COMPETING LINES OF ACTION: A SOCIOLINGUISTIC APPROACH TO THE HUMAN-COMPUTER INTERFACE IN DOCTORS' CONSULTATIONS

by

Abdesalam Soudi

Bachelor of Arts, Ibn Zohr University, 1994

CEC, Mohammed V University, 1995-1996

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This dissertation was presented

by

Abdesalam Soudi

It was defended on

November 13, 2013

and approved by

Jeannette South-Paul, MD, Andrew W. Mathieson UPMC Professor

Department of Family Medicine, University of Pittsburgh School of Medicine

Barbara Johnstone, PhD, Professor, Department of English, Carnegie Mellon University

Yasuhiro Shirai, PhD, Professor, Department of Linguistics, University of Pittsburgh

Committee Chair: Scott Kiesling, PhD, Associate Professor, Department of Linguistics, University of Pittsburgh

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Abdesalam Soudi, PhD

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As computers continue to infiltrate medical practice, it is important to understand the impact of technology on the medical interview. In this dissertation, I examined the effect of computer use on doctor-patient conversation to understand how physicians manage competition over their attention by the computer and the patient.

By video recording patient-physician interactions, I was able to describe how the computer, like the physician or patient, participates actively in the medical interview. The computer shapes the interview design, as its onscreen prompts dictate forthcoming courses of action. Thus the needs of the electronic patient listed onscreen and those of patient in-person overlap and at times even clash. The responsibility to coordinate this three-way interaction mostly falls on the physician, who has to manage expectations from both the patient and the computer. The situation is also difficult for patients because while they are participants and invited players in the conversation, they do not have access to computer's turns.

Physicians managed this competition through gaze, verbal resources such as 'onscreen commentary,' physical orientation, or a combination of all of these strategies. Physicians turned their head between computer and patient while sustaining involvement with the other. They kept their lower bodies in line with the computer to communicate engagement with it, and used their head, torso, and gaze to engage with the patient simultaneously but temporarily. The practice of narrating what the physician sees on the computer monitor – what I call onscreen commentary –

may help physicians draw imaginary 'fences' to protect their interaction with the computer and emphasize the patient’s by-stander or ‘on hold’ status. Onscreen commentary also affords patients’ access into what physicians are doing on the computer. The arrangements around the computer which are negotiated between patients and doctors lead to various generic organizations that result in various participation frameworks.

I have described the challenges associated with interviewing the patient while using the computer. Insights from this research can be used to support the meaningful use of health information technology and provide a framework for improving the use of computers in the medical interview.

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LIST OF ABBREVIATIONS

CA: Conversation Analysis

CC: Chief Complaint

CDR: Clinical Data Repository

DGAP: Doctor gazing at patient

DGAC: Doctor gazing at computer

DGAWP: Doctor gazing away from patient

DGAWC: Doctor gazing away from computer

Dr: Doctor

e-patient: Electronic Patient

EHRs: Electronic Health Records

HP: Home Position

HPI: History of Present Illness

MD: Medical Doctor

MG: Mutual gaze

OSC: Onscreen Commentary

PC: Personal Computer

PGAD: Patient gazing at doctor

Pt: Patient

UPMC: University of Pittsburgh Medical Center

PREFACE

I would like to express my utmost gratitude to my parents for raising me and my eight siblings in a village in Morocco. Being the youngest of the family, many of my older siblings were also like parents to me. Village life growing up was very different from my life now: we studied by candle-light, and traveled to a nearby small town for market day on Thursdays and occasional peeks into urban life. I learned how to read and write in my village's mosque; a house built of clay surrounded by pepper and Argan trees, situated at the village's corner. At the very beginning, my learning was based off oral literature and the Koran. Every day I memorized a surah, or small chapter, of the Koran. I would arrive in the morning (assuming I wasn't rebelliously hiding in a tree playing truant) and grab my little thin rectangular wooden board (called a louha), which would have a verse written on it in ink. I would read the piece aloud over and over while tracing the writing with a wooden piece that looked like a pen (lkarraj). As the inked script disappeared with all the scratching, I memorize the section. The imam was often busy in other corners of the mosque but ordered us intermittently to keep reading aloud. At the end of the day we had to recite what we had memorized and clean the louha very well before going home.

It has been a long journey from that little mosque in my village in Morocco to where I am today in the Cathedral of Learning at the University of Pittsburgh. I had a rich and diverse sociolinguistic background growing up, and this led to an interest in examining human language.

The lectures on sociolinguistics by Dr. Scott Kiesling gave me tools to not only appreciate and describe the richness and intricacies of my background, but discover even more about my language socialization and cultural development. This sociolinguistic learning enabled me to reflect on my experiences growing up in a diglossic community, overwhelmed by the pool of linguistic choices afforded to me. Sociolinguistics prepared me also to explore the human-computer interface in doctors' consultations.

I never imagined that one day I would research how American physicians converse with both patients and computers; growing up, my mother took care of me with herbal medicines. As a language coordinator at the University of Pittsburgh Medical Center, I was however, touched by patients' stories and the all miscommunication I witnessed on a daily basis. The work I did with Dr. Jeannette South-Paul on cultural competency in health care also helped me develop a strong interest in doctor-patient interaction. Thus, despite my own inexperience in medicine and technology, I became interested in the doctor-patient conversation, which eventually led to the production of this work.

I would like now to take this opportunity to thank several people who have helped me on this research journey. Dr. Scott Kiesling, my committee chair, opened the door to the cathedral of learning and offered me a chance to learn and grow in the area of Linguistics. I met Scott for the first time in 2005 through my previous Professor Dr. Christina Paulston. I would like to thank him for teaching me how to analyze and appreciate talk as a basic and constitutive feature of human social life. He also taught me to become a researcher. I truly appreciate his guidance and all his advice, and his extensive expertise in sociolinguistics. Scott has directed my learning and allowed me to explore several new areas in Linguistics without interruption. He never questioned

my academic plans, and I appreciate his confidence in me. I truly thank him for years of friendship and his ongoing support.

Dr. Jeannette South-Paul was an amazing friend, colleague, and mentor before she became a dissertation committee member. A mutual friend, Dr. Monique Higginbotham, knew about Jeannette's interests in culture and language in healthcare and connected us in 2004. Jeannette contributed in significant ways to my learning, especially in regards to cultural competency and communication in healthcare. She has advocated for my work and has enabled opportunities for me to share my expertise in linguistics in the medical field. In the spring of 2014, we will be teaching a master's level course on cultural competence in education and practice for the fifth time. We continue to teach several courses for fourth year medical students as well as monthly rotations on the same topic. Jeanette assisted me in finding the perfect location for my research and directed my research to several practical problems that physicians face in today's clinic. Her clinical insights and passion for her work have been very inspiring.

Dr. Barbara Johnstone has been an amazing source of learning as well about Sociolinguistics and discourse analysis. I appreciate her kind and continued attention to my work. Barbara has always reminded me how important my work was; this kept me very motivated. I met Barbara in the spring of 2007 when I joined the SMILE group (Social Meaning in Language). Since then I have attended these meetings weekly during fall and springs terms. I feel very lucky to be part of this amazing setting where we enjoy parsing linguistics materials that would otherwise be difficult to read on our own. These meetings afforded me several opportunities to learn from both Barbara and Scott and engage in weekly discussion. It also gave me a chance to discuss my research. I appreciate Barbara's support and her constant availability to discuss my work. The work Barbara and Scott do on Pittsburghese today continues to inspire me and urge me to reflect on my daily linguistic practices, and has also raised my awareness of the status of my own dialect in Morocco.

