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The Communicative Function of Clinical Narrative in Radiology Reporting

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Abstract. *Clinical narrative is often taken as a direct representation of real objects and events such as patients, diseases and treatments. We refer to this conceptualisation as the 'referential function' of clinical narrative. We introduce a complimentary perspective, taking clinical narrative as a construction relative to the situated intentions and routines of communication between author and reader. This perspective, that we call the 'communicative function', highlights the value of some underused features of clinical narrative. In this paper we bring together models of narrative structure and of communication to present a theory of the communicative function of clinical narrative. We pay particular attention to clinical narrative in radiology reporting.*

1. Introduction

Narrative is a central feature of the health record, used by clinicians to communicate, represent, hypothesise and define clinical information. Although of fundamental concern, studies of how narrative is used by clinicians are rare [1]. Narrative in the electronic health record is often treated as referring directly to real objects and events; however this is only one of several ways in which clinical narrative can be conceptualised. We show that an alternative to this referential function can be of significant use in making sense of clinical information. This alternative, we call the 'communicative function'. In this paper we discuss radiology reporting in terms of these two functions. We elaborate the communicative function with discussion of the story metaphor and models of communication, proposing a basic model of the communicative function of radiology reports.

2. The Referential Function

The referential function of clinical narrative assumes a direct relationship between a word or phrase and the thing it represents. Friedman, Cimino and Johnson [2], for example, seek to uncover underlying concepts expressed in narrative in radiology reports. A phrase such as "minimally increased amount of fluid around the flexor hallucis longus tendon" (from figure 1) can be assumed to have a direct relationship with the real fluid and real flexor hallucis longus tendon. The fluid around the flexor hallucis longus tendon has the change modifier "minimally increased". This change must be relative to other changes; a minimal increase should be relative to other increases. The radiology report in figure 1 must be consistent with other radiology reports in its representation of the world; there is an 'intertextual' relationship. This intertextual relationship can be standardised for a number of

SCAN LEFT ANKLE TECHNIQUE: Coronal and sagittal proton density turbo spin echo and T2 weighted fast field echo and axial variable echo sequences were performed through the ankle. FINDINGS: Normal appearances to the peroneal tendons, posterior tibialis, flexor digitorum and flexor hallucis longus tendons with no evidence of gross tenosynovitis. There is a minimally increased amount of fluid around the flexor hallucis longus tendon as it passes posterior to the talus, this is of doubtful significance. The Achilles tendon is normal in shape and signal characteristics with no evidence of significant tendinitis or tear (the patient did complain of tenderness around this site at the time of his attendance). The anterior talofibular ligament is intact with normal appearances. The other major ligamentous stalibizers of the ankle joint are also intact. The sinus tarsi contains normal fat signal. The subtalar joint shows contiguous normal articular surfaces. No significant excess fluid is seen in the ankle or subtalar joints. There is a focal area of increased fat signal within the calcaneous, consistent with an intra-osseous lipoma, this is of no significance. CONCLUSION: No evidence of significant trauma. No evidence of an osteochondral injury. ABC/XYZ

Figure 1: Example Radiology Report
(The radiologists' initials at the end of the report have been altered)

important purposes related to the aggregation of data including administration, decision support and quality assurance.

3. The Communicative Function

In contrast to the referential function, the communicative function of clinical narrative assumes a direct relationship between the text, and its authors and readers. A word or phrase is seen as relative to the needs, routines and intentions of its authors and readers rather than to objects and events in the real world. To Hunter [3], clinical narrative is a clinician's reconstruction of the actual 'thing' rather than a transparent representation of it. Hunter makes analogies between clinician's narrative and Sherlock Holmes' reconstruction of a crime. The "minimally increased amount of fluid around the flexor hallucis longus tendon" is not taken as a transparent statement directly relating to the real world. Rather it is an authoring clinician's representation. Taking the clinician's representations in terms of communication, we can consider that the author tailors their narrative with the intention to get a particular message across. The author uses the change modifier "minimal" with an intended reader in mind. Rees [4] found the clinical narrative he studied to be oriented to an intended reader, often as an attempt to appear competent to that reader. Other reasons may be to emphasise or de-emphasise a point according to how important the author takes it to be or how important they believe the reader will take it to be. The author may wish to influence the reader. Berg [1] showed that clinical narrative is not passive but an active agent in influencing the care process.

We can reverse our perspective of the communicative function and view clinical narrative in terms of the reader. The "minimal increase in fluid" need not be relative to all other change modifiers if the reader knows what is minimal to that author. The reader may use the narrative in differing ways according to their knowledge of the implied author. At a basic level, a reader may or may not trust the narrative of particular implied authors. For

example, radiology reports that are passed from an external institution will sometimes be redone by a radiologist at the destination institution. Schoop [5] has studied the power and trust between author and reader of shared care notes in a geriatrics ward. Schoop used language action theory, which was particularly applicable to the form of notes involved. For this study of radiology reports, we use a larger scale, structural approach: the story metaphor.

We have shown the referential function to place clinical narrative on an inter-textual network. The communicative function however considers clinical narrative in the context of the relationships between its authors and readers: an interpersonal network.

