

# Variations in Oncology Consultations: How Dictation allows Variations to be Documented in Standardized Ways

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**Abstract.** In-between 2016-2017 a new hospital information system (HIS) was introduced at several hospitals in Denmark radically changing the core work practices for a majority of the healthcare professionals. Promptly, the new HIS began to receive criticism from healthcare professionals for failing to live up to proclaimed expectations. To fully understand the problems experienced by the healthcare professionals we need to understand the fundamental nature of the work prior to the implementation. In this paper, we investigate patient consultations as they were performed prior to the implementation of the HIS at an oncology department. Reporting from a 1.5 year-long study, we find patient consultations were organized in three sequential activities: review, interaction, and documentation. Further, we find that the dictaphone served as a key artifact allowing physicians to enact flexibility in documentation while simultaneously providing them with the capability to communicate and coordinate with the medical secretaries. Our empirical findings suggest that the medical secretaries are critical for structured documentation of variations in health data and are the cornerstones that allow physicians to enact sentimental efforts when interacting with patients. These insights prove important in understanding the criticism aimed at the new HIS implementation since the implementation removed the dictaphone as a key artifact and instead introduced a new organizational structure where documentation was assumed accomplished in parallel with patient interaction. The transformation consequently shifted work, previously performed by the medical secretaries, to the physicians.

**Keywords.** audio recordings; CSCW; dictaphone; documentation; field study; healthcare; health data; information systems; medical secretaries; oncology; patient consultations; treatment trajectories; variations; work practices

## 1. Introduction

Clearly, important insights on the nature of cooperative work arise from in-depth workplace studies and detailed descriptions of concrete work practices (Blomberg and Karasti, 2013; Møller et al. 2017). Due to the strong reliance on ethnographic workplace studies in CSCW many workarounds, particularities, and bottom-up practices have been documented as they have emerged in complex real-life interactions (Bjørn and Rødje, 2008; Clarke et al., 2006; Møller and Dourish, 2010; Svensson et al., 2007). In recent years, the interest to move from particular studies towards more generalized considerations have caused researchers to focus more on how to arrive at insights relevant for design outside of a particular context (Schmidt et al., 2007). In this kind of work, we see a dedication to investigate variations and commonalities across empirical sites as an approach to arrive at more generalized insights based upon specific situations (Balka et al., 2008; Wulf et al., 2015). These efforts have particularly engaged CSCW researchers studying healthcare technologies since core challenges for the design of healthcare technologies tie in with agendas of standardization across medical domains, hospitals, and patient populations (Berg, 1997). In this paper, our interest also lies within variations found in medical work. However, not as a general interest in methods for CSCW but instead in trying to establish a fundamental understanding of the aspects, which in our empirical case, allowed the physician to consider the unique nature and variations across patients while documenting different types of data in standardized ways.

Patient consultations are highly cooperative activities where healthcare practitioners and patients together evaluate and interpret the current health condition of the patient to make a decision on how to proceed with treatment and further investigation (Mønsted et al., 2011). It is a situation, where medical professionals through examinations, diverse testing, and the narrative told by the patient, transform patient concerns into solvable problems (Kane and Luz, 2009). Our interest is a particular type of patient consultation, namely, consultations with patients diagnosed with cancer in different stages of their treatment trajectory. Cancer patients serve as an interesting empirical case for CSCW research because of the cooperative complexities caused by the temporal treatment patterns that are structured through diverse sets of recurrent sequential activities. A cancer patient consultation is not a one-time activity but instead a long-term relationship between the physician and the patient which involves numerous patient consultations and treatment sessions. Cancer patients can be compared to chronically ill patients with diseases such as hemophilia and diabetes (Danholt and Langstrup, 2012), thus, the technology, which is used to document patient consultations, must support these sequential interactions over long-term periods. Further, cancer patients may have a metastatic disease where treatment is centered around improving quality of life and prolonging their lives rather than curing them. Thus, the diverse nature of the illness provides interesting insights into requirements for documentation of patient data and trajectories over time. Finally, some cancer patients are cured with the combination of surgery, chemotherapy/immunotherapy, and/or radiotherapy. These patients will be

controlled routinely for relapses. The stage of cancer (localized or metastatic), treatment options (neoadjuvant, adjuvant, curative, and palliative), as well as the physical state of the patient (performance status), and comorbidity makes each oncology patient consultation diverse in nature. In turn, the complexities increase the challenges and requirements for what constitute appropriate documentation of health data. Furthermore, several technologies are entering the patient consultation situations which directly impact the ways in which patient consultations can take place (Boulus, 2009; Christophersen et al. 2015; Silsand and Ellingsen, 2016). As CSCW researchers, we must consider how to design cooperative technologies that can capture the uniqueness of each patient while allowing information to be stored in digital repositories that are appropriate for the continuous long-term treatment trajectory.

We explore cancer patient consultations as cooperative practices containing three types of interlinked activities: reviewing past information, interacting with the patient, and documenting the interaction. By extending the analytical space of patient consultations we are able to explore the variations which are important to document for the treatment of cancer patients. The research question guiding our work is: *What are the types of variations which shape oncology patient consultations and how does the organization of work and cooperative technologies allow the physician to enact flexibility and treat each patient uniquely?*

The empirical basis for the paper is a 1.5 year-long workplace study conducted at the Department of Oncology at Copenhagen University Hospital, Herlev, Denmark. We observed patient consultations in four different oncology teams specialized in treating different types of cancers in the same department. By comparing these different teams, we have been able to identify general variations which are important in terms of documenting cancer patient consultations.

We identify different variations which directly impact the documentation and these are *physician variations* (specialties, seniority, and patient knowledge) and *patient variations* (new patient, undergoing treatment, evaluation of treatment (by scans), termination of treatment, patient's physical, mental, and social state). Our data demonstrate that each variation impacts how the physician *interacts* with the patient, and thus also, what information is required to be *documented* with the aim of *reviewing* the health data at a later stage. Our data demonstrate that physicians' ability to enact flexibility when interacting with patients is vital. Moreover, by applying the dictaphone as a core artifact mediating the work between the physicians and the medical secretaries we find that the healthcare professionals are able to connect medical reasoning, health data documentation, and coordination of future treatment, while taking variations into account and that it is the medical secretaries who allow for variations to be documented in standardized ways across patients and physicians.

So, why is this important for ECSCW? Because we are currently witnessing how the collaborative technologies supporting the physicians within hospitals are being replaced by new IT systems and infrastructures which do not take into account the local work practices of the physicians. New systems are introduced into Danish hospitals in parallel with decisions to take away important

functionality such as the dictaphone - together with introducing new workflows for instance that documentation should be done while interacting with the patient as a cooperative process between the physician and the patient. Such decisions neglect to acknowledge the connection between documenting past factors (activities, numbers, socio-emotional state etc.), ordering new initiatives for the patients (scans, medication, treatment etc.), and reflection on the patient situation as a whole. We argue that by removing the dictaphone, a significant and embedded artefact, in combination with changing the flow of work from the sequential process of interaction, documentation, and reviewing - into a parallel process, where interaction and documentation are to be done simultaneously, the work is fundamentally changed from the perspective of the physician. The new HIS system will by default interrupt the way of working. Understanding practices and artifacts are important if we are to unlock the nature of the rising criticism toward the newly implemented HIS and identify new potential solutions to address the critique.

