Computer Supported Cooperative Work (CSCW)

On Intertext in Chemotherapy: an Ethnography of Text in Medical Practice

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Abstract. Building on literary theory and data from a field study of text in chemotherapy, this article introduces the concept of *intertext* and the associated concepts of *corpus* and *intertextuality* to CSCW. It shows that the ensemble of documents used and produced in practice can be said to form a corpus of written texts. On the basis of the corpus, or subsections thereof, the actors in cooperative work create intertext between relevant (complementary) texts in a particular situation, for a particular purpose. The intertext of a particular situation can be constituted by several kinds of intertextuality, including the complementary type, the intratextual type and the mediated type. In this manner the article aims to systematically conceptualise cooperative actors' engagement with text in text-laden practices. The approach is arguably novel and beneficial to CSCW. The article also contributes with a discussion of computer enabling the activity of creating intertext. This is a key concern for cooperative work as intertext is central to text-centric work practices such as healthcare.

Keywords: Text, Intertext, Documents, Healthcare, Literary theory, Computer technology

1. Introduction[1]

This paper concerns a specific type of resource – text – in medical practice. It attempts to bring a particular analytical resource – literary theory – to the analysis of texts in work practice. The aim is to reach a better understanding of how cooperative work is accomplished by collaborative actors through the use of mutually constituted texts in text-centric work practices.

Previous studies have shown that cooperative work in complex organisational settings such as hospitals involves large amounts of paperwork. Sometimes, actors are working with one text in particular, and in other cases multiple texts have to be consulted, annotated and aligned as part of everyday work practice (Fitzpatrick and Ellingsen 2013). More specifically, multiple texts in cooperative work settings may have to be 'combined' in particular ways in order to become meaningful. This is a phenomenon, which has been a key concern of CSCW for many years (Schmidt and Bannon 2013). Arguably, however, it is also a phenomenon that has not yet been fully conceptualised within CSCW. This article attempts to rectify this state of affairs by introducing the literary theory of Michael Riffaterre (1980) to CSCW, specifically,

[1] This article draws on findings and analyses presented in articles published over the last couple of years (i.e., Christensen 2013, 2015)

the concept of *intertext* and the associated concepts of *corpus* and *intertextuality*. However, the analysis does not depend on literary theory alone, but also on the seminal work of Strauss et al. (1997). Specifically the insight that practitioners must reconcile the contingent nature of medical practice with the formal nature of text in the clinic. Furthermore, the analysis addresses what Garfinkel (1967) has called the organizational problem *par excellence*, namely, how does the practitioner 'know what to do next'?

The short answer to Garfinkel's question, following Strauss et al. (1997), might be that practitioners 'know what to do next' partly by virtue of their ability to reconcile the contingent nature of medical practice with the formal nature of text in the clinic. However, this is a rather abstract answer. The analysis of intertext presented in this article contributes with a more concrete answer: The ensemble of documents used and produced in practice can be said to form a corpus of written texts. On the basis of the corpus, or subsections thereof, the actors in cooperative work create intertext between relevant (complementary) texts in a particular situation, for a particular purpose, in order to 'know what to do next'. The intertext of a particular situation can be constituted by several kinds of intertextuality, including the complementary type, the intratextual type and the mediated type. In this manner the article addresses a fundamental agenda, put forward by Strauss et al. (1997) and Garfinkel (1967), through an analysis informed by the literary theory. This is an analysis that involves a systematic conceptualisation of the cooperative actors' engagement with text in text-laden practices. The approach taken is arguably novel and beneficial to CSCW. We will return to a discussion of this below.

Our empirical data originate from a study of text in chemotherapy. During chemotherapy, physicians, nurses, bio-analysts and pharmacists continuously create and use texts such as patient consent form, treatment and examination form, prescription form, hydration and observation form, side effect form, form for reporting serious incidents and side effects, dose modification form, flow diagram for blood samples, guideline for labels for blood samples, blood sample labels, guideline for handling of blood samples and referral form for PET-CT scans and more. As such, chemotherapy is a highly text-laden practice. We will focus on text in a specific kind of chemotherapy, treatment performed in the context of a routinely performed clinical trial.

The article is structured in the following manner. First, we will describe related research and introduce the main analytical concepts of the study. Second, we will describe the research setting and methods. Third, we will consider the corpus of written text internal to the practice. Fourth, we will explore the achievement of intertext as well as three types of intertextuality, which are pertinent to the construction of intertext. Fifth, in the discussion section we will compare the concept of intertext to more established CSCW concepts, in order to clarify the contribution, and we will discuss computer support of the actors creation of intertext. Finally, a conclusion will be provided.

2. Documents in medical practice and beyond

Documents, which include records made in various materials, whether paper-based or digital, are important constitutive elements of many cooperative work practices (Østerlund 2008); this is well established. For years, scholars have recognised a co-constitution of documents and the situational and organisational contexts in which they are produced and used. A series of investigations along these lines have been carried out in hospitals (Fitzpatrick and Ellingsen 2013) as well as in other cooperative work settings (Schmidt and Bannon 2013).

Documents may be directed at solving a paramount problem of organisational life, the practical problem *par excellence*: "What to do next?" (Garfinkel 1967). The literature on medical records offers many examples supporting this general view of documents. Doctors and nurses use documents to accomplish particular tasks at hand and to support their sense-making activities (Berg 1996, 1997; Hartswood et al. 2003; Heath and Luff 1996). Medical documents constitute an integral part of transforming patients into manageable problems in particular organisational contexts. Doctors and nurses use records as an integral part of their work practice. This includes a host of document practices such as using the format and layout of records to give significance to certain elements, the interpretation and combination of documents or paying attention to what information is included and what is left out (Berg and Bowker 1997; Bossen 2002; Mønsted et al. 2011; Østerlund 2008). This echoes the seminal work of Strauss et al. (1997). Focusing on the concept of 'illness trajectory,' Strauss et al. (1997) vividly illustrate the complex, contingent nature of medical work underlining the fact that physicians must in every situation establish a connection between the particular situation at hand and the formal nature of text in the clinic (i.e., formal patient records, forms, guidelines, protocols etc.).

A series of CSCW studies extend this research agenda and focus on interconnections and structure among multiple documents in healthcare and elsewhere. For example, Schmidt et al. (2007) found that multiple written artefacts in two oncological clinics were complementary in the sense that they had to be aligned and read together not only to give an adequate picture of the patient's trajectory, but also to support workflow. Documents are often arranged in assemblies of artefacts. This is what Schmidt and Wagner (2004), in the context of architectural work, call "ordering systems" (i.e., complexes of interrelated practices and artefacts). Relatedly, Bardram and Bossen (2005) focus on how nurses and doctors achieve coordination through the use of a wide range of interrelated non-digital artefacts like whiteboards, work schedules, examination sheets, care records, Post-it notes etc. In the work of Zhou et al. (2011), collections of artefacts, including documents, are understood as assemblages: "*a complex system that includes boundary objects, the practices around these objects (including organisational policies), work processes and coordination mechanisms within these objects, and special functions for*

designated groups" (Zhou et al. 2011, p. 3354). In a different domain, Christensen and Bjorn (2014) have also studied how collections of documents shape work practice in their study of 'documentscapes' in global interaction. According to their study, documents can be said to form a documentscape when each document depends upon the wider ensemble for meaning as well as utility. Documents in the documentscape take their meaning from their position in an ensemble of documents, used or produced in series or in parallel. The concept of documentscape highlights how intertextuality can draw the distributed use of documents together and provide structure and integration to highly distributed cooperative work practice. This article shares Christensen and Bjørn's interest in intertextuality, as we shall see below.

Other researchers have focused on tensions between various forms of written artefacts (e.g., paper documents vs. digital documents) highlighting that the materiality and organisation of the documents matter hugely, in terms of how written artefacts can contribute to work practice. For example, Heath and Luff (1996) describe the consequences of introducing a new IT-based record system for general practitioners: because the system prescribed a certain order in which to go through the record, separated formerly co-situated categories and limited the length of entries, however, it did not support the actual practice of the practitioners. While the system was developed to support better records by providing a national database and ensuring precise data, it inhibited the work of practitioners to the extent that they embarked upon an ambiguous strategy of working with electronic as well as paper-based records, with the result that neither were satisfactory. Similarly, Zhou et al. (2009) examine the informal use of nursing documents before and after the introduction of new digital information technology. The introduction of new information technology does not adequately take into consideration the hand-over of informal information on patients between nurses' shifts. Tang and Carpendale (2007) focus on the information flow during nurses' shift changes in a hospital department and how various technologies impact the process. In focus are the relationships between informal information sharing and the introduction of new information systems. Chen (2010) studied an emergency department (ED) and revealed a gap between the formal electronic medical record documentation process and the actual clinical workflow, which leads medical staff to contrive workarounds in the form of intermediate transitional written artefacts. Park et al. (2013) describe how clinicians in two departments at the same hospital develop informal documentation practices after the introduction of a new electronic medical record (EMR) system that does not support these practices. Furthermore, Ellingsen and Monteiro (2003) point out that it is by no means evident in medical practice what constitutes relevant documentation in a particular situation. Being able to accurately assess what is relevant – from situation to situation – is part of what it means to be a competent actor. Fitzpatrick (2004) has coined the phrase 'the working record' leaving little or no room for (falsely) construing the medical records as a passive 'information repository'.

Previous studies, then, have established that documents can be key elements of cooperative work practice, and that in many instances actors combine and align heterogeneous yet complementary texts as part of their practice. Very important contributions have been made in this area. However, few CSCW studies draw explicit inspiration from literary theory (an exception is Christensen and Bjorn 2014), and very few use concepts originating in that field. This is quite a conundrum. Given the fact that literary theory (and semiotics in general) is potentially well placed to give a new view and new insights into precisely how documents become such powerful instigators and how they are constitutive of cooperative work practice (Harper 1998). Harper (1998, p. 25) draws attention to this fact in a literature review by stating that: "*Literary theory may appear well removed from our concern with documents in organizational life. But in fact it does have a lot to say on this topic. The semiotic view emphasises that there is no such thing as a 'free standing text' […] rather each text is linked in one way or another to each and every other text in a system […].*" The introduction of the literary theory of Riffaterre (1980) to CSCW, in this article, may be said to follow Harper's suggestion (although he does not directly point to Riffaterre's work).

The notion of documents related to one another in systematic ways is important, then, and there is good reason for advancing the approach of semiotics and literary theory in CSCW. We will now turn to presenting the proposed analytical concepts.

3. Analytical concepts

As mentioned, we will rely on the influential French scholar of literary theory and semiotics Michael Riffaterre in an attempt to invigorate a CSCW analysis of documents in cooperative work. His work is part of the tradition of semiotics where names such as Saussure, Bakhtin and Volosinov, and Kristeva loom large. In the seminal work of Saussure (1974), followed by Volosinov (1986) and later Kristeva (1986), texts or documents are to be treated semiotically; that is, language is a system of signs in which one sign implies the presence or absence of another sign (Saussure 1974). This means that no document is "isolated". Rather, each document is linked to each and every other document through intertextuality, through a practice of "presence and anticipated presence (absence)." The most crucial aspect of language, in this perspective, is that all language responds to previous utterances and to existing patterns of meaning and criteria of evaluation, but it also anticipates and seeks to promote future responses (Harper 1998). One cannot create or even understand an utterance or a written work, such as a document, as if it was detached in meaning, unconnected to previous or future utterances or written works (Volosinov 1986, p.72). This is the legacy that Riffaterre builds on and is a part of.

