Case Report ■

Information Needs, Infobutton Manager Use, and Satisfaction by Clinician Type: A Case Study

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Abstract To effectively meet clinician information needs at the point of care, we must understand how their needs are dependent on both context and clinician type. The Infobutton Manager (IM), accessed through a clinical information system, anticipates the clinician's questions and provides links to pertinent electronic resources. We conducted an observational usefulness case study of medical residents (MDs), nurse practitioners (NPs), registered nurses (RNs), and a physician assistant (PA), using the IM in a laboratory setting. Generic question types and success rates for each clinician's information needs were characterized. Question type frequency differed by clinician type. All clinician types asked for institution-specific protocols. The MDs asked about unfamiliar domains, RNs asked about physician order rationales, and NPs asked questions similar to both MDs and RNs. Observational data suggest that IM success rates may be improved by tailoring anticipated questions to clinician type. Clinicians reported that a more visible Infobutton may increase use.

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Introduction

Clinicians frequently experience unmet information needs while using clinical information systems (CIS).[1] However, the use of an online information retrieval system has been shown to significantly improve the quality of answers retrieved by experienced clinicians when compared with clinicians not using an online information retrieval system.[2] Other research showed a clinician's prior beliefs, length of search time, order of information accessed, variable search strategies, and electronic information resource choices may influence their decision making processes and retrieval of correct answers while using information retrieval systems.[3,4] Furthermore, the types of information needs, the contexts in which the needs arose, how the clinicians attempted to address their needs, and success rates may vary by clinician type.[1,5] Moreover, a study by Westbrook et al provided evidence that the proportion of correct answers varied by clinician type when unaided by an electronic information retrieval system, but after the use of an information retrieval system no variation was detected between clinical groups. Thus, the use of an information retrieval system may increase the consistency of correct answers obtained, independent of the type of clinician using the system.

The aim of this case study was to examine, in a controlled setting, the usefulness of streamlining information retrieval at the point of care. Information retrieval is streamlined by using CIS context-specific information to anticipate clinicians' information needs and, when selected, provide resources to meet the needs of different types of clinicians. The context-specific links between the CIS and the information resources are referred to as Infobuttons and are implemented through the Infobutton Manager (IM).[6]

Case Description

We observed 14 clinicians using Infobuttons in a laboratory setting at Columbia University School of Nursing between October 2006 and October 2007. Convenience samples of clinicians who were employed at New York Presbyterian Hospital and who routinely used the CIS that was used in this study were invited to participate. The participants, 6 medical residents (MDs), 4 nurse practitioners (NPs), 3 registered nurses (RNs), and 1 physician assistant (PA), were instructed to think aloud by verbalizing their thoughts as they performed the tasks described in each of the 3 assigned scenarios (Table 1). A session (all 3 of the scenarios) required approximately 20–40 minutes to complete. The data were collected using Morae Software (TechSmith, Okemos, MI) which captures a simultaneous audio (participant's voice) and visual (computer screen) recording. Researchers can later review the recordings to identify events of interest for detailed analysis. The study

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Table 1 ■ Scenarios by Clinician Type

MDs, NPs, PA (Order Entry)	RNs (Order Review for Intended Implementation)
1. Ordering a laboratory test and an antibiotic medication	1. A fall and injury precautions order
2. Ordering an intravenous heparin drip	2. An insulin medication order
3. Ordering fall and injury precautions	3. An order for blood glucose monitoring

MD, medical resident; NP, nurse practitioner; PA, physician assistant; RN, registered nurse.

was approved by Columbia University's institutional review board, and participants were compensated $40 for their time.

Methods

To understand the clinician's information needs, we used our Information Needs Event taxonomy (INE).[1] One researcher (S.C.) reviewed the observations to identify all clinical questions that were related to the given scenarios. These questions were then characterized according to their generic question type, clinician type, information need type, method of expression, context in which it arose, resource utilized (see Appendix available as a JAMIA online-only data supplement at http://www.jamia.org), search strategy (Infobutton selected or no Infobutton selected), and outcome (success, deferral, failure). For this analysis, we excluded clinicians' questions that were specific to navigating the user interface, such as "I was forwarded to this screen, what should I do?" Once the data were coded, they were analyzed using SPSS version 15.0 (SPSS Inc., Chicago, Illinois) to summarize the generic question types per clinician type. Using the INE, frequencies and mean frequencies of generic question types according to clinician type were calculated; content analysis was performed on the observed recordings to identify themes.

