging from information look-up (lab results) to entry of almost all nursing care information into the computer. The number of form types utilized by our observed subjects ranged from 5 to 11. Additionally all subjects wrote information on scraps of paper or forms that were typically carried in the nurse's pocket throughout the shift. The information recorded on the scraps varied by subject and nurses were rarely observed consulting the scraps when documenting into a patient's record. We, however, observed that the scraps, were frequently utilized during handoff communication and thus seemed to contain the information deemed important or appropriate for communicating at handoffs.

Baseline care planning practices on our units were minimal and seemed to be done to follow a policy requirement and brought little value to the nurse in day to day practice. Like all other communication observed, handoffs at shift report also varied widely in both structure and content. Some similarities in communication practices were apparent were noted for nurses working in the same unit or organization. The similarities were minor and typically involved use of common forms. Finally, of note was the consistent anecdotal mention by observers of the visible fatigue present in nurse subjects who completed 12-hour shifts.

## **Baseline and Follow-up Survey**

**Method.** A survey instrument was administered at baseline (pre go live) and follow up (at 24 months for the Y1 units (4); and at 12 months for the Y2 units (4). The items assessed the demographic characteristics of the subjects as well as their perceptions of unit/organization related practices and characteristics applicable to the intervention.

The Flashlight Current Student Inventory (Ehrmann and Zuniga 1997) of pretested stems (e.g., The \_\_\_\_\_ skills that I am acquiring are useful in my work setting) was used to develop 26 items to the survey as follows:

- 6 items—nurse demographics;
- 4 items—general computer usage (baseline only);
- 9 items—familiarity, extent of use, and satisfaction with the standardized terminologies NANDA, NOC, and NIC;
- 2 items—perceived usefulness of HANDS method;

- 1 item—perceived usefulness of current method of care planning (for most at baseline this was old method –for new hires this would have been HANDS – FU (all HANDS));
- 1 item—level of interest in improving care planning method.

In addition, there were 33 items used from two other existing instruments:

- 17 items—safety culture (Vogus 2004);
- 16 items—trust (Mishra 1992; Mishra 1996).

The baseline version of the survey was distributed to all attendees at the pre-go live orientations and thereafter to new hires during training when feasible. The follow up survey was distributed to the mailboxes of all previously consented RNs (n=310) who were employed on the study units at the time of the follow-up survey. The RNs who had not signed a consent received a letter in the same type of envelope describing what the consented were being asked to do.

**Results Survey.** A total of 660 surveys were completed (419 at baseline and 241 at follow-up). The response rates were respectively 88% for the baseline and 78% for the follow-up. The population for the baseline survey included all RNs who were offered consent and accepted at baseline. It was not feasible to engage in the consenting process with all new hires and float staff. The population for the follow-up survey consisted of all consented RNs employed on the study units at the time of the survey. The main findings of interest are the culture scores, perceived usefulness of HANDS, RN familiarity with NNN, and RN satisfaction with NNN. The culture scores for each of the units revealed that the units had positive cultures at the onset (5 point scale means for 8 units ranged from 3.3 - 3.8) and these scores did not change significantly at follow-up (5 point scale means for 8 units ranged from 3.3 - 4.0) utilizing independent t-tests. The RNs familiarity and satisfaction with the terminologies (NANDA, NOC, and NIC) and perceived usefulness of the care planning method compared to the baseline method were significantly more positive at follow-up across all eight units in independent t-tests (familiarity  $p < .000$ , satisfaction  $p < .000$ , and usefulness  $p < .001$ ).

## Think Alouds

**Methods.** Seven think alouds were conducted in four of the eight study units (located in three of our four organizations) to evaluate the effectiveness of training post go live and to detect application barriers that may not be apparent to users. Subjects responded to a public notices and were selected based on availability and level of experience. Each was given a \$50 stipend for participation. The convenience sample was comprised of four experts (> 5 years of nursing experience) and three novices (< 2 years of nursing experience). The think alouds were conducted at three months post-go live for our one subject from a second year unit and at around 15 months post with the six subjects from three of the three first year units. The subjects were instructed to create plans of care for two generic patients, one starting from scratch and the second utilizing a starter template. The subjects were carefully instructed to think aloud as they created the plans of care in HANDS.