Dr. Yas Shirai has taught me about usage based grammar, which connects in many ways to the conversation analysis approach I adopted in this work. His contributions, in particular his comment about hybrid technology (which is discussed in the conclusion) was very helpful. Yas has also invited me to talk about my research with his undergraduates. Having a variety of forums in which to share my work has helped to strengthen my research. His encouragement and insights have been vital to my understanding of this research and my professional role in academia.

I feel very honored and privileged to have been able to work with Scott, Jeannette, Barbara and Yas. I also extend my thanks to the many people who have helped make this research a reality: all the participants (physicians and patients), the staff at the Shadyside Family Health Center, Dr. Seth Rubin, Dr. Jack Anon, Mr. Mark Valenti, UPMC eRecords council. Also, I owe debt of gratitude to the faculty and staff of the linguistics department and the dean's office, in particular, Allison Thompson, Connie Anne Markiw, Pat Cochran, Irene Wright, Susan Merriman, Philippa K. Carter, and Lisa Kubick for their help and support throughout this process. I would also like to thank the family medicine department staff, particularly, Terri Lyn Greene. In addition I would like to thank the members of SMILE, and the CA community in UCSB and UCLA. My two outside experts, Dr. Chuck Goodwin, and Dr. Barbara Fox, have shared their time and long distance advice.

Special thanks go to all my amazing friends who have kept me great company throughout this time: Socrates Demetriades, Mohamed Sharaf, Jamal Arif, Panickos Neophytou, Matt Wood, Jordann Siri Wood, Shelome Gooden, Sheikh Atef Mahgoub, Claude Mauk, Brian Brubaker, Fawn Draucker, Hamza Halaba , Jamie Hudzik, Rasha Al Hashimi and her family, Suhair Ayasso and her family, Mohammed Metwalli and his family, Gamal Elaggan and his family, Jamie Novak, Maeve Eberhardt, Miceli Family, Manuela Wagner, Ellen Cohen, Aziz Abbassi, Redouane Khamar, John Lovelace, Sarah White, Dustin Cowell, Emanuel Vergis, Sarah McCague, Matt Bryan, Monique Higginbotham, David Mortensen, Lori Levin, Bruce Baker, Thomas Polzin, Alan Juffs, Ben Friedline, Bob Conti, Kristopher Geda, Veronica Lifrieri, Wendy Whitehead Martelle, Emily McEwan-Fujita, Laura Brown, Adam Hodge, Mariana Achugar, Ben MacLaren, Cui Jie, and many friends and acquaintances whose names do not appear here. All these people have supported me in many ways and I appreciate their friendship. Thanks to all my friends around the world.

Binney, my wife, has been amazingly supportive and proud of my work. I appreciate her patience with my daily switches between dissertation life and life at home. Uniquely, however, my dissertation was part of both of our lives. She had a personal interest in my work because after graduating from medical school, she started using technology to interview her own patients. Initially I was interested mainly in medical discourse, but few months into her residency, Binney handed me a one-page article about a physician describing his struggles with using a computer to interview a patient. During my preliminary research, Binney herself wrote a short piece describing her own challenges with the computer. In addition to being my wife, Binney served as my informant whenever I had questions about the computer system that doctors use. I really appreciate her love and support not only in my academic life, but in my personal life as well.

And I must extend thanks to my in-laws for their understanding and sensitivity to our hectic life, and hours of patient listening.

I would like extend many thanks again to all my dear family in Morocco for their encouragements and love and for continuing to bless my journey in the States despite the physical distance that separates all of us. I am deeply grateful to everyone, and I feel blessed having you all in my life.

DEDICATION

To my dear parents

My mom, Elhajja Ezzehra Soubai
My dad, Elhaj Moulay M'barek Soudi

I can never thank them enough for their eternal blessings, sacrifice, love, & support

In loving memory of my Dad, Elhaj Moulay M'barek Soudi (December 15, 2012)

1.0 INTRODUCTION

Commonly referred to as “peripheral brains” by practitioners, computers are now so ubiquitous that one may wonder if physicians are handicapped without them. They are encountered in the hospital, in the outpatient clinic, and even in physicians’ pockets as PDAs or smart phones. Although physicians are trained to use medical software, often they are not trained on the new dynamics of medical interviewing with the computer as a partner in the room. Yet computers in all their forms can have a significant impact on the all-important doctor-patient relationship. What happens to the patient when the doctor is interacting with the computer? What effect does this have on conversation with the patient?

It was with these questions in my mind that I undertook this research. In this introduction, I present the scope of my research, state the problems related to the human-computer interface in doctors’ consultations, and underline the reasons for providing a sociolinguistic analysis of those interactions. Additionally, I will underline the gap in the study of the human-computer interface in physicians’ consultations and then highlight the general context and theoretical tools needed to make sense of my research.

1.1 BACKGROUND, SIGNIFICANCE AND AIMS

This dissertation examines the impact of computers on doctor-patient conversation. As technology continues to progress and infiltrate medical practice, it will become ever more important to understand the best ways for doctors to integrate their use of technology into the medical interview. Otherwise they may compromise their judgment, their attention to patients, and ultimately, patient satisfaction. If patients believe doctors are paying more attention to the computer than to them, patients may question the doctors' motivation, commitment, and caring, leading to negative outcomes for all concerned.

The participants in the medical interview have changed irrevocably with the introduction of the computer, and prior research falters in trying to adequately explain the dynamics. There are now more partners with more agendas in the exam room: the patient trying to get care, the doctor working in an increasingly compressed schedule, and the computer with all of its software applications. This machine demands attention from the doctor, providing an almost overwhelming amount of information and requiring completion of its multiple internal checklists. This competition for attention and primacy of goals increases the existent asymmetry in the exam room.

Additionally, implementation of Electronic Health Records (EHRs) is considered a critical solution to the challenges facing healthcare in the U.S. (IOM, 2001; cited in Lipman et. al, 2012). As a result of extensive medico-legal information required by the system at the point of care, Lipman et al. (ibid) explain that many physicians remain hesitant to implement EHRs even in the face of considerable financial incentives. In terms of its impact on doctor-patient interaction, physicians in the Veteran Health Administration have noted that interaction with

EHRs may interfere with patient interaction (Embi et al., 2004; cited in Lipman, 2012). Als' study (1997) of patients' attitude towards the computer in Denmark showed that patients were not satisfied during computer-based interviews. Some patients in her study even shared that the doctor's attention to the computer was disturbing. In another study in Australia by Pearce (2008), the computer was described as detracting from the visit.

The Agency for Healthcare Research and Quality (AHRQ) and the National Institute of Standards and Technology (NIST) (cited in Lipman et. al, ibid) have recently published two seminal reports elucidating the need to adapt systems to work-flow and to focus on human computer interaction (HCI) and the usability of the system (Schumacher, 2010; Carayon, 2012). These reports call for a need to look more into the challenges of EHR adoption.