Before we venture any further it should be made clear that Riffaterre was concerned with building a theory of literature focusing on the semiotics of, for

example, novels, short stories and poems. He was not a scholar of cooperative work and not interested in documents in medical practice. Nevertheless, his work may turn out to be very useful to us in CSCW, if used carefully.

According to Riffaterre (1980), the reader routinely establishes *intertext* between texts in order to make them meaningful. A text can be almost meaningless, unless it is connected to other texts by the actor, through his or her process of reading or writing. This presupposes a *corpus* of known texts (i.e., a body of texts familiar to the reader) as well as various forms of *intertextuality* by which intertext can be created.

The concepts of *corpus, intertext* and *intertextuality* in a CSCW context are described here:

- *Corpus* refers to the ensemble of texts available to the collaborative actors – central to their work practice.
- *Intertext* is the meaning achieved by the actor by combining several texts from the corpus in accordance with the demands of a given situation. Intertext may be said to be a 'situational property' as it is always created as part of performing a task in a given situation with specific circumstances. The concept of intertext is central to the analysis.
- *Intertextuality* refers to the various ways that intertext can be achieved. That is, the meaningful combination of several heterogeneous documents from the corpus in relation to a particular work task. There are, at least, three different kinds of intertextuality, the complementary type, the mediated type and the intratextual type.

By introducing the concept of *corpus* to the study of cooperative work, we become analytically sensitive to the body of text distributed among the many different actors involved in cooperative work. The concept of *intertext* allows us to consider how the individual actors achieve meaning by integrating and combining several texts in a particular situation, and the concept of *intertextuality* draws attention to the various ways intertext can be achieved.

Note that, the concepts are interconnected in a systematic manner (e.g., the concept of *intertext* relies on the concepts of *corpus* and *intertextuality* as auxiliary concepts and *vice versa*). This, in effect, allows the empirical analysis to have these same systematic virtues. That is, this set of concepts originating in the field of semiotics may help us conceptualise the individual's act of creating meaning using documents, and the system or structure of the documents influencing this act, in one and the same analysis. Arguably, this is as mentioned above beneficial to CSCW. We will return to this proposition in the discussion section of this article.

Finally, note that *text* in this study is a reserved word, referring to the utilisation of a writing system, which exists as a part of practice, relying on an inventory of written form such as letters, numbers and other established signs (Harris 1995, p.56).

Having presented related work and our main analytical concepts we are now in a position to move forward with the empirical analysis, but first we shall describe the research setting and methods.

4. Setting: the oncology department

The oncology departments studied consist of an outpatient clinic, a day clinic with room for 12 patients and a ward with 33 beds. In addition, the department has a centre for patient information as well as a centre for cancer research. Approximately 400 healthcare professionals with expertise in cancer treatment, care and research are associated with the department. The department offers radiation therapy as well as chemotherapy. There are approximately 4,400 new referrals to the departments per year and 3,600 admissions. Anually, the department administers 56,000 sessions of radiation therapy as well as 27,000 sessions of chemotherapy. The hospital's surgical department performs tumour surgery in collaboration with the department.

In brief, oncology work is the delivery of examination and treatment against cancer tumours. Cancer treatment, typically, requires lengthy therapy, delivered in multiple cycles, accompanied by regular check-ups before, during, and after therapy. All these interactions need to be carefully documented so that they can be reproduced at later stages. In this manner, oncology work involves large amounts of paperwork. Furthermore, oncology work is safety-critical work. In chemotherapy, for example, patients are given aggressive chemicals with taxing and possibly damaging side effects. All clinical measures taken therefore have to be carefully recorded Figure 1.

In addition, although the department is highly specialised and devoted to chemotherapy and radiation therapy, oncology is highly interdisciplinary. The department needs to cooperate with other clinical specialties, such as departments of surgery, urology, and gynaecology; the laboratory; as well as with the pharmacy. In short, the department is embedded in a network of institutions and has to maintain relationships with them, and keeping track of and recording the various requests and results that are exchanged is a crucial issue.

The staff at the department is organised into teams, with each team focusing on a particular kind of cancer such as, for example, lung cancer, breast cancer, prostate

Figure 1. Cytostatic drugs and text ready for use in chemotherapy at the department.

cancer or colon cancer. The teams also organise research within their area of interest. Patients with a particular kind of metastasised colon cancer (the focus of our study) are offered a tried and tested protocol of carefully regimented chemotherapy known as 'the standard treatment' with weekly infusions of cytotoxic drugs, which affect rapidly dividing cells. Chemotherapy can be said to roughly consist of the administering of drugs, in multiple cycles, and the taking of blood tests for the purpose of monitoring the state of the patient. Chemotherapies are based on hundreds of clinical protocols, with specifications of combinations of drugs and cycles (see also Schmidt et al. 2007). However, when the standard treatment does not live up to expectations, the patient may be offered an opportunity to partake in a clinical trial, which may consist of testing a new combination of drugs and cycles.

4.1. Chemotherapy as a clinical trial

The development and refinement of chemotherapy is an ongoing process and a part of the *modus operandi* at many hospitals (at least, in Denmark). Clinical trials are routinely set up to improve on the state of the art.

The objective of the clinical trial in focus is to determine whether or not treating colon cancer by administering a specific combination of cytotoxic drugs bi-weekly, rather than weekly (i.e., the standard treatment is weekly), will yield improved results. A research protocol is part of the corpus of written text, internal to the trial. It may be said to be the starting point of the trial and is authored by an investigating team of physicians. The protocol states that patients included in the trial are to be randomly divided into two groups. One group receives the chemotherapy bi-weekly in accordance with the research protocol, while the control groups receives the chemotherapy weekly as per the standard treatment. The results, in terms of relapse rate, survival rate and quality of life, are to be compared across the two groups. If the experimental treatment performs better than the standard treatment then it is well on its way to becoming the new standard. According to the research protocol, there are reasons to believe that the treatment is just as (or more) effective when administered bi-weekly, rather than weekly, and that this will have an effect on, not only relapse rate and survival rate, but also on the quality of life of the patients. Being subject to chemotherapy puts enormous pressure on a patient in every sense of the word and being infused with cytotoxic drugs bi-weekly, rather than weekly, alleviates some of this pressure. This is part of the rationale of the trial.

Note that the practices of the clinical trial do not differ much from chemotherapy in general, in the sense that it is virtually the same kind of written artefacts that are involved. Apart from the research protocol, which is not present in standard treatment, the same procedures and the same

documents are used in standard chemotherapy treatment. As such, this study has a bearing on chemotherapy in general, as practiced in Denmark, rather than only on clinical trials. The nurses and physicians within the department call clinical trials "treatment with research protocol" – the point being that it is still considered to be treatment. It is a new combination of drugs and cycles that is typically being tried out in a clinical trial at the department.

5. Methods

The empirical material was generated through fieldwork, including interviews and observations of work practice. Seven weeks of observations of daily work at two oncological departments as well as a medical department were carried out. Additionally, and central to the study, texts such as protocols, guidelines, forms, templates, charts and checklists were collected and studied. The entire corpus of text used in the performance of a specific clinical trial in oncology was obtained and studied, amounting to twenty different *types* of documents. During the fieldwork, these written artefacts were studied, both with and without actual clinical data. This was undertaken, for example, by following the lifecycle (inspired by Harper (2000)) of various types of text in oncology and medical practice with a view to how individual texts were used in conjunction with other texts in treatment as well as, for instance, in auditing practice. Eight in-depth interviews on the practices of combining text with text in oncology were carried out with three physicians, three specialist nurses and two pharmacists. Broadly speaking, during data generation and analysis, particular attention was paid to how different actors involved in a clinical trial use the many texts in conjunction, rather than one text at a time.

There is a plethora of texts at play in chemotherapy (not to mention oncology in general) and to limit the scope of the analysis this article will, as indicated, focus on texts (e.g., protocols, guidelines, forms, charts, questionnaires and checklists) that are pertinent to the performance of a particular clinical trial in chemotherapy. This is considered a particular example of clinical work, rather than something out of the ordinary (this kind of activity is routine in oncology departments and does not differ fundamentally from standard treatments in terms of the use of texts). We will now move onto the analysis.

6. Text in chemotherapy

As indicated above, chemotherapy is a complex enterprise with a host of different actors (e.g., physicians, nurses, pharmacists, and patients), processes (e.g., surgery, radiation therapy, and chemotherapy) and sub-processes (e.g., taking blood samples, analysing blood samples, administrating drugs, regulating doses, observing patients,

informing patients, performing PET-CT scans and much more). How is oncological practice integrated across actors, processes and sub processes? The corpus of written text is part of the answer.

6.1. The corpus of written text in a clinical trial in chemotherapy

Generally, when speaking of a corpus of written text which is internal to a given practice such as, for example, chemotherapy, we are talking of the accumulated body of texts available to the whole range of actors involved, including patient records, nurses records, primary sector records, research protocols, forms, charts, instructions, guidelines, templates and much more. However, we can also consider the corpus in a more limited sense, as related (with fuzzy boundaries) to a select subsection of oncological practice such as the performance of a clinical trial for experimental treatment of cancer patients.

The corpus of written text associated with the clinical trial in focus includes research protocol, patient information brochure, patient questionnaire on smoking habits, patient inclusion and exclusion form, patient consent form, treatment and examination form, prescription form, hydration and observation form, side effect form, form for reporting serious incidents and side effects, dose modification form, flow diagram for blood samples, guideline for labels for blood samples, blood sample labels, guideline for handling of blood samples and referral form for PET-CT scans and more.[2] Being integral to the clinical trial, the corpus of written text partly constitutes it (see also Berg 1996; Berg 1999).

As mentioned, a research protocol is part of the corpus of written text, which is internal to the trial. It may be said to be the starting point of the trial and is authored by an investigating team of physicians. In the 30 pages of the protocol the objective of the trial, its rationale and design are accounted for and described. For practical reasons of clinical work, it is necessary to translate or convert the 30 pages of prose in the research protocol into a series of associated forms, charts and checklists. A project nurse explains:

> The research protocol is our starting point. Part of what I do is to convert the protocol into forms and checklists. This thick cookbook [the research protocol] must be simplified in order to be useful in the clinic during the 20–30 min you have with the patient. On forms and checklists you can instantly get an overview of what to do next, what patients to include, what examinations to perform and what patient safety measures to carry out.

[2] Excluding the research protocol, these types of documents are all present in the standard treatment of cancer patients and as such has a bearing on cancer treatment in general, rather than only on clinical trial.

Hence, on the basis of the research protocol, the project nurse, in consultation with various specialists, adds an array of additional texts to the corpus in order to facilitate clinical work. In practice, these texts (which are mostly forms, charts and checklists) become a part of the basic constitution of clinical practice.