**Results Think Alouds.** The think aloud exercises provided valuable feedback for improving both the software and our training strategies. For example, several subjects could not find the unhighlight button and this was fixed by enlarging the icon. We also found that one of our subjects confused the current rating of NOC with the expected rating (expected rating was rated lower than current). The latter alerted us to the need for reinforcement of the meaning and protocol for scoring current and expected NOC ratings. A number of other enhancements were added to the HANDS software and training modules based on the findings from these valuable exercises. The think alouds are particularly useful in identifying problems that RNs may be unaware of and thus cannot share in an interview, focus group or survey (e.g., too many clicks to find information or navigate, forgotten or unaware of a useful feature such as history being available inside plan).

## Interviews

**Method.** A total of 77 Interviews were conducted in the second quarters following the first and second year go lives mainly to learn what bothered users about the Method. In the first wave, 27 RNs from three of our four Y1 units were interviewed. In the second wave 44 RNs were interviewed. A minimum of 5 interviews were conducted with RNs from all 8 study units. In these convenience samples research assistants arrived on the units at different times of the day and approached consented subjects to participate in a 10-minute interview offering a \$10 stipend. The interviewers were instructed to “do what it takes” to make the subjects feel comfortable sharing their concerns and let respondents set the direction if they wish to do so. There were eight basic questions but because of the time constraint and desire to let respondent set the direction, not all were asked of every subject. The questions were as follows:

1. Do you have any burning concerns about HANDS that you would like to share with me confidentially? (What do you dislike about the HANDS care planning Method?)
2. What things are important for all nurses to think about when rating a current NOC (to be sure rating number means the same thing to every nurse)? Expected NOC?
3. What is the purpose of the Safety Survey? Do you typically use a category other than ‘do not care to respond’? (aware data anonymous)
4. What do you like about the HANDS care planning Method?
5. To what extent, if at all, do you use SHARE format for shift report? How so? If not, what are the barriers to using SHARE in report? If not, do you use the care plan at all in report? Why or why not?
6. Suggestions for improving the quality of shift report using HANDS care plans & SHARE structure.
7. What was most useful in the initial HANDS Training? What was not useful? Do you have any recommendations for improvement?

8. The data you input into HANDS allows us, as researchers and professionals, to answer many questions regarding patient care and outcome. Think about the type of information you enter into HANDS. What kinds of questions would you like to answer with this data?

**Interview Results.** Interview responses were recorded by the interviewer onto the interview sheet. The responses were coded into categories and subcategories based on the interview questions (Scott's  $\pi = .721$ ). In general, we received excellent feedback about the technology concerns and knowledge deficits of our respondents. As expected the feedback focused on concerns and suggestion for improvement given these were the questions being asked of the respondents (See question types, wording, and sequencing above). The results corroborated the results of the think alouds and related aspects of the follow-up survey results (done almost 6 months after the interviews). Most of the technical and knowledge deficits identified in the interviews had also been noted by our research assistants in the think-alouds. Similarly, RNs who answered interview question #4 (what do you like about the HANDS care planning Method?) responded favorably indicating they liked the Method and found it superior to previous care planning methods. The favorable comments were in agreement with the significant findings found approximately 6 months later on the follow-up survey.

The responses to improving the quality of shift report "using the HANDS care plans & SHARE" were the most revealing. The RN responses clearly suggested that HANDS POC was not being used as the organizing communication framework that had been envisioned. To our surprise, however, rather than indicating a poor design the respondents suggested the opposite. The RNs were very aware of the need to improve the quality of the handoff and indicated that HANDS/SHARE offered a viable alternative. The RNs suggested that the situation could have been remedied by better training, change management, greater availability of computers, and by providing consequences for lack of compliance. In hindsight, these comments made great sense to us. The existing handoff structures were deeply ingrained in the work flow and communication patterns of our nurses and thus unlikely to be changed without a more targeted effort.

