

Validation of the Impact of Health Information Technology (I-HIT) Scale: An International Collaborative

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Abstract. In 2005, the Healthcare Information Management Systems Society (HIMSS) Nursing Informatics Community developed a survey to measure the impact of health information technology (HIT), the I-HIT Scale, on the role of nurses and interdisciplinary communication in hospital settings. In 2007, nursing informatics colleagues from Australia, England, Finland, Ireland, New Zealand, Scotland and the United States formed a research collaborative to validate the I-HIT across countries. All teams have completed construct and face validation in their countries. Five out of six teams have initiated reliability testing by practicing nurses. This paper reports the international collaborative's validation of the I-HIT Scale completed to date.

Keywords: information technology, computer use, nursing practice

1. Introduction

Nurses' use of Health Information Technology (HIT) to facilitate communication and improve patient care processes is a relatively new phenomenon. Well designed systems and integrated technologies hold promise for improved communication and patient safety.[1] However, recent reports suggest that poorly integrated systems and technologies are frequently not adopted by end users, may be an impediment to effective communication and contribute to adverse events.[2] Poorly integrated systems do not support the bedside nurse's role as coordinator of patient care. Nurses are at the hub of communication in hospitals and the nursing role of coordinator of care is fundamental to effective and safe patient care. The ability of bedside nurses to carryout integrating activities is dependent on ubiquitous access to information and the ability to communicate effectively. As hospitals internationally transition from paper-based to electronic systems, it is necessary to develop ways to explore the impact of HIT on nursing practice.

In 2005, the HIMSS Nursing Informatics Community developed the I-HIT Scale to measure the impact of HIT on the nursing role and interdisciplinary communication in USA hospitals. Items for the I-HIT scale were generated from a critical review of the literature using MEDLINE (1966) and CINAHL (1982) to present databases with the search terms: HIT applications and tools, healthcare communication, and professional nursing role. Four key themes: 1) HIT as a facilitator/barrier to interdisciplinary communication, 2) HIT

as a facilitator/barrier to the nursing roles of communication coordinator and integrator of care, 3) HIT as a facilitator/barrier to the nursing process, and 4) Unintended consequences of HIT were identified and used for generating potential items. A focus group interview with nursing informatics experts was conducted to refine survey items. Content and face validation of items was completed and reliability testing was achieved using survey responses from a sample of over 1000 nurses. The development and testing of the I-HIT Scale in the USA has been described in detail elsewhere.[3-4] In 2007, nursing informatics colleagues from Australia, England, Finland, Ireland, New Zealand, Scotland and the USA formed a research collaborative to validate the I-HIT in six additional other countries.

2. Objectives

This paper provides an overview of the survey validation process, results to date of construct and face validation, and survey dissemination for reliability testing.

3. Materials and Methods

In accordance with established procedures,[5] the international team agreed on five phases of survey validation and dissemination: 1) Content and face validation (including translation/back translation in Finland), 2) Dissemination of validated survey for reliability testing, 3) Psychometric evaluation, 4) Dissemination of validated survey and 5) Results Reporting.

Content and face validation. Content validation, involved review of the I-HIT scale by nursing informatics experts in participating countries to assess the language used was clear and culturally appropriate. Modifications were made to ensure that each I-HIT item was conceptually equivalent with the item in the U.S. version of I-HIT. International experts verified that each of the 29 survey items was clear, understandable, and culturally appropriate. Following established methods[5] of asking content judges to use a four-point scale to rate each item for content validity (CV), the 90% average congruency percentage standard was used to retain items in each country's I-HIT. Each international colleague recruited four nurse experts in HIT to rate each item for relevance (the degree to which each item is relevant to the impact of health information technology on the role of nurses and interdisciplinary communication in hospital settings) and interpretability (the degree to which each item can be interpreted and understood within the culture) using the following four-point scale: 1 = not relevant/ not interpretable; 2 = unable to assess relevance or interpretability without item revision; 3 = relevant/interpretable but needs minor alterations; 4 = very relevant/easily interpretable. Experts also provided comments for improving relevance/interpretability for items rated ≤ 4 . Scores and comments from experts were evaluated and used to modify items.