One form, namely the aptly named 'patient inclusion and exclusion form', lists the criteria for deeming a patient fit to enter the trial or not. It structures the selections of patients through its pre-printed categories. On the paper form it is stipulated that in order to be included in the trial a patient must be 18 years of age or older, have a life expectancy of more than 3 months, be relatively fit (performance status 3 according to WHO standards). Furthermore, the patient must not suffer from hypersensitivity to one or more drugs used in the trial, be pregnant or nursing a child. The patient must also have had a relapse of colon cancer in spite of having gone through all cycles of the available standard treatment.[3] With regard to the enrolment of the patient in the trial, this form is crucial, but it does not stand alone. Also used are patient information brochures on the trial and a patient questionnaire on smoking habits.

Furthermore, written artefacts such as forms and lists are a part of the trial's temporal organisation. For instance, the *examination and treatment form* constitutes the temporal organisation of the trial (see Figure 2). That is, the organising principle of the examination and treatment form is the concept of 'series', each spanning 14 days with infusion of drugs at the 14th day of each series (this is from series 3 and onwards once the preliminaries, such as establishing a baseline,[4] are out of the way). A series also includes examinations, such as the establishment of performance status, blood samples and tumour size by PET-CT scans at the 7th day of any given series – there are 53 series of examinations and treatments in total. Physicians and nurses refer to the form as the 'noughts and crosses form' where a nought indicates a task to be performed and a cross in a nought indicates a completed task. In this manner, the form contributes to the temporal organisation of the trial.

Without the treatment and examination form's central role as a coordinative artefact, the meticulously detailed structuring of this complex chemotherapy scheme would be impossible. The form is perhaps the central working document of the corpus, as it provides physicians and nurses with an overview of all the treatments and examinations scheduled for the patient as well as a medium for keeping track of progress. A nurse emphasises the temporal aspect, the rhythm of the *treatment and examination form,* by tapping her fingers as she explains:

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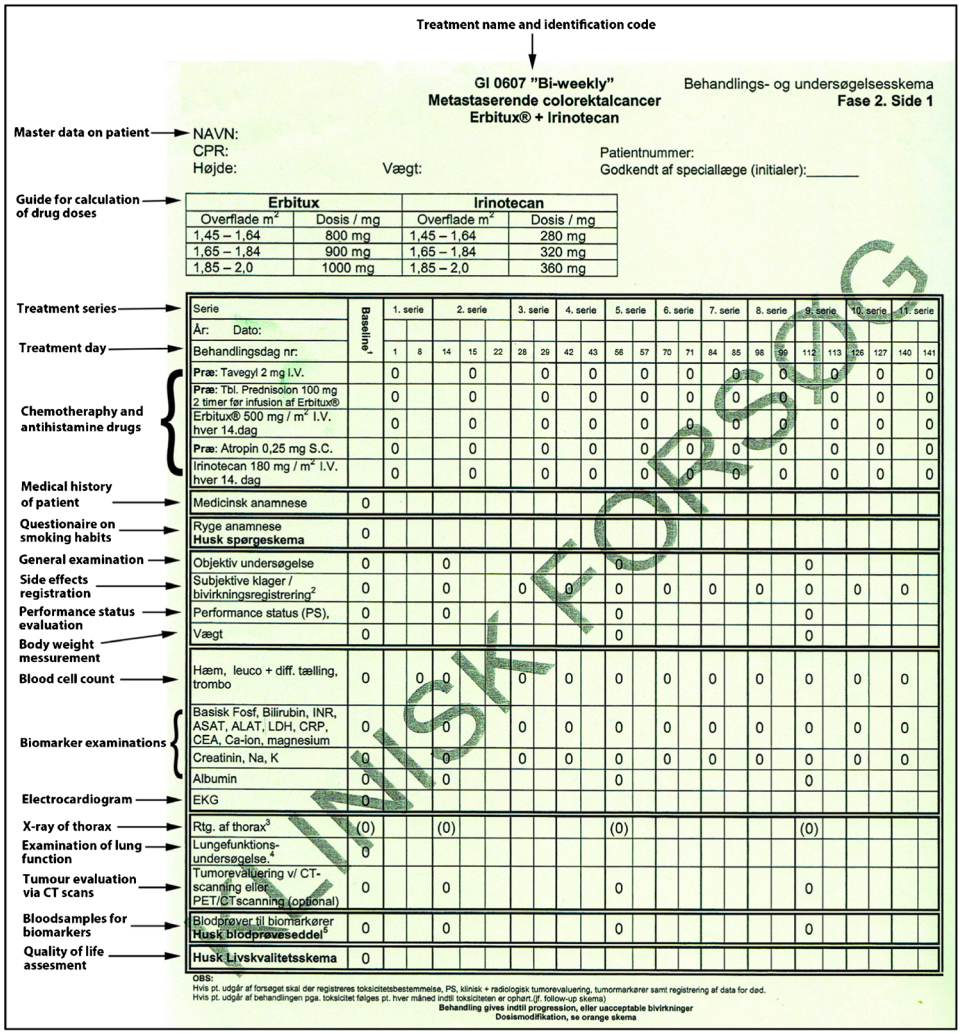
[3] The latter criterion is an important one as the trial seeks to not only to establish a new standard treatment which is superior to the one in use at present, but also to provide an extra option in terms of treatment when the standard treatment has been exhausted.

[4] A baseline, a starting point in physical terms, is established upon which to base any assessment of progress (improvement or decline) in the patient's condition during the trial. The baseline is established using the treatment and examination form, stipulating examinations including PET-CT scans for the assessment of tumour size, blood samples, EKG, weight, and asking the patient for his/her subjective impression of his/her condition.



Treatment name and identification code

GI 0607 "Bi-weekly"
Metastaserende colorektalcancer
Erbitux® + Irinotecan

Behandlings- og undersøgelsesskema
Fase 2. Side 1

Master data on patient → NAVN:
CPR:
Højde: Vægt: Patientnummer:
Godkendt af speciallæge (initialer):_____

Guide for calculation of drug doses

Erbitux		Irinotecan	
Overflade m^2	Dosis / mg	Overflade m^2	Dosis / mg
1,45 – 1,64	800 mg	1,45 – 1,64	280 mg
1,65 – 1,84	900 mg	1,65 – 1,84	320 mg
1,85 – 2,0	1000 mg	1,85 – 2,0	360 mg

Serie	Baseline[1]	1. serie	2. serie			3. serie	4. serie		5. serie		6. serie		7. serie		8. serie		9. serie		10. serie		11. serie	
År: Dato:																						
Behandlingsdag nr:		1	8	14	15	22	28	29	42	43	56	57	70	71	84	85	98	99	112	113	126	127	140	141
Præ: Tavegyl 2 mg I.V.		0			0			0		0		0		0		0		0		0		0		0
Præ: Tbl. Prednisolon 100 mg 2 timer før infusion af Erbitux®		0			0			0		0		0		0		0		0		0		0		0
Erbitux® 500 mg / m^2 I.V. hver 14.dag		0			0			0		0		0		0		0		0		0		0		0
Præ: Atropin 0,25 mg S.C.		0			0			0		0		0		0		0		0		0		0		0
Irinotecan 180 mg / m^2 I.V. hver 14. dag		0			0			0		0		0		0		0		0		0		0		0
Medicinsk anamnese	0																							
Ryge anamnese **Husk spørgeskema**	0																							
Objektiv undersøgelse	0			0							0							0						
Subjektive klager / bivirkningsregistrering[2]	0			0			0	0			0		0		0		0		0		0			
Performance status (PS),	0			0							0							0						
Vægt	0										0							0						
Hæm, leuco + diff. tælling, trombo	0		0	0			0	0			0		0		0		0		0		0			
Basisk Fosf, Bilirubin, INR, ASAT, ALAT, LDH, CRP, CEA, Ca-ion, magnesium	0			0			0	0			0		0		0		0		0		0			
Creatinin, Na, K	0			0			0	0			0		0		0		0		0		0			
Albumin	0			0							0							0						
EKG	0																							
Rtg. af thorax[3]	(0)			(0)							(0)							(0)						
Lungefunktions-undersøgelse.[4]	0																							
Tumorevaluering v/ CT-scanning eller PET/CT-scanning (optional)	0			0							0							0						
Blodprøver til biomarkører **Husk blodprøveseddel**[5]	0			0							0							0						
Husk Livskvalitetsskema	0																							

Treatment series → Serie
Treatment day → Behandlingsdag nr:
Chemotheraphy and antihistamine drugs
Medical history of patient → Medicinsk anamnese
Questionaire on smoking habits → Ryge anamnese **Husk spørgeskema**
General examination → Objektiv undersøgelse
Side effects registration → Subjektive klager / bivirkningsregistrering[2]
Performance status evaluation → Performance status (PS),
Body weight messurement → Vægt
Blood cell count → Hæm, leuco + diff. tælling, trombo
Biomarker examinations → Basisk Fosf, Bilirubin, INR, ASAT, ALAT, LDH, CRP, CEA, Ca-ion, magnesium; Creatinin, Na, K; Albumin
Electrocardiogram → EKG
X-ray of thorax → Rtg. af thorax[3]
Examination of lung function → Lungefunktions-undersøgelse.[4]
Tumour evaluation via CT scans → Tumorevaluering v/ CT-scanning eller PET/CT-scanning (optional)
Bloodsamples for biomarkers → Blodprøver til biomarkører **Husk blodprøveseddel**[5]
Quality of life assesment → **Husk Livskvalitetsskema**

OBS:
Hvis pt. udgår af forsøget skal der registreres toksicitetsbestemmelse, PS, klinisk + radiologisk tumorevaluering, tumormarkører samt registrering af data for død.
Hvis pt. udgår af behandlingen pga. toksicitet følges pt. hver måned indtil toksiciteten er ophørt.(jf. follow-up skema)
Behandling gives indtil progression, eller uacceptable bivirkninger
Dosismodifikation, se orange skema

Figure 2. The treatment and examination form provides physicians and nurses with an overview of all the treatments and examinations scheduled for the patient taking part in the clinical trial as well as a medium for keeping track of progress. The form springs from the research protocol.

I look at the form [i.e. the treatment and examination form] in order to find out what should happen. First this has to happen [taps her finger on the table top], then this [tap], this [tap], and this [tap].

In addition to the treatment and examination form there are a number of other forms at play. The *prescription form* is another important part of the corpus. The physician prescribes the drugs to be administered during chemotherapy on the prescription form and passes it onto the hospital pharmacists who prepare the

compounds for the individual patient calculated according to the patient's body surface (e.g., Erbitux 500 mg/m^2). Both physician and pharmacist calculate the doses as a fail-safe measure – a wrong dose may seriously harm or kill the patient.

The prescribed drugs for chemotherapy are picked up and administered to the patient by a nurse using the *hydration form* (see Figure 3). This form specifies for how long and in what order and in what quantities the various preparations are to be given. For example, the form stipulates that during the first treatment 2 mg Tavegyl must be infused, then 100 mg Prednisolone, then after an hour 500 mg/m2 Erbitux is administered in the course of 120 min, followed by rinsing with NaCl (saline), then a pause and the patient is observed for side-effects for a period of 1 h, followed up with Atropine 0.25 mg, a 10 min break, then Irinotecan 180 mg/m^2 in 250 ml NaCl over 30–60 min, then again NaCl rinsing. Finally, the patient is handed Imodium and Prednisolone to be ingested before the next treatment in order to counter side effects. This highly structured form emphasises the disciplined work nurses have to perform when administering chemotherapy.