Finally, the low level of compliance with the handoff protocol was in contrast to the POC submissions in which compliance ranged from 78% - 91% on the eight study units. The high rates for POC submission were achieved without formal "consequences" for not compliance. We conjectured that there are a number of factors that contributed to the differences. For the POC, the rules of use were relatively concrete, the application was easy to use, there was flexibility on when the plan could be entered, and gaps were obvious when plans were missing. For the handoff, the description of the method was broad and thus supported wide variation in the application of it (nurses could say they were doing it when they really were not); there was little flexibility around when handoffs occurred (if computers were not available handoffs had to go on), and training did not help nurses understand how information shared in old handoff should be handled in new handoff structure. This discrepancy is the subject of future research.

## Focus Group

**Method & Results.** One, two hour focus group was held with four champions from three of the four Y1 study units approximately 15 months post go-live. The focus group was held offsite (reason for low attendance) and a \$50 incentive was paid to each participant. The feedback was hand recorded by research assistants. The transcripts were reviewed by the investigators and

found to contain no pertinent additional information from that gathered from the interview data. For this reason the focus group data was not coded and formally analyzed.

## Safety Survey

**Method.** A safety survey was instituted at the go-live as a means of anonymously monitoring error rates in our 8 study units. A short electronic survey would appear (see below) immediately following the submission of the RNs first POC on a shift in which the respondent was required to pick at least 1 of 5 options from 3 error options (made, observed, avoided), a fourth “no errors” option, and fifth “do not care to respond” option. Respondents were allowed to pick more than one of the error categories but only one response was allowed if the “no errors” or “do not care to respond” were selected. Additionally, if an error option was checked, the RN could provide more details by selecting “willing to give more details.” The survey typically took no more that 2-3 seconds to complete one time per shift.

**Results Safety Survey.** There were a total of 141,325 surveys submitted from all 8 study sites into HANDS over the 24 month live period. There were 39,068 (28%) of the surveys in which the RN checked the “do not care to respond” option. On the remaining 102,257 (72%) RNs reported 1490 errors (made, observed, or avoided) which represented an error rate of 1.457% for the responder category. Though there were no significant differences in error rates across time, the trend was downward. 1.688%, 1.384%, 1.585%, and 1.338% (6mo, 12mo, 18mo, 24mo). Of interest is that the responder % significantly ( $p < .01$ ) increased across time from 59%, 66%, 77%, 80% (6mo, 12mo, 18mo, 24mo) indicating a potential trust in the anonymity of the process. Of note also, however, is that our interviews of RNs from the Y1 sites indicated that there may have been confusion about the meaning of the Safety Survey (one indicated that she thought it the questions related to errors made in HANDS). We followed up by circulating clarifying information to our Y1 sites and adding a clarifying statement to the survey tool and more information to the training modules for the Y2 sites. Though reported error rates were very small and not significantly different over time and across units, we do believe the tool and process used offer real promise for simple and cost effective rate for monitoring error rates across time. We expect to do further study of the Safety Survey process to establish its meaning and usefulness.

## Mindfulness Measures

Mindfulness for this study was defined as the nurse being thoughtful in creating and entering admission and update POCs in HANDS. This would include selecting the nursing diagnoses, outcomes, and interventions standardized NANDA, NOC, and NIC terms and the status of these that accurately reflected the care provided. At the present time there is no formal system for evaluating the appropriateness of the various components of care. Most importantly, appropriateness cannot be determined without first establishing that the care provided is accurately represented. For purposes of this study, our goal was to determine if there was evidence that RN mindfulness was occurring with regularity on patients POCs within episodes of care. Mindfulness was operationalized as the entry of at least one optional change on a minimum of one POCs during a patient’s episode of care.

**Method.** The HANDS software and database allowed us to anonymously track the number of optional changes to a patient’s update POCs during an entire episode. We were also able to calculate and assign the optional changes per update POC to anonymous RN IDs. This allowed us to examine “mindfulness” by patient episode and link changes made on update POCs to RN characteristics (experience, education, # of hours worked/month). An example of this analysis is reported on Unit 7 in Table 3. The results of the other units are forthcoming.