The paper is structured as follows: In the following section of the paper, we revisit CSCW literature within healthcare. Then we present our research method before presenting our results. This is followed by a discussion of our findings, which finally lead us to the conclusion of the paper.

## 2. Patient Consultations and Information Technology

Creating an integrated healthcare sector across healthcare providers is difficult and we often see a distinct fragmentation across both technical, organizational, and professional boundaries leading to more fragmented healthcare services for patients (Aanestad and Jensen, 2011; Boulus and Bjørn, 2010; Ellingsen and Munkvold, 2007). In an effort to overcome these challenges healthcare institutions have introduced electronic patient records to allow for increased and improved access to patient health information across boundaries (Reidl et al., 2008; Winthereik and Vikkelsø, 2005). Further, health organizations see an opportunity in alleviating the rising costs of healthcare and improving patient safety, quality of care, and increase efficiency through healthcare information systems (Reidl et al., 2008). Despite countless efforts to materialize these opportunities the implementation and adoption of electronic patient records have often not reached the expected outcome. Here challenges can be attributed to the conflicts between standardized systems and medical work practices as well as the complexity of health work (Bjørn et al., 2009; Hanseth et al., 2006; Zhou et al., 2012). Additionally, when healthcare information systems were first introduced to the healthcare setting technical challenges were seen as the main concern, however, organizational complexities have proven to play just as an important role in deciding the success or failure of a system (Berg, 2001; Reidl et al., 2008). Especially within healthcare, much research points to the need for understanding the complexities and many interdependencies that exist within clinical work practices (Reddy and Jensen, 2008; Reidl et al., 2008; Silsand and Ellingsen, 2016). Prior research on the organization of medical work has documented the

multiplicity which shapes medical work (Strauss et al. 1985). Important facets of medical work include the machine work, the safety work, the comfort work, the sentimental work, and the articulation work as it is accomplished by the healthcare professionals when structuring and guiding the illness trajectories of patients with chronic illnesses (ibid). When we explore the work involved in consultations with cancer patients, we thus need to pay attention to the multiple aspects which shape the variations in the medical practice.

An integrated healthcare system needs to function across multiple local settings and disciplines but variations found among medical workers may prove difficult and costly to sustain (Jensen and Aanestad, 2006; Reidl et al., 2008; Zhou et al., 2011). When creating or reconfiguring a healthcare system to fit such diverse environments, we must explore variances in medical practices. In such work, successful strategies for design have been found to be situations where ad-hoc or low-frequency situations are excluded and focus stays on practices which are uniform and transcend local work (Reidl et al., 2008). Moreover, it is important that we consider the categories which are designed into the digital systems to ensure that new systems do not impose categorization upon medical personnel risking resistance (Bjørn and Balka, 2007). Therefore, it is key to pay equal attention to both the work practices of healthcare professionals and ensuring that important flexibility of current practices is preserved in new designs of systems (Bjørn and Balka, 2007; Langhoff et al. 2016). It is significant to articulate and identify which aspects can be standardized without constraining important local flexibility and which aspects require local reconfiguration to function in a particular work context (Bjørn et al., 2009).

Medical records play a crucial role in allowing health professionals to perform their medical work. Not only do the records shape the overall treatment trajectories of patients they also influence and affect each individual patient consultation (Berg, 1996). The electronic medical record can be viewed as a place to store information for later use explained in terms of continuous processes of reading and writing (Berg, 1996). The role of electronic medical records as coordination mechanisms and repositories have been discussed (Schmidt et al., 2007), and researchers have (Bansler et al., 2016; Mønsted et al., 2011) specifically examined the role played by electronic medical records in supporting healthcare professionals' medical reasoning and decisions making. Previous work has pointed out how physician's journal notes serve as a tool for thinking and enabling healthcare professionals in making sense of the past history and current medical state of patients (Bansler et al., 2016). Building upon this work we explore the needs and requirements of physicians when treating cancer patients. Further, we explore the contextual contingencies (Bjørn et al 2009) which directly impact the ways in which physicians are able to review past history and interact with the patient appropriately. If we are able to classify these contextual contingencies we can use the insights to understand when system design succeeds and when they fail.

Medical records are collections of past and current health information in regards to specific patients (Bansler et al., 2011). A core source of information within the medical record is the journal notes. The journal notes intend to describe

a patient's treatment trajectory by highlighting selective medical events, findings, and thoughts which describe the patient's condition and provide a basis for action (Cicourel, 1990; Corbin and Strauss, 1991; Strauss et al., 1985). Important ways for physicians to express their thoughts are by using narratives to inform their confidences and concerns when proposing diagnoses and plans for action. Accordingly, journal notes are cognitive artifacts which afford physicians in recalling patient's history while also functioning as collaborative tools to coordinate decision-making and action among medical staff (Bansler et al., 2016). However, as expressed by Berg (1996, p. 520) 'no memory, however, can exist without forgetting' and what selectively ends up in the record (and how) is a prerequisite for making the medical record function in the first place. Yet, this selectivity can also complicate medical work especially for patients with chronic conditions. Chronic patients often see multiple health professionals at different spatial locations - and in such situations, there is a risk that the health data becomes fragmented (Bansler et al., 2011). This is especially due to the contextual nature of each clinical encounter that is prominent for chronic patients who often have long and complex treatment trajectories (Corbin and Strauss, 1991; Huh and Ackerman, 2012). In such cases, the use of health information is often highly contextual and situational, and previous research found that electronic patient records often fail in adequately supporting health professionals in their daily work (Bardram, 2004; Zhou et al., 2012).

Thus, when we explore the variations in patient consultations in our empirical case it is important that we pay attention to the different types of technology and the role they play in making coordination work function.

### 3. Research Method

Studying the work involved in and around cancer patient consultations we conducted an ethnographically informed workplace study (Forsythe, 1999; Luff and Hindmarsh, 2000; Randall et al., 2007) exploring the multiple sites for design (Bjørn and Boulus-Rødje, 2015) at a Danish oncology department. The study continued over a period of 1.5 years from February 2016 to May 2017. We observed 119 patient consultations performed by 11 individual physicians, two nurses, and two medical secretaries at four of the five oncology teams at the Department of Oncology at Copenhagen University Hospital, Herlev, Denmark. In total, we observed the daily work at the oncology department for 138 hours and conducted interviews with nine key stakeholders for a total of 13 hours. Moreover, we observed two training sessions (7.5 hours), where healthcare professionals were introduced to a new hospital information system which was to be implemented at the hospital.

During all of these activities, we gained an in-depth understanding of real-world social processes and technology used during patient consultations and in turn worked towards gaining 'detailed insights into the concepts and premises that underlie' what healthcare professionals do (Forsythe, 1999, p. 129). We used different empirical techniques including formal and informal interviews and

analysis of document sources (Powdermaker, 1966; Wax, 1971; Werner and Schoepfle, 1987), however, we mostly depended upon participatory observations (Blomberg et al., 1993). In our work, we have explored the different workplace activities surrounding patient consultations by focusing on how artifacts and systems feature in daily practice in different ways. Additionally, we explored the nature of collaboration and articulation work (Gerson and Star, 1986; Schmidt and Bannon, 1992; Strauss, 1985), which is pertinent in the work in order to execute patient consultations in an appropriate manner. During this work, we followed physicians before, during, and after patient consultations. This revealed a complex daily practice structured by artifacts, systems, health data, and demanding patient conversations. This work has given us unique insights into the variations that exist in the oncology teams we followed.