Case Observations

Table 2 lists the total number of information needs and the average number of information needs events per session by generic question type and clinician type. Overall, the subjects were successful in meeting their needs about half of the time (51% for MDs, 47% for NPs, 49% for RNs, 60% for the PA) (Table 2). Ninety-two percent of the time that a clinician selected the Infobutton, they advanced on to use an IM resource. When the clinicians selected an IM resource, they successfully met 62% of their needs, deferred 17% of their needs by not searching the resource for an answer, and failed to resolve their needs 22% of the time despite searching the resource for an answer. In comparison, when clinicians did not select the Infobutton, they successfully met 38% of their needs, deferred 38% of their needs, and failed to resolve 24% of their needs.

While thinking aloud during the case scenarios, all of the RNs and one NP expressed the need for patient education content. They stated the content should be at low literacy levels with Spanish translation available that included pictures and simple instructions in a printable format for use by patients. Additionally, the RNs asked a total of 13 clarification questions to determine the rationale for a physician order; 12 of these 13 questions were of the generic question type, What are my patient's data? The MDs asked a total of 28 questions addressing background and institutional guideline information for the fall and injury precautions order. The MDs suggested the inclusion of a function to calculate creatinine clearance and

Table 2 ■ Frequencies of Generic Question Type by Clinician Type and Outcome Rates by Clinician Type

	Question Type Frequency (Average per Session)				
Generic Question Type	MD N = 6	NP N = 4	PA N = 1	RN N = 3	Total N = 14
How is this done at this institution?† (‡NP)	29 (4.8)	20 (5)	3 (3)	8 (2.7)	57 (4.1)
What is the dose of drug x?* (‡MD)	33 (5.5)	10 (2.5)	7 (7)	1 (0.34)	44 (3.1)
Can drug x cause (adverse) finding y?*	14 (2.3)	13 (3.3)	3 (3)	6 (0.5)	33 (2.4)
What is this (unfamiliar) domain-specific information?† (‡PA)	22 (3.7)	3 (0.75)	8 (8)	6 (0.5)	31 (2.2)
What are my patient's data?†	10 (1.7)	6 (1.5)	2 (2)	12 (4)	28 (2)
What is the patient education related to x?† (‡RN)	0	1 (0.25)	0	23 (7.7)	24 (1.7)
How should I manage condition x (not specifying diagnostic or therapeutic)?*	3 (0.5)	5 (1.3)	0	8 (2.7)	16 (1.1)
How should I treat condition x (not limited to drug treatment)?*	5 (0.8)	2 (0.5)	0	6 (0.5)	13 (0.93)
What is normal in this situation?†	6 (1)	4 (1)	0	1 (0.34)	11 (0.79)
What is the drug of choice for condition x?*	4 (0.7)	3 (0.75)	1 (1)	0	7 (0.5)
What test is indicated in situation x?*	1 (0.2)	1 (0.25)	0	0	2 (0.14)
What is the cause of test finding x?*	0	1 (0.25)	1 (1)	0	1 (0.07)
Total per clinician type	127 (21)	69 (17)	25 (25)	71 (24)	292 (21)

	Outcome Frequency (%)				
Outcome Rates	MD	NP	PA	RN	Total
Success	65 (51)	32 (47)	15 (60)	35 (49)	147 (50)
Deferred	34 (27)	23 (33)	10 (40)	8 (11)	75 (26)
Failure	28 (22)	14 (20)	0	28 (39)	70 (24)
Total per clinician type	127	69	25	71	292

MD, medical resident; NP, nurse practitioner; PA, physician assistant; RN, registered nurse.
*Questions from Ely. †Questions from Infobuttons. ‡Most frequent question for clinician type.

weight-based drug doses. The NPs discussed that due to their bedside RN experience they understood the fall and injury prevention protocol, but did want medication information. All clinician types suggested that there should be more institution-specific protocols accessible through the IM. Finally, all clinician types felt that the IM was a useful clinical tool that, with improved awareness and publicity, a more visible Infobutton icon, and fewer required mouse clicks, could serve as a valuable resource for meeting clinician's information needs.

In addition, detailed content analysis of the participants' verbalizations of their information needs revealed 3 themes: institution-specific information need; unfamiliar domain information need; and clinical rationale for order information need. The institution-specific information needs were expressed by all clinician types and were observed when clinicians expressed either a desire to access the hospital protocol for each scenario presented or expressed satisfaction when the resource was found to be an institution protocol. Notably, institution-specific guidelines for frequent, yet complicated, processes such as antibiotic prescribing and intravenous heparin drip prescribing were highly valued and desired as easily accessible resources by the participants of this study. The second theme, unfamiliar domain information need, was specifically expressed by MDs as they discussed their uncertainty and curiosity about what occurs after writing nursing orders for fall and injury precautions. The third theme, clinical rationale for order information need, was demonstrated by RNs seeking to know the physician's rationale for entering an order to assess its appropriateness.