**Table 3. Mean number of optional RN changes to update POCs (Unit 7)**

Yr, Quarter	# Pt Eps	Total POCs	Total POC/ Patient: M	Total POC/ Patient: SD	Total POC/ Patient: MD	Total POC/ Pat.: Mo	Total POC/ Pat.: Min	Total POC/ Pat.: Max	M changes/ POC <sup>e</sup> : M	M changes/ POC <sup>e</sup> : SD	M changes / Pt. Episode <sup>e</sup> : M
2006 <sup>f</sup> , 3	105	1087	10.3	14.2	6.0	3.0	2.0	123	1.08	1.14	11.12
2006, 4	145	1416	9.7	10.5	6.0	3.0	2.0	61	.92	1.08	8.92
2007, 1	130	1359	10.5	11.6	6.0	5.0	2.0	61	.85	.76	8.92
2007, 2	121	1282	10.6	13.1	6.0	3.0	2.0	79	.63	1.10	6.68
2007 <sup>f</sup> , 3	36	320	8.9	9.5	5.0	2.0	2.0	40	.66	.90	5.87

<sup>e</sup>Changes occurring after admission poc submission: includes Add mini care plan; Activate, Add, Delete, or Resolve NANDA; Activate, Add, Delete, or Resolve NOC; Activate, Add, or Delete NIC. <sup>f</sup> Quarters 3 in 2006 and 2007 do not include 3 full months of data. The time periods are in quarters of 3 months each, so that the 3<sup>rd</sup> quarter of 2006 is July, August and September, the 4<sup>th</sup> quarter is October, November and December. The 3<sup>rd</sup> quarter of 2007 contains only the data from July when we ended HANDS on the unit. The total number of POC per quarter.

**Results.** The number of patients, POC per patient, changes made per POC and changes made per patient remain consistent across time in Unit 7 (having removed the admission POC). As is illustrated in Table 3, while the number of patients and average number of plans of care remained stable, the average number of changes per POC and patient episode steadily dropped off nearly 50%. Unit 7 was live with HANDS for only 12 months and this pattern is indicative of the change pattern seen on the other units. According to this data, many more changes are made during the early months following implementation when clinicians are adjusting to the new system and making changes to the plan that more accurately reflect the care (e.g., adding, subtracting, changing status of the NANDA, NOC, and NIC terms in the plan). This pattern was also found across the other seven study units. Though it is difficult to draw any conclusions, this trend is similar to what has been reported in the literature regarding patterns of use following implementation of electronic documentation systems. It is also possible that this trend suggests a move away from mindfulness because the POC did not become an integral part of the handoff process where the importance of an accurate plan would have preempted mindlessness.

We also examined POC changes by work status, education, and experience. There were significant differences in the average number of changes made on POC based on work status but not on education or by years of experience on the current unit or in nursing in general. Full-time RNS made significantly more changes, on average, per patient (M = 8.3, SD = 6.4) than did part-time RNS (M = 2.9, SD = 3.0) or very part-time RNS (M = .60, SD = .94,  $F_{(2,41)} = 12.7$ ,  $p < .001$ ). While those with a BSN or higher education made, on average, more changes per patient (M = 4.3, SD = 5.9) than did those without a BSN (M = 3.1, SD = 2.6), it was not statistically significant (most likely we were underpowered to test this in this unit).

## Heedful Interrelating Measures

For this study heedful interrelating was defined as consistent and systematic use of the HANDS plan of care by the RNs in guiding communication at every handoff. Our expectation was that RNs would use the report format taught in orientation for Y1 sites and strengthened and called “SHARE” in the Y2 orientation at each formal.

**Method.** A total of 43 handoffs were observed between months 20-21 for Y1 sites and month 8-9 for Y2 sites. The handoff observations took place on all eight study units and ranged in number from 3-16. All shifts were represented in the 43 observations but not for every unit. The verbal dialogue of each was recorded through audio taping. The audiotaping for the seven of units in which RNs engaged in a face to face verbal report were recorded by a research assistant, For the remaining unit we utilized the tapes that were created by the RNs for official report. When possible the following additional information was gathered by the research assistant: 1) location of handoff; 2) oncoming nurse information: frequency of receiving report from handoff RN, prior knowledge of patient, expected complexity of care for next shift; and 3) handoff nurse: scraps and forms used and importance of each to the handoff communication allocated by points to total 100. The verbal component of each handoff was transcribed verbatim.