In total 4 researchers were involved in the data collection over the course of the study, and results were discussed and validated by one of the physicians at the oncology department. During data collection, data analysis was initiated as an iterative process where ideas were written down and explored in more detail informing both the continued data collection as well as the construction of the theoretical argument. All observation notes, interviews etc. were transcribed, shared, and structured among the researchers both as raw data and as empirical write-ups (Eisenhardt, 1989).

When exploring detailed ideas three of the researchers went through the complete data material to extract important empirical incidents which could help explore identified issues in more details. This analytical process was inspired by grounded theory (Glaser and Strauss, 1967). The different coding strategies allowed us to explore different perspectives and theoretical angles on the empirical data. However, when we did cross-case analysis across the different oncology teams, types of cancer and physicians, a recurrent theme which emerged was the role of variations. Contextual dependent variations across patient consultations became our main analytical take on the data. Thus, we decided to center our analytical process on identified types of variations. It was also in this work that the focus on the dictaphone emerged as a central artifact for the physicians to address and document each patient in unique ways.

### 3.1 The Empirical Setting

#### 3.1.1 Danish Healthcare Sector

The Danish healthcare sector is a complex, public-funded, distributed organization consisting of approximately 54 hospitals, 3510 general practitioners, and 901 specialized medical doctors all servicing around 5.6 million Danish citizens (Herning, 2016). A major challenge for the Danish hospitals has been the large number of different hospital information systems which are in use simultaneously without being able to communicate with each other (Herning, 2011). In 2007, the number of IT systems in use was 27, but by 2013 these systems had been reduced to just 5, however, the 5 remaining IT systems were still reported as being slow, unstable, unreliable, and potentially compromising

patient safety in the Danish media (Seidenfaden, 2013). Consequently, in 2013, the Capital Region and Region Zealand decided in a joint effort to procure one common IT system for their combined 18 hospitals to replace the current hospital information system OPUS including integrated subsystems and paper-based journals.

In a press release from November 2013, it was stated that the two regions had chosen a system and signed a contract worth around DKK 1 billion with the American software company EPIC as the supplier and NNIT, one of the leading IT service providers in Denmark, as the subcontractor (Fribo, 2013). The IT system, with the name 'Sundhedsplatformen', should replace the current 5 IT systems at the 11 hospitals run by the Capital Region and 7 hospitals run by Region Zealand. The implementation of Sundhedsplatformen began at Herlev and Gentofte Hospital and according to the plan all 18 hospitals were to use Sundhedsplatformen by the end of 2017. Sundhedsplatformen comes with the promise of a more effective and coherent healthcare system in the two regions and the overall vision is that this will allow better treatment, fewer errors, less double registrations, and easier transfer of patients and their data across both hospitals and regions (Region Sjælland, 2016).

Our work in this paper reports from our ethnographic work prior to the implementation of Sundhedsplatformen conducted at the Department of Oncology at Copenhagen University Hospital, Herlev (the first hospital to have Sundhedsplatformen implemented). Thus, our work is intended to assist in evaluating the cooperative design of Sundhedsplatformen concerning the support of cancer patient consultations. Additionally, we hope that our classification of variations can be used to identify potential aspects in the system design which could be redesigned after the implementation to ensure that physicians continue to enact important variations for each individual cancer patient consultation.

### 3.1.2 Oncology Department

Copenhagen University Hospital, Herlev services around 425.000 citizens in nine different municipalities. The main hospital building which stands twenty-eight floors high or roughly 120 meters was built in the mid 70'ies. Next to this tower of concrete is an annex four-story high, where the oncology department is located. On the second and fourth floor, the oncology department has their outpatient clinics, where they serve the patients, who are not hospitalized. On the seventeenth floor, the oncology department has their ward, which houses 33 beds and 12 daytime beds, where patients can be referred to for prolonged treatment, daily treatment, such as chemotherapy, and observation (Herlev Hospital, n.d.-a). On the seventeenth floor, next to the ward, the oncology department has another small outpatient clinic with a few consultation rooms.

The Department of Oncology at Copenhagen University Hospital Herlev is one of the largest and most specialized within cancer treatment in Denmark with an approximate 420 employees and 120.000 yearly cancer treatments and consultations, 3.650 patient admissions, 56.450 radiotherapies and 27.200 chemotherapies (Herlev Hospital, n.d.-a; Herlev Hospital, n.d.-b). The staff at the oncology department primarily consists of physicians, nurses, and medical

secretaries, who are divided into five specialized teams: Team GI, Team HT, Team UG, Team MA, and EFEK. Each team are specialized in specific cancer types: Team GI treats patients with cancers of colon/rectum, anus, pancreas, liver and biliary tract; Team HT treats patients with cancers of head and neck, thyroid, lung, and skin (non-melanoma); Team UG treats patients with sarcoma, malignant melanoma, kidney, bladder, gynecologic, and prostate cancer; and finally, Team MA treats patients with breast cancer. The EFEK team is a unit for experimental cancer treatment (a dedicated unit for Phase I and early Phase II trials). The five oncology teams work closely with several other specialized health professionals such as radiologists, nuclear medicine physicians, surgeons, pathologists, social/healthcare workers, physicists, engineers, and bio-analysts. Patients diagnosed with cancer needing additional treatment after surgery or with metastatic disease are referred to the Department of Oncology. Treatment includes radiotherapy, antineoplastic treatment including chemotherapy, targeted therapy, immunotherapy as well as experimental treatment with new medical drugs.

At 8 o'clock during most days the oncology ward conducts their morning meeting with every present physician (up to 80 physicians) across the oncology teams. The meeting usually concerns two main topics. First, there is a report or update of the most significant events from the night shift focusing on the hospitalized patients. Second, there is an open discussion concerning some of the more problematic patients, who will come in during the day. As the meeting ends physicians who are involved with patients that will receive radiotherapy during the day go to another room and have a second meeting discussing those patients, which last approximately 20 minutes. Around 9 o'clock Monday-Friday, the physicians and nurses dispatch to their respective rooms to attend the patient consultations and work tasks of the day.

## 4. Results: Oncology Consultations

### 4.1 Between Interaction, Documentation, and Review

Cancer patients often go through complex and lengthy courses of both diagnosis and treatment spanning from several months, to years, to a lifetime. During their treatment trajectory cancer patients come in contact with numerous medical professionals while attending multiple patient consultations, treatment sessions, and a range of other medical appointments such as physical examinations, blood testing, and various scans.

The patient consultations at the oncology department are where the patients and the physicians *interact* and together decide the treatment options which is based on the patient's health condition including comorbidity, blood test results as well as the status of the disease which is frequently monitored by CT or PET/CT scans. Patient consultations can take place when patients visit the hospital but sometimes also over the phone. The consultation always includes a dialogue between the patient and the physician, and in cases of collocation usually also

includes a physical examination of the patient's body as the below example will demonstrate:

Charles, a 67 years old male patient and his spouse Mary is brought from the waiting room to the consultation room by the physician and the interaction begins. After the initial pleasantries and greetings, the physician initiates the consultation by asking Charles how he is feeling and if he is doing better after the dose reduction of his cancer treatment. Charles explains that he is doing okay but is still experiencing some breathing problems. In consideration to this, the physician decides to stethoscope the lungs. Charles then hands over a piece of paper stating the results of his self-measured blood pressure results to the physician who concludes that the numbers are high compared to the norm but still within expectations of the treatment. The physician measures Charles' blood pressure once more to confirm the results which were just discussed. The physician brings forth a physical paper cross-off schema and begins to ask the patient a series of questions relating to side effects such as if the patient has been experiencing nausea, vomiting, or diarrhea. He writes down the answers on the schema and places it in the paper-based journal. Towards the end of the consultation, they attend practical matters and the physician makes sure Charles is aware of the forthcoming treatment plan, such as the date and time for the next consultation, before finally leaving.

