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## Comparing Narrative versus Numerical Display of Functional Information: Impact on Sense-Making

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### Abstract

Contextual information consists of functional, social, and financial information about patients. Physicians routinely have difficulty incorporating contextual information into clinical decision-making despite the emphasis on patient-centered care and functional status. One reason for this difficulty is that such information is not well-represented in the patient medical record. This study assesses the impact of a "story-form" model versus a "medical" model on a practitioner's ability to recall and incorporate contextual information. We assessed this question through the analysis of responses of 30 clinicians to 2 vignettes presenting contextual information in both formats. Overall, there was a statistically significant difference between the narrative and numerical form with those receiving the narrative form for contextual information being more likely to consider it a top issue. Reference to goals in the report of key clinical factors was also significantly higher for the group receiving goal information. Implications for sharing contextual information in EMRs are discussed.

### Keywords

Decision-support; writing; computerized documentation

### Introduction

Contextual information consists of the functional, social, and financial information about patients.[1,2] Because contextual information is patient specific, it is key to understanding the patient's unique situation and individualizing evidence based care. However, social and functional information is often not communicated across settings and is neglected in clinical decision-making despite the fact that functional information is a powerful predictor of patient outcomes. One reason that it is not integrated well into care is that this information is relatively unavailable or difficult to locate in current EHRs.[3]

Increasing the availability of contextual information, especially functional information, is likely to improve care, enhance decision-making and improve teamwork. Smith, et al. showed that enhancing access to the patients' functional information at discharge decreased hospital readmissions.[4] Frick, et al. found that clinicians were better at predicting patients'

quality of life and personal goals when they had accurate information about functional status.[5] Clinicians significantly underestimated post-acute care needs,[6] the degree of frailty in the elderly,[7] and acute mental status changes.[8] For example, Emergency Room patients' functional status was assessed directly by research personnel and correlated with physicians' decisions to hospitalize or admit to an ICU.[9] Decisions to hospitalize or admit to an ICU were predicted by the physician's perceptions of the patient age and functional status, but not by their real functional status as measured by researchers.

Psychological studies suggest contextual information may not be organized cognitively the same way as clinical information.[10] Episodic and social information is likely represented in "story-form" and is personal, specific, and linked to a particular time and geography. Clinical information, in contrast, is abstracted, semantic, and depersonalized knowledge and might be best represented numerically.[11,12] Therefore, contextual information, which includes social information, may be best shared through stories or narrative. Yet, much of what constitutes current decision-support eliminates important context-specific information in the effort to minimize information overload. The ironic result is that what appears to be less information is processed more slowly than more information. In other words, narrative information may be better at improving sense-making for functional and contextual patient information than numerical and tabular data.

Sense-making consists of answering the question "what is going on here?" It is high-level automatic information processing that integrates the disparate components of the environment to create an integrated "perception of the situation" and the creation of meaning.[13] Sense-making is highly social because meaning is embedded in our culture and shared context. The clinical narrative provides the best place in the medical record to acquire a true "sense" of the patient. Narratives contain high-level summaries, expected trajectories and overall goals of care.[14]

The purpose of this study is to directly examine the impact of the form of information display on cognitive processes. This work is part of an overall effort to better define the format and structure of a shared information space for contextual information in order to inform the design of a shared information display. A previous study by the authors examined the nature of contextual information and identified seven characteristics of contextual information relevant to its use in a clinical setting. [15] These characteristics represent an initial taxonomy to support future EHR design, Natural Language Processing (NLP) and text searches.

## 1. Methods

### 1.1. Design

The design was a 2-way within-subject randomized trial where participants were assigned to one of two presentation sequences for two vignettes. Each vignette had two forms for presenting functional information, a narrative "Story-form" format which included patient goals, versus a numerical/tabulated presentation of functional status. The design was counter-balanced across the participants, with the order of presentation randomly assigned.

Thirty volunteer MD residents, nurse practitioners, and staff physicians from the Salt Lake City VA Medical Center were approached singly and asked to complete the forms.