In chemotherapy it is relatively easy to kill all cancer cells with highly toxic drugs, but relatively hard to do so without also killing the patient. This is the reason for the monitoring of not only the relationship between the drugs and the tumour, but also the relationship between the therapy and the patient's body as a whole. That is, we may say that there is a myopic view or interest in the relationship between drugs and cancer cells. For example, are the drugs destroying the cancer cell? Can we see the

HYDRERINGSSKEMA

Serie: Dato:	Tid	Start	Sign	Slut	Sign	Bemærkninger
Præ: Tavegyl 2 mg i.v						
Præ: Tbl. Prednisolon 100 mg 2 timer før infusion af Erbitux						OBS; om pt. har fået Prednisolon med hjem!
P + BT tages ***før*** og ***efter*** Erbitux®						
Erbitux® 500 mg/m^2 **Infusion over 60 min.**	60 min.					
P + BT tages ***før*** og ***efter*** Erbitux®						
Skyl – NaCl						
Præ: Atropin 0,25 mg s.c	5-10 min.før CPT-11					
Irinotecan 180 mg/m^2 i 250 ml NaCl	30-60 min.					
Skyl – NaCl						

Drugs | **Duration of infusion** | **Start time** | **Signature** | **End time** | **Signature** | **Comments**

Figure 3. Hydration form used for the infusion of drugs during chemotherapy.

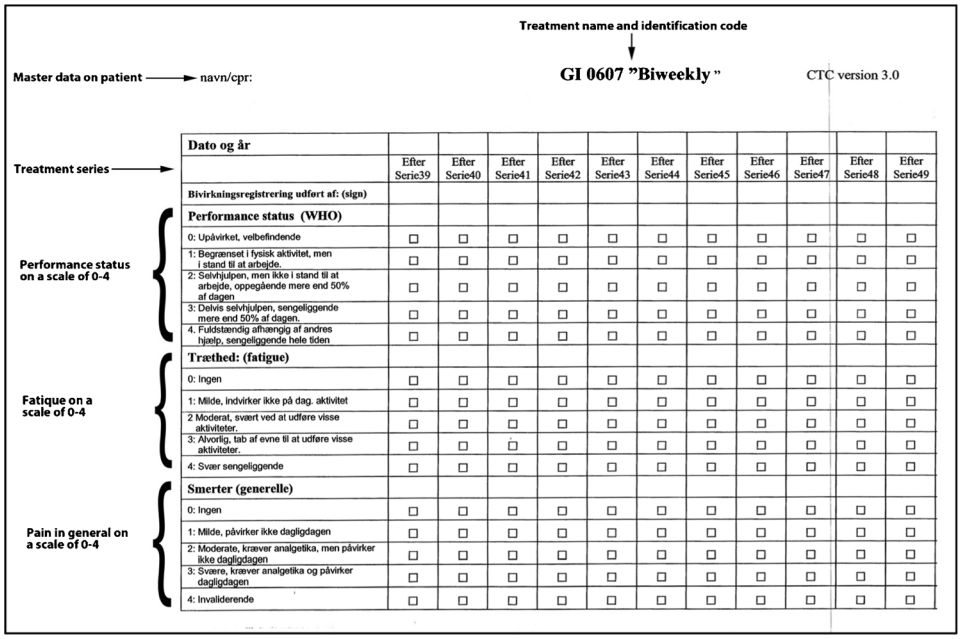
tumour shrinking when we are comparing PET-CT scans of the tumour over time? In addition, there is the interest in the relationship between the chemotherapy (as a whole) and the patient's body (as a whole). For example, what are the side effects of the treatment? How is the patient's performance status affected by the treatment? Can the patient's body tolerate the doses?

In practice, these two relationships are, as indicated, represented and monitored in different ways. While the relationship between the drugs and the tumour is monitored primarily *via* PET-CT scans, the relationship between the therapy and the patient's body (as a whole) is recorded as side effects on a form, according to a grading system (from 0 to 4 where 4 is most severe), which will be elaborated upon in the following.

PET-CT scans are the primary means of evaluating the relationship between the drugs and a tumour. PET-CT imaging combines nuclear medicine techniques and special x-ray equipment with sophisticated computers to produce multiple images of the inside of the body that can be compared over time. These cross-sectional images of the area being studied can then be examined on a computer monitor or printed. The objective is to identify when tumours in cancer patients improve ("respond"), stay the same ("stabilise"), or worsen ("progress") during chemotherapy. These criteria are specifically not meant to determine whether patients have improved or not *per se*, as these are tumour-centric, not patient-centric criteria.

The centrality of PET-CT for tumour evaluation is reflected in the corpus of text. For example, the corpus includes a *referral form for PET-CT* scans made specifically for this chemotherapy protocol. On the form, it is indicated that each patient is to be subjected to scans during the trial. The first scan will be at the inclusion in the trial, the second after the first series of chemotherapy, the third after the second series, the fourth after the third series, and the fifth after the final series of cytotoxic drugs. Physicians and nurses carry out the referral and specialists conduct the scans.

The relationship between the therapy as a whole and the patient body as a whole is, as indicated, monitored in terms of a lab test of blood samples as well as verbally relayed feelings of side effects. For example, a nurse interviewing and observing the patient makes use of a side-effects form in order to quantify, in accordance with WHO standards, the performance status as well as levels of fatigue and pain experienced by the patient after each chemotherapy session. This is undertaken according to a grading system (from 0 to 4 where 4 is most severe). This is a process that relies on the expressions and observations of feelings of pain and discomfort as relayed by the patient to the nurse. Hence, a *side effects form*, is also a part of the corpus. It is used by nurses registering the status of the patient after each session of chemotherapy, in terms of fatigue, pain, nausea, vomiting, diarrhoea, rashes, fever etc. (see Figure 4). Associated with the side effects form is a text entitled *form for reporting serious incidents and side effects*, used when reporting such occurrences to the Health and Medicines Authority, as well as a dose modification form used when adjusting the prescription of drugs in accordance with the observed side effects.



Treatment name and identification code

Master data on patient → navn/cpr: GI 0607 "Biweekly" CTC version 3.0

Treatment series →

	Dato og år	Efter Serie39	Efter Serie40	Efter Serie41	Efter Serie42	Efter Serie43	Efter Serie44	Efter Serie45	Efter Serie46	Efter Serie47	Efter Serie48	Efter Serie49
	Bivirkningsregistrering udført af: (sign)											
Performance status on a scale of 0-4	**Performance status (WHO)**											
	0: Upåvirket, velbefindende	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	1: Begrænset i fysisk aktivitet, men i stand til at arbejde.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	2: Selvhjulpen, men ikke i stand til at arbejde, oppegående mere end 50% af dagen	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	3: Delvis selvhjulpen, sengeliggende mere end 50% af dagen.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	4. Fuldstændig afhængig af andres hjælp, sengeliggende hele tiden	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fatique on a scale of 0-4	**Træthed: (fatigue)**											
	0: Ingen	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	1: Milde, indvirker ikke på dag. aktivitet	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	2 Moderat, svært ved at udføre visse aktiviteter.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	3: Alvorlig, tab af evne til at udføre visse aktiviteter.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	4: Svær sengeliggende	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pain in general on a scale of 0-4	**Smerter (generelle)**											
	0: Ingen	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	1: Milde, påvirker ikke dagligdagen	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	2: Moderate, kræver analgetika, men påvirker ikke dagligdagen	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	3: Svære, kræver analgetika og påvirker dagligdagen	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	4: Invaliderende	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Figure 4. A nurse interviewing and observing the patient makes use of a side effects form in order to quantify, in accord with WHO standards, the performance status as well as fatigue and pain levels experienced by the patient after each chemotherapy session. There are ten pages that make up the complete form

When the two relationships, between drugs and tumour on the one hand and between therapy and the patient's body (as a whole) on the other hand, intersect in practice, a nexus emerges that must be handled by the physician. This nexus is handled through the creation of intertext (as we shall discuss in the following section on intertext).

The actor's perception of the advantage of forms, list and charts in the clinic over 'free text' is emphasised by a senior nurse:

> … the staff cannot be expected to read through a lot of long, winding prose … they need simple forms that are easy to use. Information should be available at a glance while working with the patients in the clinic.

In this manner, the practice is (partly) constituted through the arrangement of a corpus of written text including a research protocol as well as associated forms, lists and schedules made for the purpose. It is important to add that, for example, physicians do on occasion deviate and schedule examinations and treatments that are not stipulated by any form or schedule of the corpus – this is undertaken at the discretion of the physician as deemed necessary, following the patient's condition. However, such deviations from the protocol of the clinical trial may render the results of the clinical trial dubious in an auditing perspective. That is, if the clinical protocol

of the trial is not observed then the 'scientific' rigour and the results of the trial may be called into question during a review, which will occur. Upon completion of the trial, a governmental authority audits the clinical trial in order to establish the validity of the findings, and as such there is an incentive, not least on the part of the investigators, hoping to publish the results of the trial in academic journals for example, to adhere to the protocol of the trial as engraved in, for example, the treatment and examination form.

On reflection, we may say that making relations between a corpus of texts is part of what brings the distributed endeavour together by enabling connections between what was otherwise disparate actors, times and places such as connecting nurses at the ward with physicians at the office, with technicians at the lab and pharmacists at the pharmacy. It is clear that the corpus of written text is the backbone of the clinical trial – but exactly how do the individual actors achieve the relations between the many documents and texts as demanded in different situations? Accounting for the corpus of texts is only half of the story, that is. It speaks to the distributions of documents among cooperative actors, it speaks to their use and suggests interrelations. But how do these relations occur? This is where the other half of the story pertaining to semantics becomes relevant. This perspective helps explain how the corpus of texts becomes meaningful as a corpus or, more precisely, as intertext. It allows us to shift the focus from considering the totality of documents among members of a cooperative work ensemble to considering the perspective of the individual actor making relations between selected texts for a particular purpose. This will be elaborated upon in what follows, starting by employing a useful distinction, namely the distinction between *corpus* and *intertext*.

6.2. Intertext

We must be careful to avoid confusion between the *corpus* and the *intertext*. As mentioned above, the *intertext* is the meaning achieved by the actor by combining several texts from the corpus in accordance with the demands of a given situation. Intertext is an activity concept. In reading the individual document at hand the situated actor is attentive to the wordings, phrasings, illustrations and categories that are (only) meaningful in unison with other texts.

Consider, for example, a physician reading and completing the prescription form for administering cytotoxic drugs to a patient who is suffering from significant side effects because of the chemotherapy. Administering drugs to a patient in this situation requires the creation of intertext including the prescription form, the side effect form and the dose modification guideline. These texts complement each other and none of the texts can stand alone.