Discussion

This study examined the usefulness of the IM and information needs of clinicians in a controlled laboratory setting. The development of a calculator function, patient education materials, more institution-specific protocols, and fewer required mouse clicks should increase the usefulness of the IM. We found that information needs varied according to clinician type, but that clinicians of each type experienced a comparable number of information need events per scenario. The IM was successful in providing information to address clinicians' information needs. Clinicians were found to defer fewer needs and have a higher success rate when using the IM compared to not using the IM. Our overall outcome rates (success 50%, deferred 26%, failure 24%) are consistent with previous INE taxonomy outcome rates of clinicians in the clinical setting (success 49%, deferred 26%, failure 25%).[1] These promising findings, coupled with the fact that 92% of the time clinicians selected the Infobutton they advanced on to use an IM resource, indicate that the IM may help answer a clinician's questions while using a CIS.

To further improve the IM, information needs may be grouped as needs that can be met by an informatics application, such as the IM, or information needs that represent a lack of communication or understanding between the various health professions that operate in silos.[7] Lack of knowledge about another professional's role and responsibilities has been shown to limit collaboration; yet, a clinician's interest in collaborating may positively influence teamwork, and collaboration may help improve patient centered decision making.[8] The hospital policy indicates that MDs must document a patient's fall and injury risk, yet this study indicates that MDs still lack knowledge about fall and injury prevention protocols, which are typically characterized as a nursing domain area. However, the MDs were interested in learning about the process of implementing fall and injury precautions during patient care. The RNs in this case study asked for the physician rationale for an order; previous work by Baggs et al.[8] indicates that nurses may purposefully delay the implementation of an order to provide time to understand and verify physicians' reasons for care decisions in order to assess the appropriateness and safety of an order. The NPs' bedside RN experiences and order entry responsibilities may have influenced their question types, which were similar to both the RNs' and MDs' question types.

This case study is limited by the sample size of clinicians, the limited setting from which the clinicians were selected, and the scenarios presented to the clinicians. For instance, the RNs reported that they were very familiar with insulin administration and blood glucose monitoring procedures. This familiarity may have influenced the nature of the questions that the RNs asked, such as requests for patient education materials.

Access to unfamiliar domain-specific information and the inclusion of rationales within order entry interfaces may increase collaboration and interdisciplinary care. Clinicians of all types appear to desire evidence-based information in the form of institution-specific guidelines to direct care. The RNs highly value low-literacy, multilingual patient education materials in addition to institution-specific guidelines.

Conclusion

Clinicians reported that the IM platform is easy to use and useful in providing desirable information resources, and that greater awareness among clinicians and a more evident Infobutton within the CIS may increase use. Our results indicate that the clinicians using the IM successfully answer over half of their information needs. In general, different clinician types expressed different types of information needs; therefore, tailoring the IM to the specific clinician type may increase the success rate of providing just-in-time information to busy clinicians at the point of care.

References ■

1. Currie LM, Graham M, Allen M, Bakken S, Patel V, Cimino JJ. Clinical information needs in context: an observational study of clinicians while using a clinical information system. AMIA Annu Symp Proc 2003:190–4.
2. Westbrook JI, Coiera EW, Gosling AS. Do online information retrieval systems help experienced clinicians answer clinical questions? J Am Med Inform Assoc 2005;12:315–21.
3. Lau AY, Coiera EW. Do people experience cognitive biases while searching for information? J Am Med Inform Assoc 2007;14:599–608.
4. McKibbon KA, Fridsma DB. Effectiveness of clinician-selected electronic information resources for answering primary care physicians' information needs. J Am Med Inform Assoc 2006;13:653–9.
5. Cimino JJ. Use, usability, usefulness, and impact of an Infobutton Manager. AMIA Annu Symp Proc 2006;151–5.
6. Cimino JJ, Li J, Allen M, et al. Practical considerations for exploiting the World Wide Web to create Infobuttons. Medinfo 2004;11:277–81.
7. Ray M. Shared borders: achieving the goals of interdisciplinary patient care. Am J Health Syst Pharm 1998;55:1369–74.
8. Baggs JG, Schmitt MH. Nurses' and resident physicians' perceptions of the process of collaboration in an MICU. Res Nurs Health 1997;20:71–80.