The criterion of credibility[6] was used to establish face validity by learning empirically if the items and scale administration procedures were acceptable and how they could be improved. Each international colleague held a focus group with hospital-based nurses who were direct caregivers in hospitals to review I-HIT items. Nurses summarized the meaning of each item, made suggestions for language modifications, and provided feedback on administration instructions. Items with less than 90% congruency were deleted. Validated items were used to build a web- based version of the I-HIT for each collaborating country and disseminated to initiate reliability testing. Potential I-HIT respondents were recruited by email and healthcare-related listservs using a non-probability snowball sampling technique and by receiving the link from nursing contacts in hospitals.

4. Results

Four content judges per participating country rated items for relevance and interpretability and provided comments to guide modifications in language and addition of examples. All 29 items were scored as relevant and interpretable in Ireland, 28 in Scotland, 27 in Australia and New Zealand and 23 in England. Two items related to the acknowledgment features of current HIT applications/tools were unable to be validated in 3 of the 5 participating countries. The following two items were initially rated poorly with a “one” or “two” by content reviewers on relevance and interpretability (e.g., low relevance/ interpretability) in four out of the five countries who completed this phase of testing.

I find the acknowledgement features of current HIT applications/tools provide adequate assurance that my interdisciplinary colleagues have received the communications that I send.

I find the acknowledgement features of current HIT applications/tools provide adequate assurance that interdisciplinary colleagues have acted upon information that I send.

Modifications of language and the addition of examples brought the ratings up to “three” or “four” in Ireland and Scotland so that the items were retained in the scale. These two items were unable to be validated in Australia, England, and New Zealand. See **Table 1** for content and face validation results.

Responses to the reliability testing of the web-based I-HIT ranged from 53 (England) to 1135 (Australia). The I-HIT has not yet been disseminated in Finland. Responses by participating country are included in **Table 2**.

Table 2: Responses to Dissemination of Web-based Survey for Purpose of Reliability Testing

Country	Responses to Date
Australia	1135
England	53
Ireland	171
Scotland	124
New Zealand	132

5. Discussion and Conclusions

The majority of I-HIT Scale items were rated as both relevant and interpretable by the international content experts. However, most items required minor modifications in language or the addition of examples to improve relevance and interpretability. English was the official language in five of the six participating countries, but there were slight differences in the use of language and terminology among those countries. Content experts suggested wording changes to achieve consistency with a country’s use of terminology and to improve item interpretability. For example, on the USA scale, the term “hospital” is used interchangeably with the terms “site” and “facility”. Content experts in several countries requested that the term “hospital” be used exclusively. Requests were made to spell out all acronyms and to add examples to ensure clarity. Some USA concepts were unfamiliar in other countries (e.g. “orders” vs. requests, treatments or lab orders). In this case, examples were added to ensure clarity.