It is by virtue of the complementary intertextuality between these texts that the document at hand becomes useful for the physician. The side effect form (completed by a nurse – see Figure 4) speaks of the significance of the side effects experienced by the patient according to a grading system (from 0 to 4

where 4 is most severe). The dose modification guideline reveals the dose reduction required according to the grade of the side effects, and the prescription form is where the modified dose is finally calculated and prescribed. For example, in a situation where the side effect form, after a treatment, reads a third degree side effect such as severe diarrhoea, the physicians may consult the dose modification guideline and read that the treatment of the patient must be postponed until the side effect has been reduced to at least grade 1 and, thereafter, only continued with 75 % of the original drug dose to be stipulated on the prescription form (see Figure 5).

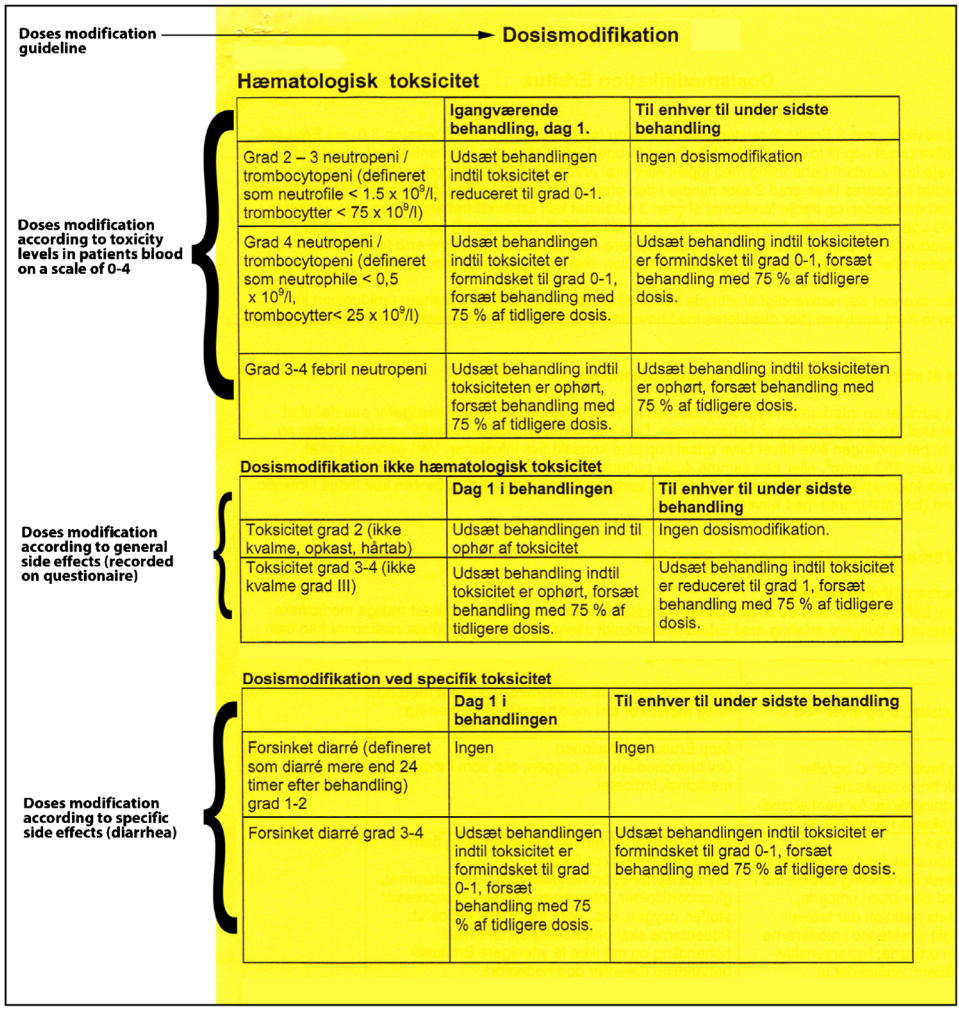


Figure 5. Intertext is a situational property in this instance created by a physician making relations between the dose modification guideline shown above and others texts of the corpus including the prescription form and the side-effects form adjusting the drug dose of a patient in accordance with observed side effects.

This intertext is part of what the physicians need to perform in order to be able to prescribe the drugs for the chemotherapy treatment in accordance with the state of the patient. In addition to this immediate intertext, a property of the work task, a larger intertext might be created that also includes the patient record, numerous clinical guidelines and more. However, the economy of practice suggests that no more intertext is created than the immediate situation calls for. The intertext is a situational property. That is, related to a particular actor, reading a particular text, for a particular purpose, in a particular context. In contrast, the corpus of texts merely refers to a collection of texts.

Thus, for the physician, creating intertext is a practical endeavour, for practical purposes, with constraints and possibilities associated with the situation and the corpus at hand. No more logic or consistency across documents, than is required by the needs of the practice, are mobilised. The intertext is perceptible only through the grids of preconception and assumption that the competent reader brings to the reading process. A physician comments:

> … it soon becomes second nature what forms, for example, to use when and why. But of course, working with the forms is dependent on everybody completing their forms in a reasonably meticulous manner.

Arguably, creating intertext addresses one of the central organisational questions for any practitioner (i.e., 'what to do next?') which Hartswood et al. (2003), citing (Garfinkel 1967), calls the practical problem of organisational life *par excellence*. In the example above, creating intertext between the three texts provides the physicians with an answer to the question of 'what to do next?'. As mentioned, the answer is to reduce the patient's dose by 75 %, in accordance with the grade 3 side effects of the patient and then resume chemotherapy once the side effects have levelled off to level 1. Note how this answer to the question of 'what to do next?' is given *via* intertext. Let us consider another example for the purpose of making a comparison.

Consider again, a physician reading and completing a prescription form administering a chemotherapy drug to a patient suffering from side effects. This time, the drug is different compared to the previous example. The patient's condition is partly evaluated through data on blood samples. The drug is as most chemotherapy drugs toxic to the human body, and the toxicity level is evaluated by taking blood samples after each infusion of the drug.

Administering drugs to a patient in this situation requires the creation of intertext including the prescription form, a lab sheet with blood values, and a doses modification guideline specific to the drug. Again, these texts complement each other, and it is by virtue of the complementary intertextuality between these texts that the physician can prescribe the correct doses while taking the patient's condition into account.

The lab sheet with blood values speaks of the patient's condition in terms of the level of toxins in the patient's bloodstream, the Erbitux dose modification guideline stipulates the dose reduction required according to the grade of the side effects, and the prescription form is again where the modified does is calculated and prescribed. For example, in a situation where the lab sheet shows that the level of neutrophils[5] in the bloodstream of the patient has fallen below a certain threshold (i.e., less than 0,5 → 10,000,000,000/l), the physician may consult the dose modification guideline and read that the treatment of the patient must be postponed until the toxicity has fallen to at least a grade 1, and thereafter should only be continued with 75 % of the original dose, to be written on the prescription form. Again, note how this answer to the question of 'what to do next?' is given *via* intertext. Moreover, note the similarities between the two examples.

The pattern of three documents (i.e., prescription form, data on the patient's condition, and dosage modification guidelines) emerging from the two examples of intertext is essentially a combination of the principles of repetition and variation. A pattern occurs when a form returns with variations compared to its previous iteration(s). Some aspects of the form remain the same, so that it is (usually) recognisable, but others differ to allow for the particular details of the situation, such as patients and drugs. Thus, patterns harbour both the familiarity of repetition (same document types) and the particularities of variation (new patients).

By repeating the document forms with new patient data, familiarity is maintained while allowing for diversity. In practice, repetition helps to create cohesion, but alone it is not enough to accommodate the diversity of particular situations, such as dealing with different drugs and patients. Variations are introduced to allow for diversity within a known form that is repeated. In this manner, creating intertext is in many cases a matter of the accomplished actors following a (learned) pattern with properties of repetition and variation.

It is important to note that there are plenty of cases of intertext that are not necessarily following a pattern. This occurs when the creation of intertext lacks formal repetition. Not many examples of this can be found in highly organised and safety critical practices such as chemotherapy where one of the traits of the practice is precisely that it is a highly structured (for clinical reasons) with patterns of intertext recurring throughout the practice. However, intertext may fail to emerge despite the presence of well-known patterns. We shall turn to this phenomenon next.

6.3. When intertext fails to emerge

Occasionally, intertext fails to emerge when the physician browses and reads the texts of the corpus. If, for example, the side effects form has not been properly

[5] Neutrophils usually make up 50–70 % of circulating white blood cells in a healthy adult and serve as the primary defence against infections by destroying bacteria in the blood. Hence, patients with low neutrophils count are more susceptible to bacterial infections, and without medical intervention the condition may become life threatening.

updated to reflect the patient's performance status after a given series of chemotherapy treatments, the physician cannot create intertext between this form and other relevant texts such as the dose modification guidelines and the prescription form and may not be able to intervene, which is a serious matter. The patient may, for some reason, have missed an appointment at the hospital and in doing so will have robbed the nurse of the opportunity to interview the patient on his/her side effects. In this situation, the physician might prescribe the next series of chemotherapy on the basis of the previously recorded side effects suffered by patients, especially if none were recorded. Alternatively, it would be more likely that, if the patient has a history of significant side effects, the physician will have a nurse contact the patient to record the side effects to re-establish the possibility of creating intertext for the purpose of dose modification. In the practitioner's perspective, a good corpus of written text is one that facilitates the unobstructed creation of intertext in accordance with medical practice.

The project nurse points out that incoherence between texts, 'form, list and guidelines that do not match up', are a liability, first and foremost, to the safety and treatment of the patient, but also to the trial as a scientific experiment. For the very same reasons, the project nurse makes an internal audit of the trial on a regular basis. Part of this audit involves the creation of intertext between texts selected from the corpus of written text, which are internal to the trial. For example, the project nurse may establish intertext between the *treatment and examination form* that, among other things, shows the progress of the patient's treatment, and the *referral form for PET-CT scans* to see if the scans called for on the *treatment and examination form* has actually been carried out. Alternatively, to cite another example of such auditing by intertext, the nurse may create intertext between the *flow diagram for blood samples*, stipulating what kind of blood samples are to be drawn, and the *request slips for blood samples* where the actual blood sample requests are recorded. In this manner, it can be noted that the project nurse performed an audit (partly) by intertext.

When intertext fails to emerge as expected, the project nurse pursues the matter until it is settled in a manner that is satisfactory, both in a patient safety and treatment perspective and in the perspective of the trial conducted as a scientific experiment.

As will become clearer below, creating intertext also relies on several kinds of *intertextuality*. We will have a closer look at various forms of intertextuality next.

6.4. Intertext and intertextuality

There are at least three types of intertextuality at play in forming intertext, namely, the complementary type, the mediated type, and the intratextual type.

The complementary type of intertextuality is perhaps the most intuitively recognisable of the three types, as it refers to how documents complement each other to make up a the meaningful whole (Riffaterre 1980). As shown above, in reading the individual text the actor is attentive to the wordings, phrasings, and

illustrations that the document at hand will be insufficient in explaining. What, to the layman reader of the text, may appear as obscurities or incompleteness and even poor grammar, are to the competent actor, traces left by the absent intertext, completeness to be completed elsewhere by virtue of the complementary type of intertextuality. However, there are other types of intertextuality at play in various situations.