Even though the patient has left the consultation room and the interaction between patient and physician has ended the cancer patient consultation has not ended yet. *Documenting* is an important activity where significant information about the patient is recorded. Physicians will start their documentation *immediately* following the interaction, however, *interruptions* might occur causing them to postpone the documentation for a short period. Documenting after the interaction occurred in all observed patient consultations. During the interaction with the patient the physician gain new insights into the condition of the patient which may prove important and useful later on. It is important to reflect upon and document these insights not only for the physicians themselves but also to ensure the continuation of the patient trajectories across different healthcare professionals who will interact with the patient at other stages.

The third activity of a patient consultation - which actually initiates a patient consultation - is the *review* of already stored information about the patient. Reviewing prior data usually takes place in the minutes leading up to the patient entering the consultation room and entails the physician reading the historic medical information found in the electronic health record combined with the paper-based journal. In our data, we identified several examples where the review activity was initiated much earlier - e.g. the day before or in the morning hours prior to the patient consultations. During the review activity, the physician reviews the available previously documented information on the patient (including blood test results, CT scans, side effects to earlier or ongoing treatment, admission etc.) as part of preparing for the interaction. This preparation is important to ensure that the physician has the required overview of the patient's overall treatment trajectory and distinct medical situation which in turn helps to ensure a professional and well-reasoned interaction. Consequently, it is therefore crucial that the information within the electronic health record and the paper-based journal is contemporary and contain all essential information required to interact with the specific patient concerning their unique situation.

One concrete example of such unique information reviewed prior to the interaction is in the case of Charles and his spouse Mary. While the patient's wife, Mary, is aware that Charles has cancer and is undergoing treatment, Charles has not told her about the severity of his condition and that he is receiving palliative treatment to provide him with pain relief and perhaps expand his life expectancy. Charles has at previous consultations discussed whether he should tell his wife or not – but it is solely his choice to make. Thus, in this situation, it is imperative that the patient's wife is not made aware of his actual medical situation until he so wishes. This was well documented in the patient's electronic health record and the attending physician knew the situation beforehand through her review and, therefore, she was able to safeguard the information and steer the consultation in a professional manner while taking the patient's worries into consideration.

Across all our cases, we identified patient consultations comprised of three interlinked activities: *interacting, documenting, and reviewing* – which could take place either in a collocated or a distributed setting. Finally, it is important to notice that some of the vital information which shapes how the physician chooses to interact with the patient might be contextual extra information such as whether the patient has told his spouse about the severity of the illness or not. Importantly, while information is captured in the documentation of the patient consultation it may be critical that the information is not openly shared during the interaction with patients if they are accompanied by, for example, a relative or friend.

## 4.2 Variations Between Physicians

Across our observations among the different oncology teams, we noticed how important variations exist between physicians, even within the same teams, when conducting patient consultations. We found that variations were based upon aspects such as *seniority, medical specialty, medical knowledge* combined with *general insights and relationship* with a given patient. Further, a somewhat more indirect variation across patient consultations was whether or not a nurse was present to support the interaction. Each of these variations impacted the ways in which the activities review, interaction, and documentation were accomplished.

*Seniority*: Physicians have different types of seniority: senior residents, staff physicians, and chief physicians. Senior residents are younger and less experienced physicians, who are still receiving a medical education. The time required for reviewing the patient's medical information prior to the interaction depends on seniority and experience:

Julia, a senior resident, come to work almost 2 hours before her first patient consultation is scheduled. Julia is a younger physician and is conducting patient consultations at another oncology team than usual. She has therefore deemed it necessary to spend some additional personal time on preparing for her patients of the day. Julia has brought multiple sheets of paper and begins to meticulously go through each patient's electronic health record while writing down notes on a paper. Additionally, Julia has asked a chief physician from the oncology team to go through each patient with her answering any clarifying questions. In total, Julia spends almost 2 hours on reviewing and preparing prior to her first consultation. Additionally, she also spends a couple of minutes between each patient on further reviewing, making sure she is completely ready for the next patient on the list.

In contrast to Julia, other physicians with multiple years of experience spend less time on reviewing, often only a couple of minutes, as they are more accustomed to handling diverse medical situations and treatments. However, the time required for reviews is also affected by the physician's prior knowledge of the patient.

When scheduling patients, healthcare professionals work to ensure that patients meet the same physician over time. Even though it is not always possible patients often interact with the same physician during their treatment course, thus, over time they often gain intimate knowledge about their patient developed over their long-term relationship. This kind of knowledge and insights often reduce the effort and time required for reviewing data prior to interacting with the patient. However, for educational purposes senior residents are regularly moved between the different oncology teams, thus, they often have to interact with diverse cases of different patients which they have no prior knowledge. In such situations, the time required for review is increased. All physicians, regardless of seniority and experience, regularly encounter patients where the demand for reviewing data is high e.g. new patients or patients they have not seen for an extended period of time. Often, physicians perform thorough reviews outside of their official working hours (at home or by coming in early) to ensure high quality and professional interaction during the consultation. Consequently, all physicians experience situations where they are required to spend additional time on reviewing information related to patients than is written within the norms provided by their contracts.

During patient consultations, physicians are sometimes assigned a nurse to support them throughout the day which especially influences the interaction activity. During our observations, we witnessed several occasions where the teamwork between nurses and physicians influenced how the patient consultations were conducted. More specifically, nurses take over tasks that the physicians would otherwise perform on their own as the below example demonstrate:

After reviewing, Laura is now ready to begin her consultations. The assisting nurse goes to the waiting room and picks up the first patient and the interaction begins. The patient, Arnold, is a 71-year old male and he has brought his ex-wife along. During the consultation, Arnold and his ex-wife are in heavy disagreement and Arnold yells a lot about the state of his health. Arnold is very ill and is starting to lose his memory and it seems he is unaware of the severity of his condition. The consultation proceeds and Laura begins a discussion surrounding side effects and the general well-being of Arnold. However, all of a sudden Arnold begins to feel sick and needs to lie down for a moment. He is assisted by the nurse to the bed and the nurse measures his blood pressure and temperature just in case. The numbers look fine and Arnold is brought back to the chair after a few minutes of resting. The consultation is brought to a close after all practicalities have been taken care of and the nurse accompanies Arnold and his ex-wife out.

From reviewing the documentation prior to interacting with Arnold, the physician knew of the tense relationship between the patient and his ex-wife, and that the patient was in a state of denial concerning the severity of his condition. Because of this information, the physician was able to balance the interaction –

supported by the nurse - to ensure it ran as smooth as possible. Information on *social and mental considerations* thus shape the interaction between physician and patient. It is highly important that such information is available and elaborated in the patient's electronic health record in order for the physicians to be properly prepared. Nurses are a rare commodity during patient consultations. However, when they are present nurses play an important role in supporting the interaction between the patient and the physician. In the example with Arnold, the nurse assisted Laura in gaining an overview of the patient prior and during the consultation by sharing her knowledge and expertise and releasing the physician from particular tasks. When the nurse performs the examination of the patient it frees up time for the physician to focus on the dialogue with the patient. As such, when nurses are present during consultations they provide additional resources for the physicians and reduce the 'manual' workload. This is especially important in situations where unknown events happen such as a patient suddenly feeling sick. Nurses assist with tasks such as physical examinations, scheduling, and picking up medicine. The expertise of nurses proves to be extremely valuable when discussing the conditions and health of patients, and long-term experienced nurses are crucial in assisting young and inexperienced physicians.