**Results of Handoff Observations.** This data has not yet been fully analyzed. The transcripts, however, provide clear evidence that the HANDS POC and SHARE structure were used minimally in these handoffs with wide variation on the aspects included. The combination of these findings with interview data about handoffs were used to examine the degree of heedful interrelating that occurred as we had defined it (i.e., utilization of the HANDS POC to guide systematic communication about the care provided and success of it, aims for future care and rationale, and two way exchange for clarifying and improving the POC). The data will be further analyzed to more thoroughly describe the structure and content of the handoffs observed as well as to hone the coding scheme for evaluations of future handoffs that we expect to include “heedful interrelating.”

## External Collective Mind Measures

We examined a number of measures to help us assess if the external representations of the POCs were valid and reliable. Specifically we conjectured that if the HANDS POC accurately reflected the collective mind of nurses, that:

1. The nurses would know the correct meanings of the NNN labels;
2. That the IRRs for NOC current and expected ratings would be at acceptable levels;
3. That compliance rates for entering plans of care would be greater than 80 % (this was expected because each RN was now being held accountable for representing the care provided in a patient’s POC for every time period that the RN was in charge of care);
4. That the % of NOC expected ratings for discharge being met would improve across time and/or that the reason cited for not being met would rarely be “expected outcomes were

not realistic.” (This is because RNs were expected to become more adept at selecting appropriate outcomes and projecting the realistic ratings of them that should be achieved at discharge).

**Method and Results NNN Term Meaning Reliabilities.** At three different time points convenience samples of RNs on the study units were approached and asked to select the definitions of six terms (2 NANDA, 2 NOC, and 2 NIC) from three to four multiple choice answers per term. The terms were selected from those used frequently on the unit and the multiple choice incorrect answers included definitions for terms that were close in meaning and the response category, none of the above. The Ns and results are shown in Table 4. The results provide evidence that the RNs understood and could discern the meanings of most of the NNN terms that were being used regularly to describe care on their units.

**Table 4. Term meaning reliability exercises % correct by time period**

Units	3-9 months post go live: RNs	3-9 months post go live: M	3-9 months post go live: Range of M for units	15 months post go live : RNs	15 months post go live: M	15 months post go live: Range of M for units
Y1 (4)	28	68%	60-79%	39	74%	56-90%
Y2 (4)	42	82%	75-89%			

**Method and Results NOC Rating Reliabilities.** A convenience sample of nurses from all eight units participated in NOC rating reliability exercises during the final year of the study. One research assistant and one to two RNs from a unit independently scored the current and expected NOC ratings for a specified group of patients. The results are shown in Table 5. The results indicate moderate reliability across raters similar to what had been found in previous studies(Keenan, Stocker et al. 2003; Keenan, Barkauskas, et al. 2003). This finding provides evidence that RNs hold a moderately strong common understanding (shared meaning) of NOC ratings when raters apply the rules of rating expected and current outcomes.

**Table 5. NOC expected and current interrater reliability results**

NOC Outcomes Rated	Units	RNs	Pts	Exp W/0	Exp W/1	Current W/0	Current W/1
155 62 unique labels	8	17	34	.53	.95	.44	..86

**Method and Results Care Plan Submission Compliance Rates.** Plan of care submission compliance rates are noted in Table 1. Compliance rates equaled the total # of POCs submitted / total # POCs submitted + gaps. A gap was defined as a period of time between an admission or update plan in which there was no POC submitted. Data gathered on each of the 8 study units for the three to five time periods (T1 – T5) were analyzed. The rate of compliance ranged from 78% (unit 8) to 91% (unit 3), with the no gap being more than 12 hours in 98% of the instances. These compliance rates were extraordinarily impressive to us given that updates of POC for the HANDS Method were required at every handoff and not just every 24 hours (the typical practice

at baseline). These rates were substantially improved over the baseline conditions where the research assistant frequently could not locate any POC on a nurse's patients. Additionally, our rates of compliance are much higher than reported in the literature even when required frequency (1 time in 24 hours, versus at every handoff).