Imagine a situation where establishing intertextuality between two texts requires or is mediated by intercession of a third text – this is the mediated type of intertextuality. For example, consider the project nurse trusted with the task of auditing the trial. Part of this task involves making sure that the *patient information pamphlet* informs adequately on the content of the research protocol, that the relationship between the protocol and the patient information pamphlet is up to standards. These standards are not based on intuition, although such faculties may come into play, rather these standards are described in regulations and laws. That is, the intertextual relationship between the research protocol and a text such as the patient information pamphlet is in the auditing situation mediated by a host of regulations and laws including "Act on Clinical Trials on Humans, No. 295 of 26 April 2004," "Medicinal Products Act, No. 1180 of 12 December 2005," "Notice on Good Clinical Practice in Clinical Trials on Humans, No. 744 of 29 June 2006," "Law on Complaints and Redress in Healthcare, No. 24 of 21 January 2009" and so on. This implies for example that anyone creating intertext between the research protocol and the patient information pamphlet for purposes of auditing the trial, does so by the mediated type of intertextuality. That is, by taking into account other texts such as regulations and laws. In oncology, in a clinical trial, the intercession of laws, regulations and clinical guidelines may mediate to induce a number of intertextual relationships between texts.

The third and last type of intertextuality that we will point to is the intratextual type. This is a specific kind of intertextuality that is perhaps most easily recognisable looking at the use of text labels and stickers – text plastered onto text. The intratextual type of intertextuality promotes the actor's creation of intertext by juxtaposing text next to text in (semi) permanent ways, by superimposing a text upon another text. The most obvious example perhaps is, as indicated, labels with patient information superimposed onto drug labels on pill containers. Another subtler example is the dose modification guideline superimposed onto the pages of the research protocol. What makes the texts stand out as separate – thus allowing for the intratextual relationship to be made - is the actor's perception of two or more texts differing in a significant stylistic or semantic sense (Riffaterre 1980, p.67). The technique of the intratextual type of intertextuality is practiced throughout oncology and the clinical trial and is evident not least in the widespread use of text labels – meticulously prepared to be stuck onto other surfaces with text.

These three distinctions should help check any tendency, perhaps all too common, to settle for unfocused notions of influence from text to text (Riffaterre 1980). Influence from text to text, as in inheritance, is best understood as a 'vertical' phenomenon often between texts of the same kind – think of an old version of a

given text influencing the subsequent creation of a new version. In contrast, the creation of intertext by various techniques of intertextuality is best described as a 'lateral' phenomenon in the sense that there is simultaneity, a mutual solidarity between texts, so that in certain situations the text can function as an artifact by its engagement with other texts – each text contributing by its comparable otherness. It is diverse rather than uniform texts that enable the creation of intertext in our case.

6.5. Intertext by design

Some of the key (clinical) rules or norms of chemotherapy could be said to be 'inscribed' in the corpus of text in the sense that the corpus 'affords' certain kinds of intertext and not others. For example, the intertext created in the example above by the physician faced with modifying a patient's drug dose is, as we have noted, no accident. That there exists, inscribed into the texts, a complementary relationship between the prescription form, the dose modification guideline and the side effects form, is by design. The project nurse has deliberately formed the three texts, made them complementary, in order to afford the (easy) creation of intertext with the situation of drug reduction in mind. This reflects the norms of the practice. To give another example, the auditing of the trial by the search for potential intertext is made possible only by the intertextuality between the *treatment and examination form* and the *referral form for PET-CT scans*. That there is in fact intertextuality between the two forms is again by design, again reflecting key clinical rules or norms of the practice.

This does not necessarily mean that all the possibilities for intertext are there by design in a strong sense. However, we may say that in chemotherapy the intertext afforded by the corpus is often there quite firmly by design and with specific purposes in mind such as, for example, the act of reducing the drug dose for patients suffering side effects. In some sense, the corpus of text with all its affordances for intertext can be said to stand proxy for some of the key norms of the practice.

6.6. Intertext and norms

The skill of intertext (i.e., making sense of a situation, aggregating the right texts, and ultimately achieving meaningful action) is central to what it means to be an accomplished professional in healthcare. This is true for both the physician and for the nurse. The criteria for determining what counts as the 'right texts' and the 'right intertext' in a given situation spring not least from the norms of the practice. These norms are not only mastered by the accomplished practitioner, but also partly inscribed in material form in the corpus of text. There are of course plenty of norms pertaining to chemotherapy that are not inscribed in the corpus of text, the conduct of bedside manners to give just one example, but other key (clinical) ones are inscribed in the corpus of text regulating the creation of intertext.

While there are always actions that are not in accordance with the norms of a given practice, the effect of actors creating intertext in chemotherapy based on a corpus of

forms, templates and guidelines is to nudge activities towards a generally homogeneous set. A practice such as, for example, chemotherapy is contingent upon lines of action that vary from one patient to the next – patients will have different age, sex, general health etc. Furthermore, the condition of each patient will differ from one visit to the next as treatment progresses and the patient's condition changes. These variations may be considered normal, and there is nothing *ad hoc* in the way they are handled. On the contrary, they are dealt with by consistently relying on a tried and tested corpus of text, which is used by the actors as the basis for the creation of intertext according to the (contingent) situation and the particular demands of each patient. It is precisely at the movement of the creation of intertext that a corpus of text imprints its norms on the cooperative actor. It is the movement where the (combined) meaning of the texts invades the mind of the actor and influences his/her actions. In this manner, the contingency of medical practice is handled in the interplay between the agency of creating intertext and the structure of the corpus from which this is undertaken. This provides regularity and consistency and hence a measure of safety for the practice. The corpus of text affords certain kinds of intertext and by extension encourages certain kinds of regularities or routines.

The term 'routine' as it is employed here, is not used in an effort to create a deterministic impression of the actors' actions in chemotherapy practice. Of course, individual judgment and choice play a significant part. Practitioners must wield and apply a wide repertoire of skills and routines to work with widely varying concrete circumstances. In light of this, we may suggest that practitioners in, for example, chemotherapy do not 'standardise' the application of their routines so much as standardise the 'toolkit' of routines from which they draw. The particular concrete application of routines of creating, for example, intertext requires on-the-spot professional judgment, a capability that may be thought essential in any situation that has a measure of uncertainty. Like more specific routines, judgment is a skill that is cultivated in education, training and apprenticeship (Langlois and Cosgel 1993).

The ability to work with text and to create intertext is grounded in the actor's training, skills and techniques that may be considered acquired and, in turn, embodied in the accomplished actor through training and apprenticeship as a 'feel for the task'. According to Bourdieu (1977, 1992) these regularities and characteristic ways of doing and being become embodied in the individual actor of the domain in the form of *habitus*. Bourdieu (1992) notes of *habitus*:

> 'The habitus […] it is a socialized body, a structured body, a body which has incorporated the immanent structures of a world or of a particular sector of that world – a field – and which structures the perception of that world as well as action in that world.' (Bourdieu 1992, p.81).

The habitus is, and acts as, a set of 'pre-perceptive anticipations, a sort of practical induction based on previous experience' (Bourdieu 1992, p.80). We could suggest that the habitus of an accomplished practitioner in chemotherapy acts as a disposition

towards certain ways of understanding, doing and being, acting and interacting that are in accordance with, or reflect, the nature of, for example, 'the field of chemotherapy'. These dispositions are in the experienced physician, for example, creates intertext and regulates the doses of a patient suffering from side effects as described in the case above. Bourdieu argued that the reproduction of practice results from the habitus of individuals (Bourdieu 1992).

7. Discussion

As mentioned above, several studies has described the fact that documents may constitute and regulate medical practice. This study has attempted to take this insight as a point of departure and address the question of *how* this is done. The 'how' has been analysed employing literary theory. We have found that the ensemble of documents used and produced in chemotherapy, can be said to form a corpus of written texts. On the basis of the corpus, or subsections hereof, the actors in chemotherapy create intertext between relevant (complementary) texts in a particular situation, for a particular purpose. The intertext of a particular situation can be constituted by several kinds of intertextuality, including the complementary type, the intratextual type, and the mediated type.

Arguably, the concept central to the analysis is the concept of *intertext*. However, does the concept of intertext add anything to our ability to account for the role of documents in collaborative work? We will explore this issue by explicitly comparing the concept of *intertext* to well-established concepts within CSCW, namely, the concept of *ordering systems* (Schmidt and Wagner 2004), the concept of *documentscape* (Christensen and Bjørn 2014) and the concept of *assemblies* (Zhou et al. 2011).

7.1. Intertext compared to ordering systems

In this section we shall compare the concept of intertext to the concept of orderings systems in order to determine if they are interchangeable concepts or not.

Recall the concept of ordering systems: coordinative practices and the coordinative artefacts upon which they rely form complexes of interrelated practices and artefacts. Schmidt and Wagner (2004) have proposed to denote these complexes *ordering systems*. Some ordering systems are ubiquitous in the modern world, such as ordering systems for organizing meetings (a complex of calendars, clocks, agendas, minutes, mailing lists, room IDs, etc.) or for ensuring due process and administrative accountability (files and folders, archives, standard operation procedures, organizational charts, circulation lists, schedules) etc. (Schmidt and Wagner 2004, p.385). Other ordering systems are more domain-specific. In the context of architectural work, Schmidt and Wagner (2004) found that diverse specialized artefacts are designed to address specific issues and concerns. The specialized artefacts used in architectural work, which in combination make up the ordering system, include a CAD

systems (with layers, layer lists, colour codes, plan identification codes and plan circulation lists) and a drawing system (with identification codes, lists, catalogue etc.), and a paper binder system (with associated labels and identification codes). It is the combination of these specialised coordinative activities and associated artefacts that make up the ordering system:

> "[…] whatever their specific purpose, ordering systems are based upon the combination of specialized coordinative practices and concomitant artifacts. These specialized practices are elaborate literate practices involving standardized inscribed artifacts. That is, to coordinative practices the role of coordinative artifacts is essential and indispensable." (Schmidt and Wagner 2004, p.385).

In short, the concept of ordering system refers to a multifarious web of interdependent artefacts and coordinative practices. In contrast, the concept of intertext refers the individual's process of making sense of a situation, aggregating the right texts, and ultimately achieving meaningful action. This is another story. Where intertext is an activity concept, ordering systems is not clearly so. As the latter concept refers to both the practices (the doing) and to the artefacts (the material entities). The concept of ordering systems seem also to refer to what we would call *intertextuality* by virtue of the notation systems and the plan naming schemes as well as to what we would call the *corpus of text* by referring to the many written artefacts. However, the activity of combining and aggregating several texts *on the level of the individual* is not included in Schmidt and Wagner's (2004) concept of ordering systems.

In sum, we have argued that the concept of intertext is *not* interchangeable with the concept of ordering systems (although it may complement it).

7.2. Intertext compared to documentscapes

In this section we shall compare the concept of intertext to the concept of documentscapes in order to determine if they are interchangeable concepts or not.