*Medical specialty:* Observing four different oncology teams, we also identified variations across medical professions within cancer types, such as lung, kidney, rectal, head and neck cancer. Commonalities across the different teams include measuring the patient's blood pressure, temperature, and weight. Different types of cancer require different types of examinations and treatments. In the case of lung cancer, patients were regularly checked with a *stethoscope* during the patient consultation, and in some cases, physicians would also perform a physical examination of potentially enlarged lymph nodes. Patients with kidney cancer usually had a physical examination while lying or sitting on a medical bed. Here the physician examined for enlarged lymph nodes, auscultation of heart and lungs, skin toxicity etc. Patients with rectal and anal cancer were examined with an anoscope lying or sitting on a medical bed. While we did not observe this examination in person, since we left the room to secure patient privacy, it is clear that this type of examination is quite intrusive and requires time for the patient and physician to prepare. The most consistent examination we observed was for head and neck cancer patients. Patients with head and neck cancer require examination of their mouth and throat which is done by the physician examining for enlarged lymph nodes of the head and neck looking for abnormalities in the mouth and using an endoscope

Each cancer type also has different treatments. Lung cancer patients can be treated with radiotherapy, immunotherapy, and chemotherapy. The most common treatment option for kidney cancer is targeted therapy with tyrosine kinase inhibitors and in some cases immunotherapy. Head and neck cancer patients are mainly treated with concomitant radiotherapy and chemotherapy. Clearly, important variations exist depending upon the type of cancer. Different types of examinations require different types of specialized equipment which shapes the interaction with the patient as well as what needs to be documented.

In this subsection, we have identified how important variations in patient consultations are caused by differences in seniority, medical specialty, and equipment, as well as the knowledge which healthcare professionals (nurses and physicians) share about the patient.

### 4.3 Variations Between Patients

No two patients treated at the oncology department are alike and even subtle differences are important to take into account and may shape the patient trajectory.

Below we illustrate the subtle differences between two patients: Lisa and Carl. The data show how patients diagnosed with cancer may react differently, thus shaping the interaction between the physician and the patient. Being diagnosed with cancer often comes as a shock for the patient as it has a huge impact on their immediate life situation.

Lisa, age 72, has just received her cancer diagnosis and is arriving for her first consultation. For the consultation, Lisa is accompanied by her daughter, Elaine. Patients commonly bring their spouses, family members, or friends to consultations and they often participate in the conversation with the physician by assisting with observations, details, or questions. Lisa has just been diagnosed with metastatic lung cancer and the consultation is an initial meeting where the physician outlines treatment options and expectancies while also listing formal medical procedures and requirements. Lisa is quite confused as she has recently been committed to three different hospitals and received several letters and phone calls in regards to her diagnosis before attending the consultation today. The physician discusses with Lisa concerning her physical condition, how she is currently experiencing pain and fatigue, and toward her daily routines and diet. The physician tells Lisa that she needs to undergo chemotherapy and explains in detail about her diagnosis, the procedure, possible side effects while undergoing such treatment, and the expected outcome. Lisa and her daughter are appalled when they hear the cancer has spread into her lungs, bones, and liver and that the chemotherapy most probably will only slow down the cancer a few months or perhaps a year at most. The final part of the consultation revolves around the patient and her daughter seeking hope in a possible remedy or by alternative treatment options should the chemotherapy prove futile. The physician emphasizes that even though the chances look grim one should never give up hope as there is always the odd chance of success or that cancer research may find a new treatment method in time. Lisa decides to commit to the hospital and begin chemotherapy.

Lisa is a new patient, and the patient consultation is a difficult meeting. The facts about Lisa's conditions are impacting her life in serious ways. New patients, like Lisa, require dedicated attention from physicians whose job is to explain the details of the diagnosis including the possibly devastating consequences it may have on the *physical, mental, and social* situation of the patient. When diagnosed with metastatic cancer patients may enter a long-term treatment trajectory and they need information about what is going to happen, in what order, why, and the potential results and side-effects of the treatment. Treatment of cancer does not just happen at the clinic. Patients often attend to additional activities in-between planned consultations. Supporting patients in grasping the severity of their condition physicians inquire the patient to express their experience from the first suspicion of cancer to being formally diagnosed with cancer. This articulation is

important to fully comprehend the situation from the perspective of the patient. Moreover, it is important as background information for treatment and for planning the future interaction with the patient. New cancer patients must be introduced to administrative and medical information as an important part of the forthcoming treatment trajectory includes their ability to understand and make decisions surrounding e.g. treatment options and choice of hospital.

While Denmark has universal healthcare and patients diagnosed with cancer get their treatment from the public healthcare sector, at a predefined hospital, specific needs might mean that it makes more sense for the patient to continue treatment at a different hospital for example due to prior ailments or transportation concerns. Furthermore, treatment, blood samples, CT-scans, and follow-up appointments for each patient often take place at different departments, hospitals, or through the patient's general practitioner office. Cancer treatment is a *collaborative* activity involving many actors situated at different geographical locations, thus, important articulation work is required to ensure that treatment and activities are aligned with the governmental regulations of cancer pathways (Møller and Bjørn, 2011) to ensure that treatment trajectories are managed correctly.

While Lisa's physician is the main coordinator of her treatment Lisa also plays an important role since she is at the center of the treatment and is the only person who will be involved in the complete set of activities. To facilitate the patient in fulfilling her role the physician inquires information about the patient's physical status to better decide on what medical path to pursue, what medicine to prescribe, and what advice to give. Attentive dialogue is always crucial in the situation of cancer patients. However, there are two types of patient consultations where the attentive and serious dialogue is particularly important. Across all our cases, we found that the toughest dialogues took place during the initial meeting with new patients as well as in cases where the patient's disease had progressed to an incurable state or the patient was not responding well to treatment.

Looking across our observations, we saw a pattern in the attentive dialogue. Initially, the focus is on the status of the cancer and appropriate treatments then it moves towards a dialogue about patients' bewilderment, frustration, and grief derived from being diagnosed with cancer. This was especially evident for cancer types where the prognosis for survival was low. Especially lung and kidney cancer patients have a poor prognosis and the majority of patients are receiving palliative treatment. In such situations, physicians do not only consider medical facts, instead, they accommodate their responses to the patient's reaction to the difficult news about their medical conditions and the effect this information have for both the patient, their family, and friends. Generally, physicians spend important time to inspire, comfort, and help with acceptance toward a patient's radical life-changing situation.

The interaction between physicians and patients is thus not only focused on measurable medical facts, acquiring health information, and making medical treatment choices, it also encompasses the mental and social bearing of the patients and their relatives. Finally, it is important to notice that Lisa's daughter played an active role during the consultation, thus, it was important for the

physician to include her in the dialogue. As Lisa had just been diagnosed with metastatic lung cancer involving lungs, liver, and bones, the physician was focused on explaining the diagnosis, the treatment, and surrounding practicalities. Importantly, the physician attuned to Lisa and her daughter to explain the new reality with short life expectancy while advising her not to surrender herself to dismay even though she was at risk of only a few months or perhaps a year left to live depending upon the response to treatment and side effects.