**Method and Results: % of Expected NOC Outcomes Met at Discharge.** Utilizing the data from T1 – T5 (with each unit reporting 3-5 time periods), the % of expected NOC outcomes met within 1 at discharge per patient were averaged by unit and time period for the available data. Though we expected improvement across time (improve) the rates stayed fairly consistent with overall % being met within 1 for all periods ranging from 73% (unit 2) to 92% for (unit 4). We were not certain why no improvement was seen but conjecture that it was partially due to high rates of meeting expected ratings from the beginning. Moreover, a goal of meeting 100% of expected outcome ratings was unrealistic since RNs are required to enter the rating on the POC to which the NOC is added and this cannot be changed. Thus, one would expect a certain number of instances in which expected ratings were legitimately inappropriate because of circumstances that could not be seen at the onset. Reasons for not meeting the expected ratings were gathered at discharge to help understand the variance. The nurse was allowed to select one of four choices if NOC outcomes were not met: 1) rating was unrealistic; 2) patient transferred to soon, 3) patient expired, or 4) other (narrative allowed). We expected the analysis to show a decrease in the response “rating was unrealistic” over time as RNs became more comfortable with rating and having ready access to a means for monitoring NOC outcomes in daily practice.

There were mixed results on the reasons for not meeting expected ratings. . While three units did not change significantly, three units reduced the percentage of patients discharged who had not met NOC outcomes due to “unrealistic expectations” by almost 50%. Unit 4's rate dropped from 52.2% to 32.6% ( $\chi^2 = 64.9, p < .001$ ), Unit 6 s from 40.3% to 22.3% ( $\chi^2 = 40.4, p < .001$ ) and Unit 7 from 15.1% to 6.4% ( $\chi^2 = 17.5, p < .001$ ). The remaining two units had significantly higher percentages of patients discharged with unmet NOC outcomes due to “unrealistic expectations,” Unit 3 (56.2% to 71.5% ( $\chi^2 = 59.0, p < .001$ ) and Unit 4 (33.1% to 46.9% ( $\chi^2 = 32.6, p < .001$ )). In conclusion, the findings are hard to interpret but may well be explained by the fact the POC was not used regularly in handoffs (as was expected. As such the reliability and validity of the ratings were not as strong as they would have been had members used the POC in handoffs to collectively set team goals and monitor patient progress over time.

## Overall Discussion and Conclusions

A variety of lens were used in this study to determine if the HANDS plan of care (POC) Method can universally assist a patient's care team to hold a shared understanding or collective mind about care. We examined both general characteristics related to HANDS and specific characteristics of the conceptual components of mindfulness, heedful interrelating, and collective mind. Most importantly, we were able to easily implement and sustain the HANDS Method on all of our study units for the duration of the study. RNs indicated that the Method was significantly more useful than previous plan of care methods and were also significantly more familiar and satisfied with the standardized terminologies used within HANDS. Compliance rates for plan of care (POC) submission were extraordinarily impressive and ranged from 78% to 91% on the 8 study units providing evidence of ongoing mindfulness in the POC process.

Additionally, patterns of changes made to the plans by the RNs also provided evidence of the sustained mindfulness in the process.

The RNs however rarely engaged in a meaningful version of the SHARE (heedful interrelating) in which the POC was to be used to guide the handoff communication. Although the overall Method brought value, it was clear that the lack of heedful interrelating resulted in the team's "collective mind" not being fully realized. The importance of heedful interrelating to the "collective mind" was thus underscored in this study. Moreover, a synthesis of related findings (baseline observations, handoff observations, interviews, patterns of data entry) provided ample evidence that both mindfulness and heedful interrelating are essential to creating a truly reliable and valid "collective mind" that in turn enables the continuity, safety, and quality of care. The findings also provided clear evidence that current systems of documenting (EHRs, paper records) and communicating (handoff protocols) about care do not adequately support "maintaining" the team's ongoing collective mind about care. As such, there is a critical need to refine ways, like the HANDS Method, to help the patient's care team to stay on the same page across time.

In this study, we specifically learned that when the POC is not used as a major driver of team communication, it can become a secondary source that is not kept fully current and thus is less useful. Primary sources are those information pieces that are kept fully current (and also reliable and valid) because the information is seen as essential to the decision being made. Doing what it takes to ensure that the POC becomes a primary source of communication information thus is expected to automatically improve the reliability and validity of its content. The RNs in this study were fully supportive of using the SHARE protocol (HANDS POC in handoffs) but indicated the need for better training and support to realize this goal and we agree. In conclusion, we believe this study helped us make extraordinary progress toward understanding what is needed to create a valid and reliable representation of the team's collective mind. Our next steps will involve refinement and further testing of our SHARE training and implementation materials and strategies in multiple sites.