My research will address the crucial task of investigating, describing, and analyzing the dynamics of computer-based medical interviews from a sociolinguistic perspective. While the effects of the computer's presence on doctor-patient interaction may be easily overlooked by the common medical examiner, regarding computers as participants[1] with a role in the interview will allow for a deeper understanding of how computers affect the exam room in multiple ways: the balance of power, the doctor-patient connection, the conversational flow, the topical development of the interview, and the turn-taking system.

Many studies have been conducted on the use and effects of computers in the room (Als, 1997; Chan & McGlade, 2003; Greatbatch et al., 1995; Warshawsky et al., 1994), but hardly any

[1] While one might argue that paper charts have traditionally occupied a place in the system, the computer, by being an interactive tool, takes on a much more active, and thus, influential, role. Although drawing comparisons between paper-based and computer-based charts is an interesting avenue for research, my goal here is to focus fully on describing the details of using a computer to interview patients, and the implications of those observations on the conversation between doctor and patient. I connect my findings to numerous research studies that show how the activity of typing is much more complex than writing.

have focused on both the verbal and non-verbal resources of doctors or patients, and particularly on how the physician manages the interaction linguistically speaking. This research adds to the literature by drawing on conversation analysis (CA) (Sacks et al., 1974; Goodwin, 1981; Schegloff, 2007) to provide a sequential framework for the doctor-computer-patient interaction. CA offers an opportunity to explore the organization of adjacency pairs — turns of talk like question and answer turns — which make interaction and accomplishment of actions and activities possible. Every noise or lack thereof is important. "No scale of detail, however fine, is exempt from interactional organization, and hence must be presumed to be orderly" (Zimmerman, 1988, p. 415; cited in Heritage, 2006, p. 11).

Every utterance or occurrence itself stems from the framework for some next action in what Schegloff (1992) calls "procedural consequentiality." Communicative action is also shaped by the context in which it occurs since its meaning, relevance, or contribution is determined by its position amongst other talk and also by how it is composed. Conversation analysis proves to be a reliable tool in describing the organization of turn-taking, which is one of the most fundamental organizations of practice for talk-in-interaction (Goodwin, 1981; Sacks et al., 1974; Schegloff, 2007). Parties within talk-in-interaction rely on the organization of the practices of turn-taking as a resource to achieve responsiveness and coherence (Schegloff, 1990; Goodwin, 1980).

By videotaping patient-physician interactions, allowing both audio transcription and a view of body positions and gaze, this study provides a description of the sociolinguistic aspects of the human-computer interface in doctors' consultations, and provides interactional insight into the human-machine type of patient interface and its challenges due to multiple involvements or multi-tasking.

Doing more than one thing at a time is not entirely new in human-human interaction. We regularly multi-task, and this ability is seen as a virtue. The difficulty we experience in doing so varies by the nature of the activity. Multiple involvements in talk and in other conduct involving technology have several equivalents in our modern society that have been researched. For instance, recent research on driving and talking on a cell phone (Pashler, 1984; Briem & Hedman, 1995; Strayer et al., 2006; Becic et al., 2010) has shown that there are costs attached to multiple involvements, and that we are sometimes overly-optimistic about our ability to perform a given task and still engage in talk. Talking on a cell phone impairs our ability to drive, and conversation itself suffers as a result of driving. Because of parallels to the dual engagements of doctors with computers and patients, competition for resources, verbal and non-verbal, might be an issue for guiding the medical interview, and additional research is needed to examine the impact of computer use on conversation.

Research of technology usage and its impact on human-human interaction is also lacking. The traditional Human-Computer Interaction (HCI) view focuses on single users interacting with a system and does not account for "co-presence" (Goffman, 1963) around technology. The human-computer interface in the medical interview context obviously involves the use of technology with others nearby. Because the physician is using the computer next to the patient, it is also important to explore the weight of computer usage — reading, typing or engaging on an on-screen commentary — in terms of social interaction and participation types in various medical interview landmarks or organizations. It is important to see how the patient's role, for example, changes from participant to observer or bystander when the physician uses technology and how this transition is achieved and maintained.

Informed by Goffman's observations of social behavior and his concept of cross talk (1963), I also look at both physician and patient's reactions when the physician breaks the face-to-face encounter to sustain exclusive or predominant "talk" with the computer. Goffman (1963, p.25) argues that in "cross talk," a conversation where "one member of a With momentarily sustains exclusive talk with someone who is not in the With," both people involved are affected. For example, Goffman (1971) proposes that when telephone calls suspend face-to-face interactions, often physical bystanders will feel alienated by the intrusion of the phone call. The feeling of responsibility for breaking the relationship may not be easy for the person responding to the call. As Goffman (1971) suggests, because people are subject to expectations both from the person on the phone and the person with them, there is a trade-off in attending to one or the other. The physician, in this case, who must sometimes suspend his relationship with the patient to create a new one with computer, must constantly negotiate relations on these two front stages — with the computer and with the patient. The physician must satisfy needs of both the patient and the computer, leading to various formations and interactional frames. Because Goffman's concepts are based on research from the 60s and 70s, they must be updated for today's technology. To validate my research, I also tie this analysis to work done on cell phone use in public spaces with proximate others (Cooper, 2002; Cumiskey, 2005; Humphreys, 2003, 2005; Banjo et al., 2008), which also builds on Goffman's observations.

The physical space where action happens matters not only in terms of understanding the relevance and orientation of participants' embodiments around the computer and around each other, but also in understanding how their relationships, interaction frames are negotiated through gaze, gesture, and grammar. I look at how such negotiation affects doctors' body positioning and orientation, and other ways through which they navigate their space, and then tie this work to Kendon's F-formation concept (1990), which defines participants' joint transactional space. Kendon's tools can assist in mapping and defining the space in which the physician manages his or her relationships with the patient and the computer. This provides context for understanding the various linguistic resources that the doctor uses to activate or suspend his or her interaction frame with the computer or patient, thereby entering into an F-formation with the computer or the patient or both. These examples will help demonstrate the difficulties that might be inherent in singularizing or routinizing human behavior and human conversation as we move to towards paper-free clinics.

The human-computer interface (HCI) is intrinsically a multidisciplinary subject. However, much of the research on HCI has, as mentioned above, simply addressed the cognitive behaviors of users, and focused mostly on the technological aspects of the computer applications from the perspective of computer science or cognitive psychology. This orientation in focus has affected in many ways the nature of studies done on EHRs, given that much of the research tends to center on system functionalities and features, and lacks focus on how the physician manages the interaction in the first place. In analyzing the human-computer interface in doctors' consultations, this dissertation focuses on the human characteristics of the encounter through an exploration of its sociolinguistic aspects. I examine how a physician in active interaction with the computer (or the patient), for example, turns his or her head away from one participant while sustaining involvement with the other. How does the physician accomplish these transactions through gaze, verbal resources, or physical orientation to the secondary involvement or frame positioned outside the main activity? How does he or she manage multiple involvements/multimodal displays and what implications do those multiple involvements have for participation frameworks and organization of turn-taking between the doctor and the patient?