It is not only the immediate health status of a cancer patient that affects the interaction with the patient. Patient consultations can also be affected by a patient's actual physical situation, such as having a handicap or disability. To illustrate this let us turn to the story of Carl:

When Carl enters the consultation room he is in a wheelchair and has just been diagnosed with head and neck cancer. The patient and his spouse are both deaf and mute and are accompanied by a sign language interpreter. The physician explains that Carl needs radiotherapy and asks whether Carl is currently taking any medication. Carl explains, and the interpreter translates, that he does not take medication. The physician physically examines Carl's head, neck, and throat. Carl has numerous tumors spread around his neck. The physician then checks Carl's mouth and throat with an endoscope. The physician asks whether Carl smokes cigarettes since radiotherapy is more efficient on non-smoking patients. Carl explains, and the interpreter translates, that he will stop smoking, however, his wife interferes and states that she finds it very unlikely that Carl will stop smoking. Again, the interpreter translates the wife's statement. The physician suggests that Carl begins using nicotine patches. Carl, his wife, and the physician then discuss, aided by the translator, diet considerations. The physician suggests that Carl gets a food probe surgically inserted since he already has problems eating solid food — he mainly eats protein shakes — and it will only get worse with the radiotherapy. The physician explains in details how radiotherapy works and how to proceed. Carl is expected to receive treatment six times a week for a total of thirty-three treatments. Carl will expect to endure short and long-term side effects alongside the treatment. Finally, they arrange for a new consultation where another specialized physician in head and neck cancer will also attend by conference call from another hospital to discuss Carl's situation and possible treatment options.

In the case of Carl, the physician is dependent on communicating with the patient and his spouse through the hired intermediary. This increases the complexities of the discussions since the translator does not know Carl or his wife in advance and thus continues repeating questions and asking sub-questions to get more details. Further, having the attentive and serious dialogue concerning the disease and treatment is made increasingly difficult in such setups. It is not uncommon that patients are unable to talk directly with the physicians since patients might have a speech impairment or are too physically or mentally strained to communicate or remember clearly. Not all these patients have hired intermediaries; instead, relatives or friends often take the role as intermediary. During such interactions, the physician often needs to ask additional questions to get to the information that concerns the patient's physical, social, and mental status, since it is near impossible to address the patient directly. Patients, already engaged in a treatment trajectory may experience radical changes to their physical condition and some may endure physical impairment during the course of treatment while others may experience mental problems such as depression due to

the progression of their cancer. All these additional concerns are important and directly affect planned treatment and prescribed medicine.

Finding ways to overcome extra challenges of communication are crucial since the physical examination of patients may grant important insight into the actual status of patients but crucial follow-up questions are important to fully interpret what is evident during the physical examination. These questions may create a dialogue which facilitates the physician and the patient to address possible problems and concerns in relation to the patient's physical and social well-being. Physical impairment caused by cancer or the treatment may also affect the everyday habits and routines of patients such as eating, drinking, or smoking. For example, an essential concern is set on helping patients to maintain an adequate daily appetite and thirst since they may otherwise become too weak to endure the cancer treatment. The daily consumption of food and drink are extremely important factors for the success of treating cancer patients and have proven to be an essential topic during patient consultations across oncology teams and between physicians.

It is essential that patients understand their own treatment trajectory. Numerous factors may change during the treatment trajectory such as the treatment scope, prescribed medicine, and the adjustment of treatment in relation to side effects, the purpose of treatment (palliative or curative) and response to therapy. Also, there are many practical tasks to orchestrate around living with cancer, such as when to receive treatment, have blood samples drawn, scans done, restocking on prescribed medicine, or other medical supplies in-between appointed consultations. All this information and scheduling may quickly become complex and strenuous for patients in addition to enduring ongoing treatment and possible side effects. Seemingly it is necessary that patients have a strong network of people who can help them cope with all these coordination tasks. If they are not capable to do so the physician will assist the patient in organizing transportation or a palliative unit who checks up on the patient regularly. However, all such decisions are discussed at the patient consultation and the outcome greatly depends on the social network around patients and their mental and physical endurance. All these aspects are important to document and are not easily captured outside descriptive data.

In this subsection, we have illustrated the individuality of each patient related to social, mental, and physical constraints impacting patient consultations. Moreover, we have shown how conversations physicians have with their patients often are difficult and require both time and involvement from the physicians. No matter how prepared the physicians might be for a patient consultation something new or an unfolding event might impact the interaction.

#### 4.4 Dictaphone Allows for Variation in Documentation

Comparing across all our observations of patient consultations at the oncology department we found that each and every interaction is a unique encounter that depends upon the combinations of physicians' seniority, expertise, and knowledge about the patient; the patients' cancer type, social, physical, and

mental condition; and the type of consultation (bad news, good news, or status quo) and who are present (nurses, spouse, family etc.). Moreover, it is evident that each interaction with the patient is directly impacted by the insights and knowledge which the physician was able to gain prior to the interaction from reviewing already stored health data concerning the patient. Thus, the quality of the documented data is crucial for the patient consultations. Let us take a closer look at how the data from the patient consultations are documented.

After each interaction with the patient (by phone or in person) the physician spends time alone in the consultation room documenting using a dictaphone. Observing this process, it became evident that documentation is not simply about recording facts but instead includes a medical reasoning process by which the physician makes sense of the current situation through reflection. The physician uses a digital audio dictation tool, to create an audio recording, which is then digitally sent to the medical secretaries. Physicians do not dictate the entire interaction instead they sort and choose relevant information based on their medical knowledge and knowledge about the patient. As such, the information which each physician decides to include in the documentation varies between physicians. During the audio recording, the physician often pauses the recording while looking for information in the patient's paper-based journal and electronic health record. This part of the documentation process is about connecting newly gained insights to the broader context of the patient and their specific medical situation. The physician then documents important aspects which are deemed significant for the treatment trajectory. While each situation is unique, there is still a sequential pattern within the ways the physician document – a script to ensure that they do not forget important information.

The audio recording starts by the physician recalling the facts about the patient, such as age, diagnosis, type of treatment, number of treatments, and the reason for the patient consultation (new patient, evaluating the treatment response (scan results), or prescription of treatment). This is followed by a description of the patient's symptoms as described to the physician during the interaction but in the physician's own words. Next is the patient's current condition which includes observations and physical examination (blood pressure, temperature, weight, skin color, auscultation etc.), The important distinction between patient symptoms and current condition is that while the former is subjective, the latter is based upon objective medical observations. This is followed by a paraclinical description of the test results from the examinations of the patient done outside the oncology department and includes the results of blood tests, scans, urine sampling, etc. The next part of the audio recording is the reflection and argumentation for medical treatment and decisions. This is the part of the documentation which is the most critical and requires medical reasoning where the physician will combine the different types of observations like, "results from scans, blood tests, and current condition all point towards the treatment decision – continue treatment/change treatment". Finally, the audio recordings will include a coordination element where the physician will list the kind of tasks which the medical secretary is going to do. The coordination will be dictated as, "Recipe: Schedule visits forward every 4 week; Recipe: CT scan of thorax+abdomen in week 1; Recipe: Creatinine (blood work) before scan; Recipe: journal from the hospital". For each time the physician says 'recipe' it means that the following sentence describes a concrete activity to be done by the medical secretaries which include ordering scans, medication, and treatment as well as scheduling activities or collecting information from elsewhere.