4. Models of Narrative

Kay and Purves [6] have discussed using a story metaphor for clinical narrative. They consider clinical narrative structurally and propose that a story model can be usefully seen as the basic structure of clinical narrative. The story metaphor brings with it a number of structural models and concepts. One such story model is Labov's Diamond Model [7], represented in figure 2, to which radiology reports consistently fit. The Diamond Model has a six-phase structure. The abstract (1) describes what the story is about; the orientation (2) describes features such as events, characters, setting and time; the complicating action (3) describes what actually happened; the evaluation (4) describes why the story is interesting; the resolution (5) describes what finally happened; the coda (6) is a bridge back to the present. Not all stories carry all six phases, the complicating action (3) is the crucial part of the story and a minimal narrative can be that alone. The evaluation (4) is not always a distinct phase but permeates throughout. In the example radiology report the abstract (1) is implicit; the coda (6) is simply the radiologists' initials; the evaluation (4) is minimal and appears in parts of the complicating action (3). The orientation (2) describes the scan and technique; the complicating action (3) is the set of findings; the resolution (5) is the conclusion. Although we have found the Diamond Model to be applicable to radiology reports, it may not be applicable to all other forms of clinical narrative, as Opie [8] has discussed.

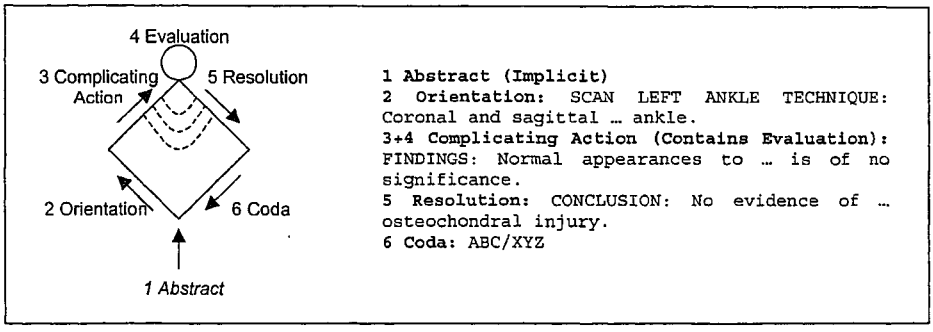

Figure 2: Labov's Diamond Model, With Application to the Radiology Report

5. Models of Communication

We now consider the communicative function of clinical narrative in terms of models of communication. In the next section we will combine the ideas raised into a model of the communicative function of radiology reports. Most models of communication are based upon the one designed by Shannon and Weaver [9] for news transmission [10]. Their model shows an information source that selects a message, which is changed into a signal by a transmitter. The receiver changes the transmitted signal back into a message for the destination. Noise is an unintentional interference to the signal.

We use Shannon and Weaver's model of communication as the basis for a model of the communicative function of radiology reports. We add to these basic features, the 'code', from Jakobson's model of communication [11]. The code, referred to as 'standards' in the Context Model supporting European pre-standard ENV13606-1 [12], is the system of norms, rules and constraints governing the production, transmission and interpretation of clinical narrative. The code ensures that the production and interpretation of the message (writing and reading the radiology report) are compatible; that the clinicians understand each other.

6. A Model of the Communicative Function of Radiology Reports

We combine the ideas raised thus far into a model of the communicative function of radiology reports (figure 3). The authoring radiologist creates a message that is organised and understood by a story frame (the Diamond Model (figure 2)). This message is converted into a signal by writing. The text therefore is simply a signal; it is a representation of the author's message, which can then be transmitted to the reader over an interpersonal network. The reader understands the text according to his or her own story frame. The reader and author both understand each other because their story frames are governed by a code of communication. The norms of what is communicated and how it is understood are dominated by institutional practice. The code is not an abstract force but promulgates across the interpersonal network. It represents the standards expected by those a clinician communicates with. The conversion of a message into a signal text is informed by the author's idea of whom the reader will be: the intended reader. Similarly the reader with reference to whom they believe the author to be: the implied author.

The model of the communicative function of radiology reports (figure 3) is intended as a basic underpinning for the understanding and representation of clinical narrative.

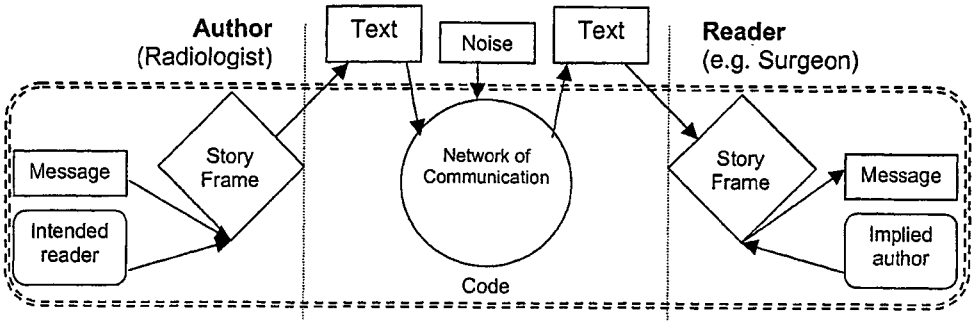

Figure 3: A Model of the Communicative Function for Radiology Reports

7. Summary

We have introduced the communicative function of clinical narrative. This function takes clinical narrative as a construction relative to the situated intentions and routines of communication between author and reader. This view is complimentary to the common referential perspective, highlighting different features and values of the narrative. We have combined a story model with communication models to represent the communicative function in radiology reporting.

In this paper, we have presented theoretical work on clinical narrative applied to radiology reports. Qualitative research methods, including an ethnographic study, are being used to support this work. Over 15000 radiology reports have been made available from an EPSRC project (GR/M549/9) to which this work is related. This project is exploring the requirements for a prototype "radiology workbench" to support a radiologist's reporting task. To this end, the project integrates a number of technologies and methods, including image analysis, structured representations of clinical terminology and user centred design. The theoretical work presented in this paper is one part of making sense of the reporting process, aimed towards constructing a useable radiology system.

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