1.2 DISSERTATION MAP

The content in this dissertation is organized and divided into seven chapters. Thus far this chapter has introduced and addressed some of the theoretical underpinnings and the goals of this research. Chapter 2.0 offers a review of literature and expands on the tools and background information needed to understand the research. It more deeply contextualizes the need for conducting this research. This section also clarifies some research decisions, including the selection of tools and the treatment of the computer as a participant. Chapter 3.0 primarily introduces the baseline conditions and research methods. Chapter 4.0 defines precisely the staging in which the computer is activated in the relationship throughout the structural units of the interview and describes various generic organizations resulting from the doctor's use of a computer while interviewing the patient. It sets the framework and contextual analysis of the general patterns of the medical interview in this human-computer interface and focuses attention on openings and closings. Chapter 5.0 summarizes physicians' gaze practices and verbal resources for managing competition over their attention by both the patient and the computer. It also discusses the implications of these resources for various participation frameworks. Chapter 6.0 focuses attention on participants' embodiments around the computer, space in which action is happening and their implications for organization of turn-taking and participation framework. It also relates the discussion to the analysis of verbal and gaze aspects. Finally, in Chapter 7.0 I provide a brief summary and conclusion. I also underscore the broader impact of this research, offer take-home points, and share observations on alternative systems and recommendations for future research.

1.3 DISCLAIMER WITH REGARD TO PHYSICIANS' CLINICAL OR INTERVIEWING SKILLS AND USE OF FINDINGS

I want to underscore the fact that my research objective is certainly **NOT** intended, enabled, or equipped to evaluate the physicians' performance, patients' satisfaction, or health outcomes. Rather I simply aim to describe the procedural consequentiality of the doctors and patients' working consensus around the computer, and the relevance of other local contextual features. I explore how the physical environment and organizational agenda (EHRs, the standard medical interview, physical interface) might shape the physicians' work and the working consensus they negotiate with their patients in order to accommodate the computer. In this way, these physicians, who kindly consented to allow me to videotape any of their encounters, serve only as representatives of how other physicians may approach the same problem. They are clinical faculty and assist with the education of residents in addition to their clinical duties. None of my comments should be interpreted as a criticism of how they care for patients, as my expertise lies outside this area.

I should also note that the responsibility of using my findings in a clinical setting or in other interfaces rests with individuals or organizations. While some of my research findings might help to remedy certain situations or arrangements, further examination of the context to which they might be applied is highly advised. It should be noted that these findings may or may not be generalizable beyond the places and situations observed.

2.0 REVIEW OF LITERATURE AND BACKGROUND INFORMATION

In this review, I address and then define my object of study by shedding light on the sociolinguistic structure and general context of the medical interview and the management of the multi-party conversations between the doctor, patient and computer. I will provide background information on my analytical approaches, electronic health records, and particularly UPMC eRecords. Additionally, I review important concepts from the literature on human-computer interaction, and the specific theoretical frames that I adopt for my analysis and my theoretical perspective on those frames. Lastly, I present my research questions.

2.2 THE MEDICAL INTERVIEW AND ELECTRONIC HEALTH RECORDS

Traditionally, physicians relied on pen and paper to interview patients and keep records, and many still do. Some medical students also handwrite notes about patients, at least when learning. Yet all this is changing, and changing quickly. The introduction of electronic health records has revolutionized how medical interviews are conducted, and has also led to increased debate about the advantages and disadvantages of using electronic health records during a medical interview. Most of the studies on doctor-patient communication (Heritage, 2006; Mishler, 1984; West, 1983) have disregarded the computer in their accounts, and little is known about the effects of the computer on health outcomes following the introduction of EHRs, which require creating, storing, and updating the records electronically.

The medical interview format continues to be updated following new medical discoveries ever since the classic conversations that ancient medical practitioners Ibn Sina and Al Razi pursued with their patients 1000 years ago. In this age, physicians are encouraged to ask their patients additional questions about health promotion and safety behaviors. But the process of recording the visit, whether on the paper or on the computer has been in a state of flux as providers search for the right EHR, and these are constantly updated with new tools. However, the main goals of the medical record — first prescribed by Hippocrates in the fifth century B.C., who stipulated that the record should be an accurate reflection of the course of disease and its probable cause, are still maintained. The new electronic format still upholds those goals, but EHRs systems provide extra functionality, such as alerts to clinicians, reminders for regular health screenings tailored to individual patients, drug interaction and allergy alerts, and suggested order sets, many of which cannot be performed at all or as easily with paper-based systems.

2.2.1 What is an electronic health record (EHRs)?

As a relatively new technology, it is important to clarify the definition and functions of EHRs. A report[2] from the National Institute of Health National Center for Research Resources (2006) uses the Health Information Management Systems Society (HIMSS) definition of EHRs:

[2] The NIH National Center for Research Resources (2006), Electronic Health Records Overview, The MITRE Corporation. All Rights Reserved.

> The Electronic Health Record (EHR) is a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports. The EHR automates and streamlines the clinician's workflow. The EHR has the ability to generate a complete record of a clinical patient encounter, as well as supporting other care-related activities directly or indirectly via interface — including evidence-based decision support, quality management, and outcomes reporting. (p.1)

Electronic Health Records have been introduced in health care organizations to replace paper charts, which can be misplaced or damaged over time.[3] EHRs allow results from the lab, outside visits, procedures, and x-ray results all to be gathered in one place and often backed up to a remote location. Physicians and other healthcare professionals can review test results and lists of current medications, and send prescriptions to the pharmacy without the need for pen and paper. EHRs also eliminate several potential errors. The computerized physician order entry (CPOE), for instance, obviates the need for doctors to inscribe their orders on paper charts and therefore eliminates issues relating to legibility of handwritten medical orders. The first EHRs began to appear in about 73 hospitals in the 1960s (Summerfield & Empey, 1965). Most of today's EHRs are based on work done in academic medical centers (AMCs) and for major government clinical care organizations, such as The Medical Record (TMR) and the Department of Defense's (DoD) clinical care patient record system used in the VA health care system (NIH report, 2006).

[3] For example, during Hurricane Katrina, hundreds of thousands of medical records were destroyed.

2.2.2 EHRs challenges

EHRs are not free of problems. For example, EHRs need to be varied depending on the user and setting. Features and interfaces that are very appropriate for emergency care may not be easily used in a primary care setting. Similarly, nurses, doctors, and pharmacists all require different interfaces which reflect their varied tasks.[4] The information that they need to access, respectively, might also vary based on the clinical setting and the patients' needs.

EHRs, according to the enumeration of its uses above, are not simply a longitudinal record or history of the patient's healthcare, but rather a dynamic system that constantly changes and evolves as a patient interacts with the health care system in various ways. The actual analysis of how the implementation of EHRs impact patient care is what makes the process so interesting. Meaningful Use of EHRs continues to be an issue from many perspectives. Ahmad (2010, p. 266) explains that "the recent emphasis on meaningful use as key priority of HIT[5] projects funded through American Recovery and Reinvestment Act (ARRA) grants….illuminates the potential pitfalls of a simplistic approach to implementing EHRs" and other aspects of health information technology. Ahmad (ibid, p. 266) expands on the narrowed perspective of meaningful use by noting how "It is seductively easy for healthcare institutions, including academic medical centers (AMCs), to focus on EHRs as aggregations of more or less desirable features and capabilities." Ahmad (2010) argues that to achieve the real goal of meaningful use which is to improve population health, a different perspective that focuses on delivery quality, patient empowerment, and engagement will be required.