The time it takes to record an audio dictation depends upon the physician's intimate knowledge of the patient and their treatment trajectory as well as the complexity in reflecting and explaining the argument for the medical decision. Most physicians spend between 5-10 minutes on the dictation and sometimes even longer as the process also involves making sense of the patient's situation and planning medical actions. The somewhat flexible nature of the audio recording allows the physicians to focus on and decide which information to include in the journal note. Additionally, when the documentation is done, using the digital audio dictation tool, it is automatically sent to the medical secretaries. It is then the job of the medical secretaries to transcribe the audio recordings, attach the documentation to the electronic patient record as a new journal note entry, and initiate all the treatment tasks mentioned after each 'recipe'.

During all our observations, we encountered very few situations where 'recipe' was *not* used. This was almost only in cases where treatment had ended and the patient was there for a follow-up consultation. We also encountered a few situations where physicians would physically go to the medical secretary and deliver the task verbally. For example, if something came up after the dictation was made. This means that the audio recording is not only used for documentation but also as a coordination tool between the healthcare professionals allowing them to distribute tasks between each other in an asynchronous way without collocation. It is during the documentation part of the patient consultation that the patient's electronic health record and paper-based journal is updated by the physician. It is also through the audio recording that medical secretaries are made aware of various practical tasks such as ordering a new consultation time, medical scan, or blood test. Part of the documentation also entails making prescriptions for both cancer and non-cancer medicine through the relevant digital medication IT-systems.

It is important to notice that the task of the medical secretaries is not only to transcribe the audio recordings they also ensure that each physician is allowed flexibility when documenting as they ensure that there is a common structure across the ways in which documentation is done within the electronic system. During our observations, it became clear how physicians were not forced to follow a specific structure in their dictation, to provide them with flexibility, when reflecting upon a patient's medical situation during the documentation process. Even though there existed common agreements on how to structure the medical journal, i.e. beginning with 'since last time', then 'objective', and ending with 'plan', many physicians did not necessarily dictate by this order. This was especially apparent for physicians with long medical careers as they had adapted their own preferred method over the years. When transcribing audio dictations, the medical secretaries structured the journal notes in alignment with the Danish medical standard for patient journals which describes what to include in a patient journal note (Sundhedsstyrelsen, 2006). The medical secretaries apply a structure, common vocabulary, and script to the journal notes which ensure easier interpretation toward future reviews, when the patient returns for the next appointment. Furthermore, medical secretaries proved to be safeguards by ensuring that all necessary health data had been included else they would prompt

relevant physicians for the missing data and include this into the patient journals. While transcribing dictations medical secretaries routinely highlighted specific words or phrases so essential information could quickly be located and assessed by physicians when reviewing the journal notes.

Finally, by combining documentation and coordination within the use of the audio recording tool the healthcare professionals also reduce the effort of articulation work. Documenting the reflections and argumentation for medical reasoning is closely connected with the types of initiatives and tasks to be done, thus, by connecting the two activities within the same tool the time to coordinate between the physician and the medical secretary is reduced.

## 5. Discussion

Oncology patient consultations produce and use health data during the activities of review, interaction, and documentation. Unpacking patient consultations as these three interlinked activities expand our perspective on health data production and use. While the review and document activity is mainly located before and after a physician interacts with a patient they may also occur during the interaction depending on the patient's situation such as the occurrence of new information or possible questions. Notably, the three activities are interdependent; *if data is not documented it cannot be reviewed, if data cannot be reviewed it may not play a part in the interaction*. Previous research has discussed the review, interaction, and document activities as separate entities (Berg, 1996; Bansler et al., 2011; Bansler et al., 2016; Hertzum and Simonsen, 2010; Mønsted et al., 2011; Chen et al., 2011). Our work shows that there are two distinct sources generating health data during the interaction activity, namely examination and dialogue. Exactly how physicians examine a patient depends on their medical specialty, medical protocol, the type of cancer, and the general physical status of the patient. In producing these health data, a variety of medical equipment is used such as nose probes, pulse readers, or physicians physically examining their patients. A physician may examine a patient due to previously reviewed data, medical routines, or due to the patient having experienced irregularities which emerges from the dialogue. The attentive dialogue is crucial when interacting with cancer patients since physicians must help their patients to relax and feel secure while asking for medical details or explaining medical considerations and findings. Medical details often introduce increased stress upon the patient since it includes informing patients about their disease and prognosis. Physicians do not only focus on treating cancer by prescribing or adjusting doses of medicine. Instead, physicians include and take into consideration the social, mental, and physical well-being of the patients.

Previous work has pointed to the importance of socio-psycho-emotional information (Chen et al., 2011) as well as the sentimental work involved in medical work for chronic illness (Strauss et al 1985). Sentimental work is critical because the 'object' of concern is alive and reacting to the illness with anxiety, fear, panic, or depression and to the medical treatment, which "can

frighten, wound sensibilities, and even threaten self-esteem (Ibid, p. 129).” Our study confirms the importance of sentimental work by demonstrating how the trajectory of cancer treatment is not *only* determined by the effects of medicine or necessarily by the tumors’ response to therapy; it is also related to the *contextual contingencies* (Bjørn et al., 2009) such as the social and mental state of the cancer patients which are not so easily monitored nor captured by standardized factual documentation. These contextual contingencies are especially attended to during the attentive dialogue. The social situation of patients play a crucial part when enduring and coordinating cancer treatment; e.g. depressions or mental impairments directly impact important considerations for prescription and planning treatment surrounding patients’ chronic illnesses (Corbin and Strauss, 1991; Strauss et al., 1985). Some patients may experience depressions or the lack of will to withstand months of treatment sessions, especially if there is no cure in sight, which in turn affect the medical decision-making. The physical, social, and mental bearing surrounding patients are all critical factors which physicians prioritize to investigate when interacting with patients. These circumstantial areas are considered for later interpretation while reflecting upon the patient during dictation and creating the audio recordings.

Patient consultations with cancer patients are both *temporal* and *directional*. Thus, the ability to qualitatively capture and support the documentation activity is accomplished by the cooperative engagement between the physician and the medical secretary mediated by the dictaphone. It is a challenge to fully understand all the complexities and many interdependencies that exist within clinical work practices (Reidl et al., 2008; Silsand and Ellingsen, 2016; Reddy and Jensen, 2008). When we examine the treatment of cancer patients we find that treatment does not only take place during the patient interaction. Instead, the treatment trajectory can be conceptually understood as multiple strings of encounters in-between treatment and test sessions where physicians together with the patient examine the condition at a different time while trimming and navigating patients’ trajectories directionally toward the best possible outcome.

Throughout their treatment trajectory, cancer patients may consult different physicians, visit different medical departments or hospitals, as well as encounter multiple medical professionals such as nurses and general practitioners. The patient’s trajectory is shaped during all these encounters which place a special demand on the availability, detail, and quality of the health data collected from each patient interaction to the next (Cicourel, 1990; Corbin and Strauss, 1991; Strauss et al., 1985). Thus, the quality of documentation is essential since it directly impacts the ways in which physicians are able to review past medical history and interact with patients accordingly. In turn, we see a crucial demand towards the design of hospital information systems supporting physicians in their consultation work (Jensen and Aanestad, 2006; Reidl et al., 2008; Zhou et al., 2011). This is a difficult task, as already documented by previous work, which shows how especially the medical record inadequately support medical work (Bardram, 2004; Zhou et al., 2012). Physicians do not only review past health data to plan or confirm a course of treatment, physicians also act upon reviewed data by confronting patients with their findings during the interaction and from

these interactions they may draw new conclusions or considerations which shapes the patient's treatment trajectory.