As mentioned above, the concept of documentscapes was coined by Christensen and Bjørn (2014) in their study of global software development practices. In this study it was noted how collaborative activity in global software development depend upon a scaffold of interconnected texts and documents distributed across the collaborative actors, and interlocked through intertextuality. Christensen and Bjørn (2014) show how hierarchical structures and sequentiality across the interlocked documents are critical to how actors make sense of the work of others and what to do next in a geographically distributed setting. The concept of documentscape refers to the entire ensemble of documents in their mutual intertextual interlocking. A series or an ensemble of documents may be said to form a documentscape when each document depends upon the wider ensemble for meaning as well as utility. Documents

in the documentscape take their meaning from their position in an ensemble of documents used or produced in series or in parallel by many people working together (Christensen and Bjørn (2014, p.2451). Furthermore, Christensen and Bjørn (2014) point out that the documentscape is not merely 'supporting' the work it is *constitutive* of it:

> "Working with documents in global software development […] is constitutive of the activities performed by the participants. We may say that software developers would not be software developers, and testers would not be testers, without the documentscape. The documentscape is not simply there to support the work; rather, we may say that the documentscape is constitutive of the work. That is, the performance of every individual or collaborative activity (almost always) involves some kind of document as an integral part of the work. Creating documents is the work in document-heavy practices such as global software development. Making documents, in our case, is not the taken-for-granted-background work that often gets neglected unless there is a breakdown. The documentscape of global software development is not the 'boring infrastructure'. Instead, it is the centre of attention, and making the documents is what makes the job positions such as tester, system analysts, or system architect." (Christensen and Bjørn 2014, p.2456).

We may say that this article shares Christensen and Bjørn's (2014) interest in how the use of collections of documents may be constitutive of collaborative work in complex work settings. Furthermore, Christensen and Bjørn (2014) also take a keen interest in the significance of intertextuality. According to Christensen and Bjørn (2014, p. 2453), the associations that position the documents in the documentscape are organized through intertextuality. This article obviously also shares Christensen and Bjørn's (2014) interest in intertextuality - this is also a key concept in the conceptual framework we have used following Riffaterre (1980). So there are similarities in interest between Christensen and Bjørn (2014) and this article. We see this in terms of the interest both studies have in collections of documents as constitutive of work practice as well as the notion of intertextuality. What is the difference between the studies, then, besides different domains being studied? The main difference is the concept of intertext. Creating intertext is not conceptualised or singled out in Christensen and Bjørn's (2014) work on documentscapes. We can imagine that working with documents in global software development may involve activities that we would dub the creation of 'intertext' but this is not part of the analysis in Christensen and Bjørn's (2014) work. That is, the activity of combining and aggregating several texts chosen carefully from a corpus of text, as a basis for achieving meaningful action, is not conceptualised or considered in detail in Christensen and Bjørn's study of documentscapes in global software development.

It seems that although the concept of intertext is not interchangeable with the concept of documentscapes it might complement it.

7.3. Intertext compared to assemblies

Leaving the distinction between the concepts of orderings systems, documentscapes and intertext for now, another concern appears. Perhaps other, more established concepts within CSCW and related research fields are already doing what intertext does. Are intertext and assemblies for example interchangeable concepts? In addition to contrasting intertext with ordering systems and documentscapes, perhaps it could be helpful to contrast the concept of intertext with Zhou et al. (2011) concept of assemblies. We shall do so in this section.

As indicated above, Zhou et al. (2011) coined the concept of assemblies in the context of a study pertaining to the introduction and use of a Computerised Prescriber Order Entry (CPOE) system at a large hospital. As the name indicates the systems handles prescriptions and administering of drugs at the hospital. Zhou et al. (2011) has a particular focus on understanding the workarounds surrounding the use of the CPOE system. For example, workarounds where health care professionals 'violate' drug administration procedure or create new work practices in response to the introduction of the CPOE system:

> "After the CPOE implementation, nurses were required to actively log into a computer terminal to receive and review doctors' orders. When they were engaged with direct patient care activities, they could not always do this frequently, so missing scheduled orders occurred more often during the first few days of the system implementation. To resolve this problem, the nursing unit leadership quickly created another workaround. They assigned a clerical staff member to constantly monitor all patients' new order status and to page nurses when no action or acknowledgement was recorded within the appropriate time frame. This mitigated the issue of missing orders, although it escalated the level of interruptions to the nurses' work". (Zhou et al. 2011, p.3357).

According to Zhou et al. (2011), such workarounds as the one described in the quote above cannot be sufficiently explained by the use of the concept of boundary objects alone. This is because the concept of boundary objects does not fully capture issues pertaining to the organizational policies, the automated work processes, and the coordinative artifacts – it mainly pertains to the information objects. In the example above organizational policies have a large part to play for example. A better understanding of the workarounds at the hospital may be achieved through the analytical lens of assemblies (Zhou et al. 2011). The view of the CPOE as an *assembly* makes it clear for example that organizational policies and managerial control are a part of the assembly. This is also clear for example when the system is made to offer special functions to monitor and aggregate nurses performance data to uphold human resource policies. We may say that the concept of assemblies helps Zhou et al. (2011) understand the CPOE workarounds in a broad context not

provided by the concept of boundary objects – hence the appropriate extension of this concept.[6]

Teasing out the difference between the concept of assemblies and the concept of intertext is straightforward we might say. The concept of assemblies takes a broad technical/social/organizational view of practice with a focus on workarounds. In contrast, the concept of intertext takes for a large part the viewpoint of the individual working with text. This viewpoint is far from pervasive in Zhou et al. (2011) study of the CPOE system as an assembly. Consequently, the concept of intertext and the concept of assemblies are not interchangeable.

7.4. Intertext beyond chemotherapy?

We have established that the concept of *intertext* and the concepts of *ordering systems*, *documentscapes* and *assemblies* are not interchangeable. What remains to be explored are whether or not there may be intertext beyond chemotherapy? In order to discuss this we will briefly reconsider the three studies just encountered (i.e., Schmidt and Wagner 2004, Christensen and Bjorn 2014, Zhou et al. 2011) from this vantage point. This is in no way meant as a systematic review. The object is merely to establish in a (very) preliminary manner if we can expect to find intertext beyond chemotherapy.

Take the practice of architectural work for example. Schmidt and Wagner (2004) describe how architects work with objectification of the building design, including text:

> "[…] one should take into account that architectural work is different from many other types of work insofar as the 'field of work' does not exist, that is, does not exist objectively, in advance, but is constructed in and through the process of design and planning and, ultimately, construction. Architectural work proceeds through the architects' producing successive objectifications of the design and interacting with them in a variety of ways, inspecting them, *comparing* them, assessing them, etc." (Schmidt and Wagner 2004, p. 363 my italics)

We can read in the passage above that architects are focused on interacting with and *comparing* successive written artifacts such as descriptions, representations, building technique standards, safety standards, requirement, laws and regulations and so on (Schmidt and Wagner 2004). Based on this description, we can gauge that architectural work involves comparing building descriptions to architectural plans while taking into consideration material specifications as well as building regulations. Can this be done without the creation of intertext? Probably not. This indicates

[6] One might say that the concept of assemblies runs the risk of including every phenomenon in the analysis from technical implementation to coordinative artifacts to organizational policy. But at the same time this is the strength of the notion of assemblies i.e., putting focus on the broad picture.

that practices amounting to the creation of intertext, using our vocabulary, are a phenomenon that may be found in architectural work i.e., beyond chemotherapy. This point may be clearer still as we move on the consider global software development as described by Christensen and Bjorn (2014) whom write:

> "What enables the documentscape to form the backbone of the collaborative effort is partly the competent actors' familiarity with the order and nature of the documentscape. The competent actor has an (normative) image of the nature of the documentscape even before it has taken its (initial) form – this is due to her training and experience. That is, knowing how documents are (supposed to be) ordered, with documents building on each other in intricate modes of presence and anticipation, serves as a mechanism of interaction [see also 19]. By knowing the quasi-sequential order and associated links through the iterative, authorless practices and continuous in-progress state of documents, collaborators can refer to, identify, and locate important knowledge relevant for their individual tasks at hand without necessarily consulting other developers all the time. Having said that, it is important to note that *performing relations between the documents* is an achievement on the part of the actors …" (Christensen and Bjørn, p. 2458, my italics).

Note the expression above '*performing relations between the documents*' – it seems to indicate that an activity amounting to the creation of intertext can be found in global software development. Documents have to be aligned. However, the concept of intertext is not used. The study of global software development is focused on the documentscape and legitimately has a different focus.

As a third indication of 'intertext beyond chemotherapy' we can suggest that working with CPOE systems, such as the one presented by for example Zhou et al. (2011), may involve the creation of intertext. For example, Zhou et al. (2011, p. X) describes how nurses has developed a workaround using both paper based resources as well as text in the CPOE system to double-check medication prescriptions:

> "Another workaround that appeared among the nurses in the study unit, as well as in other units (based on our interviews) was using paper to double-check medication. Some nurses relied on the medication information they scribbled on their personal sheets rather than on the CPOE to double-check the medication order right before they administered it. However, as a patient safety safeguard, there was a policy that required nurses to double-check medication according to the orders verified by the pharmacists" (Zhou et al. 2011, p.X)

As illustrated, nurses were required to double check medication by comparing the orders on paper verified by the pharmacist to the text in the CPOE system. We may in our vocabulary say that it sounds a lot like the nurses were looking for intertext between the two kinds of documents in order to safeguard the patients' drug prescriptions. Note that this example is not dissimilar to what we have seen in

chemotherapy in this article where nurses and doctors also look for intertext between documents in order to safeguard patient safety.

At this juncture we can note that none of the three studies considered above, use the concept of intertext, single out the activity of intertext, or analyse a phenomenon amounting to it in detail combined with understandings of corpus and intertextuality – they legitimately have a different focus. However, there are in fact scattered descriptions of practice in Schmidt and Wagner (2004), Christensen and Bjorn (2014), and Zhou et al. (2011) that imply or logically denote activities amounting to the creation of what we would call intertext. Making such an observation is of course not in any way a substitute for a *systematic* study of intertext in e.g., architectural work, global software development or CPOE use in hospitals. However, it does indicate that intertext is a phenomenon that may be found beyond the practice of chemotherapy. It calls for future studies of intertext in these domains and beyond. The upshot of such future studies in other domains would be that they could create a broader understanding of intertext on which in turn the design of computer technology may be based.

If we accept that the concept of intertext and associated concepts has the potential to contribute to the analysis of text and documents in cooperative work, then it becomes relevant to discuss the connection between intertext and computer support. For example, we might ask if computers can support the human creation of intertext, and if computers can be expected to create intertext on their own.

These are the questions that we will address next. We will do this by setting up and exploring a set of principles. Given the variety of ways in which technologies can be configured to comprise of concrete systems with regard to concrete settings (even within the confines of health care), it would be beyond the scope of this article to offer concrete systems-design recommendations. Instead, we will promote the discussion in more general terms.