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[4] Personal communication with a physician

[5] Health Information Technology

Additionally, technology adoption by physicians remains an unresolved issue. Not every physician welcomes the opportunity to type visit records. Lipman et al. (2012) explains that many physicians remain hesitant to implement EHRs even in the face of considerable financial incentives because of the workload associated with them. These physicians are willing to off-load keyboarding efforts onto someone else[6]. Reports from the Agency for Healthcare Research and Quality (AHRQ) and the National Institute of Standards and Technology (NIST) have also called for a need to further examine the challenges of EHR adoption (Cited in Lipman et al., ibid).

Research on the impact of computer presence on patient satisfaction and involvement has also shown negative results. The Greatbatch et al. (1995) study indicated that the use of the computer has resulted in interactions that are more doctor-focused and less patient-centered. Inspired by principles of grounded theory, Als' study (1997) of patients' attitudes towards the computer in Denmark showed that patients were not satisfied during computer-based interviews. Some patients in her study even shared that the doctor's attention to the computer was disturbing and that they lacked information on what was happening on the computer. The computer was also occasionally used in a way that was not originally intended. Regardless of their level of dissatisfaction, however, patients in Als' study preferred to see the screen. The other study in Australia, conducted by Pearce (2008), noted how the computer was interfering and distracting from the visit and physicians' style was most of the time disengaging. Patients' behaviors varied between screen watching, screen controlling, and screen ignoring. In all of these studies, it was

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[6] During a visit to their office in Erie Pennsylvania, Dr. Lipman and his colleague Dr. Anon shared with me that they were happy to have scribes because they started seeing even more patients. I expand on the scribe system in 7.3

concluded that general practitioners needed to change their behavior around the computer, and that the patients needed to have access to the screen to improve the communication all around.

These studies, however, have not accounted particularly for how the physician manages these interactions from a linguistic perspective, and have not described the resources that physicians and patients rely on to manage interaction and participate in the conversation. Without understanding how and why physicians are using certain linguistic practices, we may not be successful in helping physicians change their behaviors. Additionally, without examining physicians' styles and what motivates them in particular environments and stages of the interview, our analytical conclusions might be too broad to have any practical insight for minimizing the negative impacts of the computer.

2.2.2 UPMC eRecord

According to UPMC Life Changing Medicine 2010, EHRs (also known as eRecord) are now used in all 19 hospitals in the system, comprised of approximately 1.3 million patient records. UPMC has committed roughly $500 million to build up and deploy this information technology initiative, with the objectives of improving the quality of patient care, reducing medical errors, and providing more cost-effective care. The main components of the eRecord are: computerized physician order entry, a patient port, paperless reporting, and structured clinical documentation. Dr. Daniel Martich, one of the primary leaders behind UPMC's extensive adoption of electronic medical records (EMRs), stated soon after the implementation:

> Results have included a reduction in medical errors that cause harm, improved patient and physician satisfaction, improved regulatory compliance, reduced pharmacy costs, less dropped hand-offs of patients from clinician to clinician and time savings for physicians and patients. **(**UPMC Life Changing Medicine, 2005, February 28)

Dr. Martich also explains that, "Despite multiple challenges, health care professionals are embracing information technology and are enabled to do their jobs more efficiently with the use of electronic health records." (UPMC Life Changing Medicine, 2005, February 28).

This is obviously an auspicious beginning, but some questions remain unanswered with regard to the interactional effects of doctor-patient-computer dialogue. EHRs themselves may present several challenges from an interactional perspective. For example, when wrestling with the computer application to complete clinical documentation, transcription, family histories, procedure histories, health maintenance reminders, and a variety of other tasks online, the doctor might be more focused on the virtual patient than the real one sitting next to them. Do EHRs simply increase interaction with online documentation rather than interaction with the patient? Are we trading human interaction and engagement for efficiency? This is a priority of the UPMC eRecords council[7], which is also supportive of building an interface that is sociolinguistically intelligent and sensitive to fostering the doctor-patient relationship. As such, this research is indeed very timely.

While the computer offers several opportunities for doctors and the hospital organization, as mentioned above, it blurs the reality of patients and doctors in several ways, and creates social and linguistic frames that challenge the medical interview training that doctors receive while in medical school or residency. Doctors generally receive a few hours tutorial on how to use and navigate the electronic health record specific to their health system, but that tutorial is taught

[7] Dr. Dan Martich has invited me to present this work in one of his meetings for the Physician Advisory Council (PAC) for the UPMC eRecords. The council consisted of IT leadership, Health Information Management leadership, physicians, and other clinical staff, in addition to members of Pitt's Health Sciences Library System. Members from UPMC outlying facilities were also video-conferenced in.

outside of a patient context[8]. As such, when they utilize the system in the clinic, they can be baffled by reminders and situations they have never encountered, that then distract physicians from the real patient. Even test patients in training may not be able to prepare doctors for the unpredictability of their real-world encounters.

In response to these advances in information technology in our clinics, understanding the human-computer interaction is an absolute necessity to make better use of information technology, and make it more practical for all parties: patients, insurance companies, hospitals, doctors, and pharmacies. We must link technology to human development so they become partners, not antagonists, as technology opens up new areas of medical interaction.

In what follows, I expand on the analytical approaches to the medical interview and also review important concepts from the human-computer interaction and synthesize theoretical frames I adopt for my analysis.

2.3 RELATED RESEARCH

2.3.1 Verbal aspects of the medical interview

The medical interview, through the therapeutic alliance it creates, is a major determinant of compliance, and practitioner and patient satisfaction within the encounter and in terms of overall care. The medical interview has been described as the "cornerstone of the diagnostic process" (Stillman & Swanson, 1987). Consequently, many studies have been conducted on different

[8] Personal communication with a physician

sociolinguistic aspects of doctor-patient interaction. Of major relevance to this investigation is the application of conversation analysis (CA) (Sacks et al 1974, Goodwin 1981) to the medical interview as in Heritage and Maynard (2006).

The publication of the original work on Doctor-Patient-Interaction in Parsons (1959), led the way to other research starting in the 1960s that followed two main approaches: process analysis (Francis et al. 1969) and the microanalysis of discourse (Charon et al. 1994; Mishler, 1984, 1991). I will limit the scope of my review of literature to the theoretical models that address the social aspects of linguistics and linguistic aspects of sociology, namely conversation analysis (CA). I review below some of its major guiding principles. Other CA terminology will be defined in the context in which it is used.

In general, conversation analysis of medical interviews consists mainly of looking at the structure of the medical interview (opening, presentation of complaint, diagnosis, treatment, and closing) as well as the organization of turn design (Heritage & Maynard, 2006). The overall goal of CA is to describe how activities and tasks central to the medical visit are managed, to locate recurrent phenomena, and to systemize findings.

There are also three important conclusions to be drawn about the application of CA (Heritage & Maynard, 2006) to the medical interview — all of which hold significance in terms of the application of linguistics in the medical interview setting:

> "First, interactional practices through which persons conduct themselves elsewhere are not abandoned at the threshold of the medical clinic. That is, the organization of interaction described in CA studies is largely carried forward from the everyday world into the doctor's office. Second, and connected with our first point, practices for effecting particular kinds of actions — for example, describing a problem or trouble (Jefferson 1980b, 1988) or telling bad or good news (Maynard 2003) — are also carried across the threshold of the doctor's office and affect how doctors and patients go about addressing

> particular interactional tasks. Third, the organization of interaction is fundamentally geared to the joint management of self-other relations" (p. 13)

CA is, among other things, an inquiry into the nature of the procedures conversationalists follow to produce the orderliness of ordinary talk. But as described above, ordinary talk certainly continues into the clinic; so too can CA continue to be a valuable tool there. Hutchby and Wooffitt (1998) describe how CA can be both detailed and accessible. In discussing the foundations of CA, Hutchby and Woofit argue that the main concern is the nature of turn-taking in talk-in interaction: How is it organized? How do participants accomplish orderly or even apparently disorderly turn-taking? A key notion in CA is that those turns are not just serially ordered (that is, coming one after the other); they are sequentially ordered. In Schegloff (2007: 1), "One of the most fundamental organizations of practice for talk-in-interaction is the organization of turn-taking. For there to be the possibility of responsiveness- of one participant being able to show that what they are saying and doing is responsive to what another has said or done-one party needs to talk after the other, and it turns out, they have to talk singly."