Patient consultations with cancer patients also produce and use measurable data. Important sources of patient health data are quantifiable and readily measurable such as medicine doses, blood values, or pulse ratings. These data are created in various places both prior to and during the patient interaction. Often measurable data in the form of blood samples is done prior to the interaction where tests and analysis are done at labs inside or outside the hospital. Thus, it is not the blood samples which is used during the interaction, instead, it is the results of the analysis which shape the decisions. While measurable data is important, then equally so is descriptive data. Descriptive health data is the physicians' interpretations of examinations, blood work, and medical images, as well as other concerns about patient's appetite, social, or mental state. Often the medical interpretation changes the cause of treatment for a cancer patient because the patient's well-being is of utmost importance, especially during palliative treatment. Medical reasoning and argumentation are captured by the descriptive data recorded by the dictaphone and transcribed by the medical secretaries.

While both measurable and descriptive data are equally important when physicians evaluate and attend patients they place different requirements for how they are produced, interpreted, and documented. Measurable data is often more easily translated, standardized, and subsequently included into IT system designs (Bjørn et al., 2009) whereas descriptive data is more elusive, situational, and difficult to capture by preset standards (Møller and Bjørn, 2011) and thus need more attention from physicians when translated and documented for later use. Prior work point to how descriptive data is typically documented in journal notes (Bansler et al., 2016), where physicians are able to include and elaborate on numerous and differentiated sources of health data to capture the patient trajectory. Often data produced today is more relevant in the future and potentially for other practitioners than the person producing it. Further, in the case of cancer patients, the descriptive health data is critically important since it is difficult to capture socio-emotional data in other ways. When evaluating or designing hospital information systems we must consider the capability to both produce, interpret, and document descriptive health data for oncology patients in useful ways.

Patient consultations with cancer patients have unique characteristics which make standardized documentation challenging. It is important to notice that physicians readily agree to disagree upon what is deemed important to document, the level of descriptiveness, and on the detail inpatient journal notes. So, how does the oncology department manage to standardize documentation of such diverse activities? Our empirical data point to how standards within documentation are achieved by the dictaphone as a digital tool which serves as the cooperative link between the physicians and the medical secretaries. It is the use of the dictation, as a main cooperative tool, which relates and connects two important activities simultaneously: namely documentation and coordination. The dictaphone serves as an audio recording where the medical secretaries are able to know which kind of medical data about the patient to transcribe – and thus

support documentation. However, even more importantly, the documentation is directly connected to the coordination of future activities for treatment. Thus, the medical secretaries are able to, based upon the same audio recording, to ordinate, plan, and initiate treatment, medicine, scans, social workers etc. The physician can both document and coordinate simultaneously by utilizing the open-endedness of the dictaphone and it is accomplished by the small language construct 'recipe'. Each time the physician says 'recipe' the following sentence is a coordinative task. In this way, the coordinative tasks can be seamlessly integrated with the medical reflection and documentation by the physician – and then carefully be pulled apart by the secretary, who ensure that health data are typed into the right places in the digital system and the right treatment activities are initiated at the right times.

The use of the dictaphone allows physicians the flexibility required when documenting complex cases – and it is the medical secretaries who then afterward ensure that medical information follows the prescribed national standards. In this way, our work confirms earlier CSCW research that the role of medical secretaries is crucial in accomplishing hospital work (Møller and Bjørn, 2011; Møller and Vikkelsø, 2012) and that this is possible through the use of the dictaphone. At the oncology department, medical secretaries ensure that detailed standardized health data is populated in the electronic records both in terms of measurable and descriptive data and that the quality of the documented health data is high since the medical secretaries also act as an extra layer of quality assurance catching potential errors made during the audio recordings. The dictaphone thus serves as a coordinative artifact between physicians and medical secretaries which ensure both documentation quality and administrative tasks (ordering medications, transportations, treatment etc.) are accomplished.

## 6. Conclusion

Initially, we asked: What are the types of variations which shape oncology patient consultations and how does the organization of work and cooperative technologies allow the physician to enact flexibility and treat each patient uniquely? We found that the type of variations, which shape oncology patient consultations, includes physician seniority, experiences, and prior knowledge about the patient in combination with patient variations such as the social, emotional, mental, and medical condition. Additionally, all these variations get entangled with the different types of examinations that are required including equipment and who (nurses, family member, spouse etc.) is present at the interaction. Through our observations, we found that each physician work to ensure that every patient is met and addressed as a unique case by taking into account all the potential variations which might be pertinent.

So, how does the organization of work and technologies afford the physicians in enacting flexibility and treating each patient uniquely? Our empirical data demonstrate that the dictaphone acts as a key artifact and enable the physician in documenting and coordinating simultaneously while taking the unique situation

of the patient into account. A unique situation, which includes both the socio-emotional state (Zhou et al., 2010), but also the range of other variables, that are involved in reviewing, interacting, documenting patient consultations. Further, applying the dictaphone as the key artifact to coordinate the work of both documentation of what has been done in the past and future tasks to be done - it mediates the work between the physicians and the medical secretaries. Finally, this mediation of work, accomplished by the use of the dictaphone, takes place after the patient have left the room which allows for the physician to not only document past activities and plan for future activities – but also in providing a reflective space for the physician to consider the overall situation of the patient (including socio-emotional situations as well as other factors) in detail.

The sequential ordering of review, interaction, and documentation serve as an important structure which allows the physician to make sense of the historic and current medical state (Bansler et al., 2016) prior to seeing the patient and afterward to decide what serves as important information for documentation. Documentation is not only about capturing data about the patient but includes physician's reflective considerations.

What have we learned about hospital information systems from this case of oncology patient consultations? Firstly, we have explored a patient group where allowing for variations is critical for the treatment (compared to medical specialties like orthopedic, where the differences in treatment of e.g. a broken wrist are minimal). We found that within oncology as a medical domain, where variations are pertinent and important for treatment, the fundamental nature of the work includes the need for *sequential* structure between patient interaction and documentation. As such, documenting health data in *parallel* with interacting with the patient would seriously decrease the possibility of medical reflection and reasoning while potentially damaging the patient-physician confidentiality which is crucial in cases of severe illness. Further, we found that by sequentially ordering interaction and documentation, as two separate sub-activities, the dictaphone was applied as the coordinative artifact facilitating cooperation between the physician and medical secretaries. The dictaphone made it possible for the physicians to connect and relate documentation of health data engaging in medical reflection *while* simultaneously planning and coordinating future activities of treatment shaping the overall patient trajectory. While the dictaphone allowed for variation across physicians when documenting the medical secretaries ensured that the health data was standardized within the medical record since they would structure it, according to national guidelines, as well as initiate the medical tasks ordained by the physicians. Thus, the dictaphone made important connections between documentation of health data and coordination of patient treatment in unique ways while taking potential variations into account.

These insights are important if we are to consider the criticism which has arrived after the implementation of the new hospital information system which removed the dictaphone as a coordinative artifact as well as introduced a new organizational structure where documentation and interaction were assumed to be accomplished in parallel with the patient. Thus, by unpacking the nature of the work as it was accomplished prior to the implementation we gain important

insights which can help us to understand potential challenges for the design and implementation of new hospital information systems.

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