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# List of Publications and Products

## Key Publications

Anderson, C., Keenan, G., & Jones, J. (In press, 3.2009, CE offering). Using bibliometrics to support your selection of a nursing terminology set. *Computers, Informatics, Nursing (CIN)*.

Westra, B, Delaney, C., Konicek, D., Keenan, G. (2008). Nursing standards to support the electronic health record. *Nursing Outlook*, 56(5):258-266.

Keenan G, Yakel E, Tschannen D, et al. In Hughes R, editor. *Patient safety and quality: An evidence based handbook for nurses*. Rockville, MD: Agency for Healthcare Research and Quality, 2008. Chapter 49, Documentation and the nurse care planning

process. [http://www.ahrq.gov/qual/nursesfdbk/docs/KeenanG\\_DNCP.pdf](http://www.ahrq.gov/qual/nursesfdbk/docs/KeenanG_DNCP.pdf)

Keenan G, Tschannen D, & Wesley M (2008). Standardized terminologies can transform practice. *J Nurs Adm* 2008 Mar ;38(3):103-106.

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## Key Presentations

Keenan, G. (Nov. 9, 2008). HANDS: Model of a Genuine Interoperable EHR Plan of Care. Panel Presentation: Implementing Standardized Nursing Terminologies in EHRs: Challenges and Opportunities. AMIA Fall Conference. Washington, DC.

Keenan, G. (Nov. 8, 2008). HANDS: A solution for improving disciplinary and interdisciplinary communication. Part of Tutorial: Optimizing nursing documentation: Current research and practice. AMIA Fall Conference. Washington, DC.

Keenan, G. (June 23, 2008). New innovations in patient safety across the continuum of care: The HANDS method. Invited Presentation, Center for American Nurses Lead Summit Conference. Washington, DC.

Keenan, G. (June 9, 2008). Supporting Practice & Generating Powerful Nursing Care Data. Invited Presentation, University of Iowa Nursing Informatics Summer Institute. Iowa City, Iowa.

Keenan, G. (April 22, 2008). The history, research, and features of the HANDS plan of care method. Invited Presentation Veterans Health Administration National Nurse Executive Council. Seattle. WA.

Keenan, G. (April 17, 2008). HANDS: Supporting practice and generating powerful nursing data. Invited Presentation Wisconsin Organization of Nurse Executives (WONE). LaCrosse, WI.

Keenan, G., Tschannen, D. & Mandeville, M. (July 25th, 2007). A demonstration and discussion of the features and history of HANDS. Presentation to administrators, staff, and faculty of the three main local hospitals in Rockford, IL held at Rockford College.

Keenan, G, Yakel, E., Kuperman, G., Lorenzi, N., Ozbolt, J., B. (Nov. 11, 2007). *Panel: Diverse stakeholder implications of findings from a three year multi-site study of a standardized HIT supported care management system*. American Medical Informatics Association Fall Conference, Chicago.

Keenan, G. (Moderator Nov. 10, 2007) Pre-Conference Workshop (Workshop 9) *Toward a Greater Collaboration and Focus in Building the Nursing Practice Information Infrastructure*. American Medical Informatics Association Fall Conference, Chicago.

Keenan, G. (Sept. 26, 2007) *Implications of the findings of a three year study of a standardized HIT supported care management system*. Presentation Agency for Research and Quality (AHRQ) Annual Conference. Washington, DC.

Keenan, G. & Mandeville, M. Demonstration of the HANDS features. (Sept. 26, 2007). Presentation Agency for Research and Quality (AHRQ) Annual Conference, Washington, DC.

Keenan, G. (June, 2007). *The ANA CNPII is fighting fragmentation of nursing informatics*. Presentation at the Vanderbilt Nursing Terminology Summit. Nashville, TN.

Keenan, G. (May, 2006). *Using HANDS to meet the JCAHO 2006 hand-off safety goal*. Presentation to members JCAHO standards development staff, Oakbrook, IL.

\*Keenan, G. *Applications for CCR and HANDS* (May, 2006). Presentation for the Electronic Patient Record Conference (TEPR), Baltimore.