As the aforementioned breakdown suggests, CA is a micro-analytic approach, which takes apparently mundane and unremarkable spoken interactions and finds intricate patterning in the way they are organized. Just as putting a snowflake under a microscope reveals structure and complexity that are not visible to the naked eye, placing "talk" under the CA microscope breaks down what we normally take for granted and reveals the unsuspected complexity of our everyday verbal behavior. Given its interdisciplinary and dynamic nature, as well as its methodological adaptability (a point where linguistics, sociology, anthropology and psychology meet, see Schegloff 1992), CA will then enable me to explore the sequential organization of doctor-patient-computer interaction at several interactive levels and from multiple perspectives.

CA offers an opportunity to explore the organization of adjacency pairs- turns of talk like question and answer turns- which make interaction and accomplishment of actions and activities possible. According to Schegloff (2007), a very large set of sequence types seem to be organized around a basic unit of sequence construction, the Adjacency Pair (AP). The AP is a good resource for talk-in-interaction, and talk expansions and deployments. In its minimal, basic, unexpanded form, an adjacency pair is characterized by certain features. It is composed of two turns, by different speakers placed adjacent to one another; that is, one after the other. These two turns are relatively ordered; that is, they are differentiated into First Pair Part (FPP) and Second Pair Part (SPP). Adjacency pair sequences can be expanded well beyond the minimal two turn sequence which it the AP itself constitutes.

> These expansions occur in the three possible ways which a two-turn permits; before the first pair part, in what we call pre-expansions; between the first and the projected second pair part, in what we call insert expansions; and after the second pair part, in what we will call post-expansions…..Various forms of expansion can occur in each of these sequential positions, by which the parties accomplish (or seek to accomplish) a variety of interactional outcomes" (Schegloff 2007: 26).

Medical interviews can be understood as built on the armature of a single adjacency pair. Doctors' questions and patients' answers, in addition to their expansions, are structured around single underlying adjacency pairs. Building on the AP frames, it's possible to account for the role and impact of the computer on the doctor patient conversation.

Additionally, everything is important in CA; every utterance or occurrence will itself derive from the framework for some next action; what Schegloff (1992) calls "procedural consequentiality". Communicative action is also shaped by the context in which it occurs, since its meaning, relevance, or contribution, is determined by its position amongst other talk and by how it is composed. Conversation analysis proves to be a reliable tool in describing the organization of turn-taking, which is one of the most fundamental organizations of practice for talk-in-interaction (Goodwin, 1981; Sacks et al., 1974; Schegloff 2007). Parties within talk-in-interaction rely on the organization of the practices of turn-taking as a resource to achieve responsiveness and coherence (Schegloff 1990, Goodwin, 1980). The computer could affect the degree of responsiveness negatively because patients' and doctors' turn-taking may be guided by attempts to co-ordinate with the computer's needs at the expense of conversational coherence. At the same time, turn-taking and topic development will be affected by onscreen information and software prompts. Turn-taking might also be affected by the physical arrangements which lead to the computer's turn usually only being available to the computer-user. Various examples of doctors' and patients' embodiments will be referenced to demonstrate how doctors and patients are locating themselves to each other and cooperating or not as they carry out and organize action in various stages or situations and the role of the body in the interaction.

To manage intersecting demands and competition over their attention by both the computer and the patient, doctors use multiple verbal resources in addition to the gaze practices and other embodiments. I summarize the grammatical tools used, focusing on the actions of building turns and sequences which represent the main functions of language from a discourse-functional linguistics and interactional sociolinguistics (See Ford et al. 2002). In this regard, I focus on turn taking system (Sacks et al 1974) and linguistic particles/discourse markers (Schiffrin, 1987) which provide various resources for local displays of interactional stance and task switching (Butterworth, 1972). This will involve looking at grammar as an interactionally positioned structuration of language and focus on how it is continually being shaped to serve interactional needs (See Goodwin, 1979, Schegloff 1979, Lerner 1991, Hayashi et al. 1998, Ford et al. 2002). Review of these linguistic resources will explain how the current speech interface allows for multiple engagements and will therefore provide additional insight into the impact of computer use on the organization of turn-taking and participation framework.

In human-computer dialogue and automated systems, Swerts and Ostendorf (1995) and Passonneau and Litman (1997) looked at pauses and speaking rate to signal topic shifts in single-tasking speech. Yang et al (2008) studied human-human multitasking, but research is needed to look at multiple involvements and task switching in human-human-machine interfaces to improve our understanding of the doctor's multiple involvements with the computer and how these affect his or her interactions with the patient and vice-versa.

2.3.2 Visual conduct and gesture: Non-verbal discourse

Visual conduct, or non-verbal discourse, is an area in doctor-patient-interaction that has been largely ignored, as most research has been conducted on the verbal aspects of physician-patient interaction (Buller & Street, 1992; Heath, 1984). Because this research makes use of video-data to analyze doctor-patient-computer interaction, this is another area of study that this dissertation redresses. The main idea is that there are likely to be "seen but unnoticed" practices (Garfinkel 1967, cited in Zuengler et al 1998: 3), and the video analysis allows an infinite number of opportunities for reviewing for such practices. Goodwin (1979, 1981) expands on the same idea by stating how we could easily postulate what we thought we saw or knew from general knowledge and not focus on the events as they happened in real time, which should be our greater concern. The body, as Goodwin (2000: 31) puts it "functions in yet another way when prosody and intonation are used to display alignment and stance[9])".

Participants in any conversation rely on a variety of concurrent resources to accomplish their conversational goals; verbal and non-verbal discourse work together to achieve a single meaning and each behavior is comprehended by virtue of its position in context (Goodwin, 1996, 2000; Sanders, 1989). Goodwin (2000) explains that such resources include many different kinds of lexical and syntactic structures, prosody, gesture, embodied participation frameworks, sequential organization, and other kinds of materials and tools built by others that structure and model our perception in that specific environment. This work will assess elements of verbal and body language across transitions and structural units throughout the stages of the interview, and relate the social meaning of what each action communicates and how it ultimately affects the turn-taking and doctor-patient participation framework.