## 1.2. Procedures

For each vignette, participants read the material and responded to 2 questions: 1) Identify the top 3 **issues** for the patient, and 2) Identify, the top 3 **factors** used in considering their plan. Open-ended responses were selected in order to minimize response set bias. Study involvement times averaged 10 minutes. The top three issues and top three factors were coded as being either "medical" (e.g. diagnosis, lab, medications) or "contextual" (living arrangements, financial, or patient goals) by the research team (n=5) through a consensus process. The proportions of total items identified within each category were the dependent variables for each participant.

**Data Analysis**—The proportion metrics for contextual items, medical items and goals were analyzed using a separate within-subjects ANOVA for Identified Issues and for Identified Factors.

## 2. Results

Overall, there were significant differences between the narrative and numerical form of information presentation with those receiving the vignette containing the narrative form for functional information being more likely to list a contextual topic as a top issue ( $F_{1,56} = 5.21$ ;  $p=0.03$ ;  $M(\text{narrative group}) = 69\%$  and  $M(\text{numerical group}) = 31\%$ ). However, there was no difference between the groups for the top most important factor relevant to decision-making. Reference to goals in the description of factors was significantly higher for the group receiving narrative information ( $F_{1,56} = 6.20$ ;  $p=0.01$ ;  $M(\text{narrative group}) = 74\%$  and  $M(\text{numerical group}) = 26\%$ ).

## 3. Discussion

The results of this exploratory study indicate that narrative information may be a better method of communicating functional and goal information. The outcome variables were the likelihood of specifying contextual information as a top issue, the ratings of importance for contextual factors in constructing a plan and identification of patient goals. Although these results do not directly deal with the quality of decisions, they do indicate what information was attended to and what was considered important as a function of how it is displayed. Other authors have found that physicians often fail to notice contextual information and these results suggest a possible explanation. Future work could tease out the issues of attention, information processing and patient outcomes.

The evidence that narrative supports higher-level reasoning is substantial in the psychology literature. Narrative answers the sense-making question of “what is going on here with this patient.” It is this sense of the patient and the overall situation that is the foundation of the expert’s naturalistic decision-making. Once the pattern is identified and the situation made clear, then experts move rapidly to identify what needs to be done. Narrative supports the abstract processing which is required to ensure that the “gist” of the situation is attended to

and addressed. Knowing the “big picture” is one of the key components of effective decision-making and effective communication. [16]

### 3.1 Communication

Communication is key to high quality health-care [17,18] and enhancing collaboration among clinicians should be a goal of contemporary EHR design. Effective collaboration and sharing of contextual information requires creating a shared information space in the medical record. The format and structure of this space is not well known. There is a need to better elucidate a shared contextual information space for inclusion in EMRs. Coiera has made a compelling argument for the need to maintain communication environments that support clinical narrative that explains and tells complete stories because “stories” are the way that we talk. The clinical text is one place that those kinds of communications occur. [19] Similarly, Berg and Goorman discuss the limitations of the view that information is simply the right data at the right time. Because data is not context independent, it loses meaning when isolated. The clinical narrative provides that context.[20] Finally, Bolan and Tenkasi have noted the importance of our communication systems grounded in narrative in helping the community of work to construct strong shared perspectives and a community of knowing. [21] The clinical narrative is read by all members of the team and is key to creating a community around that patient’s case.

### 3.2 Goals of Care

Patient’s goals embody the patient’s life-situation. Communication of these goals among clinical team members can make a difference in the delivery of clinical care. A study by Provonost, et. al. in an ICU setting demonstrated that implementing a daily display of patient care goals increased the understanding of goals of care by nurses and residents from 10%–95% (using interview and recall data) and decreased ICU length of stay by 50%.[22] Goals of care are not often documented in EMRs and thus plans towards achieving these goals are also less likely documented.[23] Fox, et al have proposed a model for developing an ontology of goals for this purpose, but the model has not been widely adopted. The current results support these findings by demonstrating that goals are more likely to be included in a care plan if communicated clearly in the patient records. The current results support these findings by demonstrating that goals are more likely to be included in a care plan if communicated clearly in the patient records.

With the recent and widespread Implementation of electronic health records (EHRs) and the emphasis on improving cognitive support, it is important to address issues of display and information presentation based on empirical work. This study indicates that the display of information may make a difference in decision-making. Narrative may be the more effective method to inform clinicians regarding a patient’s functional status.

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