7.5. Can computers enable the human creation of intertext?

The short answer is 'yes', computers can enable the human creation of intertext *by providing an orderly corpus of text by computational means*. Current computer systems, including EMR and EPR, are positioned to take part in achieving an orderly corpus of written text that may support the creation of intertext by the human actor. That is, there are several (generic) components of contemporary computer systems that can contribute to the achievement of an orderly corpus, including features such as metadata, storage, retrieval, search, distribution, security and versioning. These features are a part of the actor's practices of categorisation and classification, and are well-known features of contemporary (computer) systems in healthcare. It is, perhaps, superfluous to account for them in any further detail. It may suffice to say that a corpus of electronic documents may be stored, retrieved, searched, organised and indexed according to a set of metadata associated with the documents. This metadata makes up the ordering principle of the corpus or, more precisely, the basis for making

order. Metadata can be said to facilitate the ordering of the various texts within a corpus, according to whatever criteria the metadata is set up to permit. Indexing may be performed through the document's metadata. A nurse using an indexing feature may, for example, generate a list of the texts of the corpus, with patient numbers, names and data types (part of the metadata) providing her with an overview of the corpus as she sets out to audit it. A search often builds on the metadata and indexing features allowing the user to find and retrieve stored documents according to various ordering principles based on any metadata created and made available. A physician may, for example, find documents associated with a patient, as the patient's personal number is a part of the metadata of the documents. Version control may also be a part of ordering a corpus as well as security through access control, bound up with user profiles and roles. All this is well-known. What such computational artefacts afford, as inscribed artefacts, goes beyond mere retention and storage. Their format evidently shows that they are not just somebody's memory aid (Fitzpatrick and Ellingsen 2013; Greenhalgh et al. 2009).

Hence, in principle and in practice, computers can take part in the creation and maintenance of a corpus of written text and this may support the human actor in his/her efforts to create intertext. This is not to say that there are no challenges in this regard. EMR and EPR systems boasting some or all of the features mentioned above (and much more) in various configurations have been critiqued to the point of making it very clear that there is much more work to be done here (Fitzpatrick and Ellingsen 2013; Greenhalgh et al. 2009). Notwithstanding, there are features of computer systems that are useful in the achievement of an orderly corpus of written text that may support the human actor in making sense of a situation, aggregating the right texts and ultimately achieving a meaningful action. Intertext is the creation of the individual actor, and it may be supported by a corpus of text which is ordered and stored by computational means.

The next and even more pressing question is this: Can computers create intertext on their own?

7.6. Can computers create intertext?

We will argue that computer technology, as we know it, have no situational awareness, at least not in terms of a sophisticated contextual understanding. Consequently, computer technology as we know it cannot create intertext as humans do. However, there is room for a redefinition of problems: Tasks or problems previously solved by humans *via* intertext may in some cases be reshaped in order to afford a more widespread use of computational power and algorithms. Let us elaborate.

Computers can extract data from predefined sources and process it according to pre-set algorithms. Recall the case described above where the physician had to create intertext between three different documents in order to prescribe the right modified dose of chemotherapy to a patient suffering side effects. Could a computer algorithm

perform the same feat? In a narrow sense the answer is 'yes', and in a broader sense the answer is 'no'.

'Yes', a computational algorithm can, in principle, calculate the dose reduction providing (1) that the degree of the side effects suffered by the patient has been quantified and made available as data to the algorithm, (2) that the original dose previously calculated is made available as data to the algorithm, and (3) that the dose modification guideline is integrated in the algorithm. In such a scenario the algorithm may calculate and stipulate, for example, that the treatment must be postponed until the side effect has been reduced to at least grade 1 and, thereafter, only continued with 75 % of the original drug dose. In effect, this is the very same calculation made by the physician creating intertext based on the various documents in the real-life example from the clinic. But is it intertext, or is it just a calculation that the computer is performing? And what is the difference?

An algorithm may perform calculations akin to those performed by the physician reducing the dose, if the data is made available to the algorithm as it was in our imagined scenario. But, this is not the creation of intertext. As previously seen, creating intertext rests on the ability to continuously access the situation and to choose the appropriate set of documents and from that vantage point create intertext. It is not merely a matter of making a calculation. It is also a matter of choosing and 'harvesting the right kind of data', appropriate for the situation. We must be careful not to confuse the creation of intertext with the calculation of the dose in the scenario. In fact, the computer in the scenario is not working with shifting situations, uncertainty, and a large corpus of documents that it must choose from. In the scenario, what has been done to afford the use of computational power is that data have been extracted and made available to the algorithm. In turn, we are not witnessing the creation of 'intertext', but rather the feeding of data to an algorithm.

Intertext is partly a modality of perception, a situational property, associated with the situation of the reader (Riffaterre 1980). It is by no means given what constitutes relevant texts in a particular situation (Ellingsen and Monteiro 2003, p.222). Furthermore, it is by no means given how to define a situation in the process of creating intertext. We are fully attentive to the fact that some classes of computer technology are referred to in terms of 'context-aware computing' or 'location-based computing'. There is a large body of literature with interesting contributions of this order, including applications in healthcare (Bricon-Souf and Newman 2007). For example, some may argue that recent development within AI including IBM's Watson show some modality of 'context awareness'.[7] However, on closer inspection, it turns out that what for example Watson lacks is the ability to connect new life

[7] Watson is a computer system capable of answering an array of questions posed in natural language. Developed by IBM, Watson was named after IBM's first CEO and industrialist Thomas J. Watson. The computer system was specifically developed to answer questions on the quiz show Jeopardy! Subsequently, Watson has been further developed with other applications areas in mind, including healthcare (https://en.wikipedia.org/wiki/Watson_(computer) -accessed 020915 14:18).

experiences to form appreciations of a situation that may not have been encountered before, which is part of what gives humans their cognitive abilities (Winston 2012). That is, the kind of context awareness that computational devices can produce does not amount to the kind of (new) situation definitions that nurses and doctors achieve as part of creating intertext. Using Ryle's (1968) terminology, computer technology is unable to provide thick descriptions of a given situation. Human reasoning and computational processing is, after all, radically different phenomena (Dreyfus and Dreyfus 1986).

Perhaps we should reserve the word 'intertext' for the human realm, considering the fact that reasoning and computational processing is radically different phenomena (Dreyfus and Dreyfus 1986). As mentioned before, computers can extract data from predefined sources and process it according to pre-set algorithms, and this is possible and perhaps even desirable. What computers, as we know them, cannot do is handle the ever changing picture involved in medical reasoning that is part of the creation of intertext. More specifically, computers cannot assess a situation, create a situation definition, and choose the right set of documents to be combined for intertext. For computers to be effective, the problem has to be redefined in terms of the feeding of data to an algorithm.

What remains is the option to recast problems. That is, we could seek to recast what humans previously solved through intertext in terms of algorithms working on retrieved data – and in this way make computational power effective; this is an option.

7.7. Challenges of substituting intertext with computational powers

Placing greater emphasis on data and algorithmic processing, rather than the human creation of intertext, raises a series of issues concerning organisational practice including transparency and accountability. We will point to four dimensions of relevance:

1. *Patterns of inclusion*. Shifting from a practice of people creating intertext to the feeding of data to an algorithm involves making choices about what to include and make algorithm-ready and what not to. Understanding what is included in the algorithmic realm and what is left to human intertext requires attention to the collection and inclusion policies of the computational services.
2. *The transparency of the algorithms*. The criteria by which algorithms determine an outcome or process data can be obscured from the practitioners when encapsulated in computational systems and code. In contrast, the creation of intertext is based on the faculties and skills of the individual actor and is, therefore, transparent to the individual. Algorithms may embody organisational policies and design choices that are unclear to the practitioner. To be able to say with confidence that a software algorithm has made the right evaluative assumption about a patients treatment, the kind that has consequences for the patient, might call for a critical analysis of the algorithm to interrogate its

underlying criteria. But in many cases, such evaluative criteria are hidden for the end user. Making algorithms open for inspection may be a design criterion. But, whether or not the practitioner actually has time to inspect them in practice, is another matter. In contrast, intertext is the work of the individual practitioner and, hence, open and transparent to that person.

3. *The accountability of the algorithms*. Intertext is created by a person at a specific moment in time for a specific purpose and is based on the availability of textual resources coupled with medical reasoning. It is clear who is responsible for the intertext and the actions that it may lead to. Algorithms encoded in software and their outcomes are differently situated. Who is accountable for the working of a software algorithm, or who in medical practice is willing to be held accountable for the workings of a software algorithm? Holding the vendor of the system accountable for the data fed into the algorithm, the working of the algorithm and the recommendations springing from the algorithm is radically different from relying on the human creation of intertext.
4. *The trap of computational uniformity*: One argument for greater emphasis on data and algorithmic processing, rather than the human creation of intertext, is that the former is uniform across instances. Given stable circumstances the software algorithm will perform in a uniform manner. This is a two-edged sword. The upside is that if the algorithm and the data capture are working as intended, then various irregularities may be avoided. This may well be in the interest of patient safety. The downside is that, if there is an error, either in data retrieval or algorithmic processing, then such an error may, in the worst case, propagate across instances and patients for quite some time before being detected and corrected. Detection of algorithmic errors in software systems becomes harder if the workings of the algorithms are obscure and not transparent to the users. This is another argument for algorithmic transparency.

In combination, the four challenges mentioned above make it obvious that there is no 1:1 substitution between human intertext and computational powers. Each *modus operandi* may have its drawbacks and benefits. What is important, is that we carefully consider these trade-offs in the context of a concrete design process in accordance with the needs of the actors in a given setting.

8. Conclusion

For the sake of clarity, we will now briefly take stock and provide a conclusion.

This article set out to address the fundamental CSCW challenge of characterising how written artifacts may constitute and influence human action in complex organizational settings. This agenda was addressed through a novel analytical approach informed by literary theory. This approach involves a systematic conceptualisation of

the cooperative actors' engagement with text in text-laden practices. We introduced the analytical concept of intertext, corpus and intertextuality to the analysis of cooperative work building on the work of Michael Riffaterre (1980). The upshot of the approach, paraphrasing Strauss et al. (1997) and Garfinkel (1967), is that it gives a precise vocabulary to describe and analyse how "practitioners 'know what to do next' by virtue of their ability to reconcile the contingent nature of medical practice with the formal nature of text in the clinic". We demonstrated the value of the approach for CSCW through an empirical study of text in chemotherapy, which we subsequently discussed.

The concept of intertext was key to the analysis. Intertext is the meaning achieved by the actor by combining several texts from a corpus of text in accordance with the demands of a given situation, relying on various kinds of intertextuality. Based on empirical data, we found that intertext may serve as a basis for action in chemotherapy. In chemotherapy it may be said to be there by design in the sense that the corpus of text is deliberately created to afford certain kinds of intertext and not others. This state of affairs reflects key norms of the practice. For example, the safety-critical aspects of the practice are reflected in the corpus of text and its affordances for the actor's creation of intertext.

Subsequent to these considerations we discussed computer support of intertext. The discussion suggested that computer support of intertext may primarily focus on providing an orderly corpus of text. The achievement of intertext *per se* was deemed outside the realm of computer technology, as we know it. This is mainly because the achievement of intertext relies on making complex situation definitions in a changing environment, and this falls outside the reach of context aware computing, as we know it. This lead us to suggest that we might want to reserve the concept of intertext for the description and analysis of human activity in order to avoid a conceptual muddle.

In conjunction with this, we also indicated that CSCW and related research fields analysing e.g., architectural work, global interaction and CPOE systems might benefit from considerations of intertext. Indications are that intertext may be key in these practices as well. Discussing variations of intertext in cooperative work in future studies may bring us closer to understanding text-centric practices in general. In addition, it may bring us closer to computer supporting an orderly corpus of text that allows for the excellent and safe creation of intertext.

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