2.3.3 Body torque, spatial organization and cross talk

In her discussion of the spatial arrangements of participants (Goffman, 1963; Scheflen, 1972), Mondada (2005, 2009) argues that the organization of talk is deeply embedded in and

[9] Goodwin (2007: p. 70-71) defines five types of stances "1) instrumental stance, the placement of entities in the ways that are required for the sign exchange processes necessary for the accomplishment of the activity in progress; 2) epistemic stance, positioning participants so that they can appropriately experience, properly perceive, grasp and understand relevant features of the events they are engaged in; 3) cooperative stance, the visible display that one is organizing one's body toward others and a relevant environment in just the ways necessary to sustain and help construct the activities in progress; 4) moral stance, acting in such a way as to reveal to others that the actor can be trusted to assume the alignments and do the cognitive work; 5) affective stance, emotions by the individual and toward others that are generated"

reflexively shaped by the interactional space: specifically, F-formation (Kendon, 1990), and contextual configurations (Goodwin, 2000). Kendon (1990) and Goodwin (2000, 2007) argue that the disposition of participants' bodies within space displays mutual attention and reciprocity, as well as shared attention towards objects. Given the physical framing of exam rooms used in this study, it is important to analyze the spatial arrangements and the interactional space of the doctor, patient and computer set-up in terms of body positioning, the orientation of doctor and patient body segments, visibility, audibility and structure of talk, and how all of these factors account for turn-taking and recipient design and management of three-way medical interviews.

This dissertation will focus on patients' and doctors' head-based gaze practices, pointing and other body orientations because these elements are critical in establishing a good participation framework that is conducive to active involvement in the conversation by both the patient and doctor and their organization of turn-taking (Goodwin, 1981). According to Goodwin (1981) and Schegloff (1987b), our body orientations communicate a frame of dominant orientation to a space wherein our long-term and dominant actions are likely to be taking place most of the time during our meeting, and thus, that is where the focus and attention resides. For instance, in the case of doctor-patient-computer interaction, it will be important to see how doctors and patients connect in various environments and stages of the interview. A doctor who is focused completely on technology would create a binding environment between him or herself and technology, which might communicate to the patient that their physician is not available to them for collaborative action (Soudi, 2010b). Gaze, gestures, and body orientation — which are tools used to bargain commitment and detachment from the conversation, or availability for a conversation

(Goodwin, 1981; Goffman, 1967) — have several implications for my exploration of how the computer affects turn-taking and how the doctor manages multi-turn-taking, openings, and closings with the patient and the computer.

An under-studied item in the research cited above, and particularly research on EHRs, is how the physical context resulting from the presence of the computer influences interactions between doctors and patients and the electronic recording of patient's notes. To define the spatial organization between doctors and patients and the impact of their spatial organization on their interaction, I will particularly focus on Kendon's (1990) F-formation, Schegloff's (1998) body torque framework, and Goffman's cross-talk and participation framework (Goffman, 1974, Goffman, 1981) which have implications for three-way interactions.

In his discussion of 'body torque', divergent orientations or positioning of participants' bodies and particularly their upper and lower segments, Schegloff (1998, p. 536-541) notes that the lower segments of the body communicate a long term orientation or 'home position' for the upper segments. The orientation of their legs, in particular, is what communicates a participant's long- term direction or focus of attention. Schegloff (1998, p. 543-545) explains that a torqued position, being an unstable position, projects an imminent return to full postural alignment with the direction in which lower body segments are facing. A torqued position indicates the orientation is temporary and the bearer of such positioning will soon resolve divergent orientation by returning to the home position The torqued posture indicates a ranking in interaction involvements and prioritization of engagement options.

Kendon's F-formation system (1990) of spatial organization examines the physical arrangements that people adopt when they engage in focused conversational encounters.

F-formation defines the boundaries of the transactional space of a group of people gathered and involved in an activity which separates them from other groups or activities taking place nearby:

> "The ring of space occupied by the people (p-space) determines group membership. The surrounding region (r-space) buffers the group from the outside world. Thus persons who are nearby but not in p-space are excluded from the fine-grained social circle that defines the F-formation. Still, the group monitors r-space to see others who may be trying to join. For example, an approaching person in r-space may be greeted via eye contact, while a person who is facing away, even if close to the group, is not treated as a potential member". (Marquardt 2012, p. 2).

F-formations have been applied to several other domains to look at the spatial patterns formed during face-to-face interactions between two or more people in studies of bodies in space, technology usage in co-present interaction, crowded environments, computing and interaction design (Morrison et al., 2011; Marquardt et al., 2012). Yet F-formation has not ever been applied to the examination of the effect of computer presence on doctor-patient interaction in a primary care context. Entering an F-formation is an "excellent means by which interactional and therefore social and psychological 'withness' may be established" (Kendon, 1992, p. 330).

Building on the above, another relevant concept in investigating usage of technology with co-present group interaction is Goffman's theory regarding cross-talk, based off his work on behavior in public spaces (1963, 1971). According to Goffman, there are two types of individuals in public spaces: people who are alone and people who are with other people: 'Singles' and 'Withs' respectively. Based on the assumption that 'Singles' might have something wrong with them for not being in a 'With' as if maybe lacking friendships or being asocial, Goffman (1963) shares several scenarios where people compensate for being alone. To legitimize their presence ‘Singles’ often resort to several defensive resources or strategies such as engaging in other types of behavior, for example reading a newspaper, or drinking coffee. A ‘With’ might feel socially exposed when their partner participates in what Goffman refers to as ‘cross talk’. This is a conversation where “one member of a With momentarily sustains exclusive talk with someone who is not in the With” (p. 25). This may result in the other person in the ‘With’ feeling awkward and vulnerable. As a result of this, both parties might feel awkward and might attempt to engage each other and manage their expectations.

The cross-talk model has been applied to usage of technology in the presence of others and namely the use of a cell phone with companions (Cooper, 2002; Cumiskey, 2005; Humphreys, 2003, 2005; Banjo et al., 2008). These studies of cell phone conversations with others describe several behaviors that both the party receiving the call and the physical partner engage in to manage expectations and perhaps reduce pressure on the person to get off the phone. The physical partner sometimes engages in parallel activities to minimize attention to the fact they are left alone and to reduce face concerns. As we look at how the physician is managing interaction with both the computer and the patient, the cross-talk model might be very useful in studying how the physician acts when he or she is busy with the computer and how he or she is compensating for leaving the patient out. It might also be useful to see how the patient is acting to reduce the impression they he or she is left alone.

Humphreys (2005) shares also another interesting point about when the person on the phone tries to engage his or her physical partner and the partner on the other end: three-way interaction or mediated cross talk. These types of interaction are challenging because the cell phone user becomes responsible for managing two distant fronts. Humphreys (ibid,

p. 821) explains that "this type of dependency upon the cellphone user is much like the dependency upon a translator in face-to-face interactions". The dynamics in these three-way situations might be comparable to situations when the physician tries to get the patient involved in the relationship with the computer. In all of these instances, the physical partner is reliant on the technology user to relate messages and since he or she does not have access to information.

Finally, I will examine the above linguistic resources and embodiments in light of Goffman's participation framework (1981) to see how doctors and patients use these multiple frames to adapt the ways they participate in conversation and interact with each other, based on their involvements in these encounters. For clarification purposes, Goffman's participation framework basically shows how people bring multiple frames and schemas to a conversational event to make sense of it and contribute to the development of a participation framework. A participation framework displays the relationship between participants in terms of their roles and statuses as speakers or hearers. It emerges within an interaction frame (Tannen & Wallet, 1987) or a particular moment in an interaction which helps us understand what is going on and establishes expectations about what may or may not happen. Participation framework encompasses several concepts some of which have already been highlighted and the remaining key terminology will be defined in the context in which they are utilized.