Table 1: I-HIT Scale Content/Face Validation Results

	Australia	England	*Finland	Ireland	Scotland	New Zealand
General advantages of HIT						
1. HIT applications/tools have decreased the time I need for end of shift report.		E				
2. HIT applications have decreased the need for direct communication around writing patient orders.	E, L	E			L	E, L
3. HIT provides better information to prepare me for my assigned patients each day.		E, L		L		
4. HIT facilitates practice efficiency.		NV			L	
5. HIT allows for patient/family participation in care		L			L	L
6. The ability of interdisciplinary team members to access information electronically has reduced their need to communicate directly with each other face-to-face or via phone.		E				
7. The ability of nurses to access information electronically has improved their ability to independently make decisions.	L	E				
8. HIT applications available at my facility improve my ability to assume care for patients transferring into my unit.		E		L	L	
9. Work lists generated from HIT tools support efficient patient care.		L				
Workflow Implications of HIT						
1. The ways in which data/ information are displayed using HIT improves access to data.	E, L	NV			NV	L
2. HIT depersonalizes care.		E				
3. The HIT applications available at my site help me to process data and therefore improve access to information necessary to provide safe patient care.		L		L	L	
4. The availability of electronic interdisciplinary documentation has improved the capacity of clinicians to work together.		L			L	
5. HIT applications/tools support the nursing process.						L
6. The ways in which data/ information are displayed using HIT reduces redundancy of care.	E, L	E, L				L
7. The ways in which data/ information are displayed using HIT facilitates interdisciplinary care planning.						L
8. HIT applications/tools facilitate interdisciplinary treatment planning.		L				
Information Tools to Support Communication Tasks						
1. My site is utilizing HIT strategies to optimize interdisciplinary communication (e.g. clinical messaging, Vocera or similar wireless voice communication system, text paging).	L	L		L		L
2. Available HIT applications/tools facilitate the process of patient tracking.		E				
3. I have access to HIT applications/tools that support interdisciplinary communication when I need them.						
4. Available HIT tools support both patient care and administrative processes.						
5. HIT facilitates ID communication that is patient centered.		L				
6. The availability of information afforded by HIT at my site helps nurses collaborate at a higher level with interdisciplinary colleagues than was possible with paper systems.	L	E, L		L	L	
7. I know how to access the HIT applications/tools available in the electronic medical record system.	L	NV			L	
Information Tools to Support Information Tasks						
1. I find the acknowledgement features of current HIT applications/tools provide adequate assurance that my interdisciplinary colleagues have received the communications that I send.	NV	NV		E	E	NV
2. I find the acknowledgement features of current HIT applications/tools provide adequate assurance that interdisciplinary colleagues have acted upon information that I send.	NV	NV		E	E	NV
3. HIT promotes 2-way communication between clinicians about patient status.		E, L			L	L
4. Communication of critical events to interdisciplinary colleagues can be done effectively using HIT.		L			L	L
5. HIT applications/tools help me to be problem-focused in my communications.	E	NV		E	L	L
Key: Modifications required to establish content/face validity L=Language modification E=Example(s) added for clarification NV=Content validity not established *Translation/back translation required for validation						

While much work has been accomplished through this international collaborative, we face several ongoing challenges. In Finland, content and face validity testing involves translation and back translation, adding significant complexity to the validation process. Survey dissemination for reliability testing proved to be difficult in participating countries. To validate the survey items, ten responses per item are needed.[7] The main difficulty associated with dissemination (with the exception of Ireland) is securing ethics approval so that national listservs can be used to contact potential participants. The process for national ethics approval is labor intensive and adds additional burden on our all-volunteer team of nurse researchers. However, based on response count to date, we believe national ethics approval is a prerequisite for securing an adequate response rate so that we can move on to reliability testing.

Recently, our Australian colleagues were able to secure national ethics approval. Using national listservs to engage hospital based nurses in participation. Over 1000 Australian nurses responded to the web-based survey in less than 30 days. In two of the participating countries, Ireland and Scotland, lack of penetration of HIT in hospital settings proved to be an additional dissemination challenge.

Several limitations are associated with this work. The generality and validity of findings based on web-based surveys are limited because respondents are limited to those with access to the Internet and those with sufficient computer literacy skills and time to complete an online survey.[8] In addition, the web-based surveys are self-report and non-probability sampling methods were employed to recruit participants. The sample may not be representative of all bedside nurses in participating countries.

As hospitals around the globe transition from paper-based to electronic communication and documentation systems, it is necessary to develop ways to explore the impact of HIT on nursing practice. The international collaborative to validate the I-HIT Scale represents a first step toward devising a means to establish a baseline measure of the impact of HIT on nursing practice.

6. References

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