2.4 HUMAN-COMPUTER INTERFACE IN THE DOCTOR'S OFFICE

The question of how computers are changing our lives has fueled a big debate, and research on Human-Computer Interaction (HCI) in the past 30 years has boomed as a result of this (Weiser 1991). Computer applications are everywhere, which makes understanding of computer software applications by the majority of the people a necessary aspect of modern life. As mentioned above, human-computer interaction is intrinsically a multidisciplinary subject, but theoretical frameworks in HCI have been dominated largely by cognitive theories (Landauer, 1987) and computer science (Denning et al., 1989; Grudin 1990).

Sociolinguistically-focused approaches to HCI can be very useful to understanding or accounting for the context in which computers are used. Because most of, if not all of, the work we do occurs in social or group settings, computer applications that are designed in accordance with sociolinguistic knowledge and the social and interactional order of its users will be more responsive and successful in their deployment in such contexts. So in contrast to modeling individual cognitive acts (Carroll, 1991), or focusing on EHRs as "aggregations of more or less desirable features and capabilities" (Ahmad 2010, p. 266), sociolinguistic approaches like conversation analysis will help us reach the real goals of meaningful use of EHRs to improve population health and delivery quality, and empower and engage patients. This microscopic analysis will identify the key aspects of single-user application, the physician's dialogue with the machine, and their dialogue with the patient.In order to understand the many issues relating to technology, it will be necessary to first fully contemplate the sociolinguistic aspects, the effects of technology on human interaction and strategies for talk, and the turns and moves of participants in multiparty conversation (Goffman, 1981; Greenberg, 1991; Johnstone, 2002).

The physical setting in this research is very unique because it expands the classic view of HCI, which is traditionally defined as the study of interaction between human users and computers (Preece, 1994). There are two points of contact in the physical setting of this research, forming a triangular in-person social frame between doctor, patient and computer. This new triangular frame has further implications for area of interface, input/output flow, and task and machine environment and most importantly the doctor-patient relationship. According to the Association for Computing Machinery, work in HCI has been concerned mostly with securing user satisfaction. In this research, I will be concerned with additional elements to this interface, namely the patient and the extent to which he or she is accounted for in the encounter, and how the physician manages his or interactions with both the computer and the patient.

One of the persistent problems with HCI is that humans generally find it difficult to manage the increased amount of coordination that is required when multiple participants are involved in any situation. Additionally, instead of having to manage the turn-taking sequences with just one other partner, participants in a multi-party conversation, like that in HCI, must manage multi-turn taking, openings, closings, and transitions across tasks — an extremely difficult challenge. This dissertation provides a good basis for an understanding of the effects of technology on doctor-patient interaction, and findings from it will be used to improve the doctor-patient-computer interface.

2.4.1 Summary of HCI-related research on EHRs

The research cited in 2.2.2 has focused mainly on the impact of computer presence on patient attitude and satisfaction. Most other research on technology in the medical context within the HCI field has mainly focused on design and other issues relating to medical informatics and single-user applications (Ahmad 2010, Tang & Carpendale, 2007). Other extensive work on EHRs in hospital environments has looked at the usage of Electronic Patient Record (EPR) during multi-disciplinary ward rounds in a hospital; focusing mainly on how the body is used during social interaction of co-present groups that utilize technology (see Morrison et al., 2011).

As mentioned above, research needs to be conducted to analyze verbals, non-verbals and other embodiments in various stages of the interview in order to understand the impact of technology on doctors and patients' global resources for communication. Furthermore, while assessing patients and physicians' satisfaction rates with systems or describing their styles might also be useful, it will be even more practical to describe and track linguistically the factors leading to such styles, patterns and satisfaction rate.

In what follows I review some background information about what prompted me to treat the computer as a participant in this context. This review will also shed light on the challenges associated with interacting with a computer in general. I also review some preliminary research conducted before launching this research.

2.5 THE THEORETICAL AND PRACTICAL VALUE OF TREATING THE COMPUTER AS A PARTICIPANT

While one might argue that paper charts have traditionally occupied a place in the system, the computer, by being an interactive tool, takes on a much more active, and thus impactful, role as I demonstrate below. When considering the computer as a participant in the patient-doctor encounter, we must contemplate the difference between the computer-driven interactions and paper-based medical interviews that also involve note taking. In both situations, the doctor puts the patient on hold to type and to write, respectively. However, the computer also prompts a series of complications based on the regimented engagement between doctor and computer. With paper, doctors can move at their own rate, make abbreviations, and connect thoughts with arrows, etc., but the computer forces physicians to answer in specific, recognizable diagnoses or choices, thereby inhibiting their speed and freedom to interact more naturally with the patient. Additionally, typing requires a different set of attention resources than writing; this of course varies from one person to another, but generally speaking, executing thoughts through a keyboard as opposed to a pen incorporates another level of separation into the process.

In traditional note taking, a doctor processes thoughts into words in his or her mind and then transcribes them. However when interacting with a computer, a doctor must process those thoughts in his or her mind then find the appropriate keys to transcribe those thoughts into the computer; note taking is more of a natural reflex, whereas the second must incorporate other factors, like typing speed, computer prompts, etc., before the same goal can be achieved. Most importantly, paper charts allow the physician to flip through pages much more easily, and do not require as many transactions as the computer.

Typing a text is the result of several operations that have considerable motor and cognitive overlap (Gentner, 1988). Keyboarding is a strikingly involved process — definitely not as simple as it might appear. Indeed, cognitive psychologists describe typing as one of the most complex and demanding activities in which humans engage (Flower & Hayes, 1980; cited in Alves et al, 2008). For example, in a review of typing transcripts, Salthouse (1986) describes the basic processing operations that take place:

> In an initial input phase, a to-be transcribed chunk is held in working memory (WM); this chunk is parsed into discrete characters, which are translated into motor programs that specify the characteristics of the appropriate keystrokes; in a final execution phase, ballistic typing movements are performed. Thus, when typing, a writer must keep active in WM the chunk being transcribed while parsing, programming, and motor execution take place. (Also cited in the words of Alves et al, 2008: 2)

A further example of the difficulties involved in typing is found in Penney and Blackwood (1989, cited in Alves et al 2008), who note that novice typists have a tendency to forget items in the last position of word lists. Finally, the experimental evidence stemming from the research of Gentner (1988) and Pashler (1993) indicates that expertise in typing is associated with the ability to perform concurrent activities successfully. This provides further impetus for conducting this research in the first place. The concurrent activity, with which I will concern myself here, is the physician talking to the patient while typing. Typing is just one of many activities when the physician must engage *with* and *on* the computer. In other words, to emphasize the complexity of typing, the computer is not just a concurrent activity, — such as walking while chewing gum, or eating while reading a book — but it is a relationship that binds the physician to the computer.

Another point about the challenges of using a computer is the flexibility in physical framing of the encounter. The partnership with the patient is not made any easier by the physical realities of the exam room, where, in many cases, the physicians must face the desktop station which is up against the wall. The computer necessitates more of a physical interaction with its transactional segments: Physicians must hold the mouse, orient their bodies towards the computer's face, type on the keyboard, and respond to the computer's queries. The computer functions like a dictator, 'one-up' in status relative to the user. The computer takes charge and absorbs as much of the physician's attention as possible. "The user consumes information, and isn't much interested in how it is managed" (Reeves & Nass, 1996, p. 159). With the paper records, on the contrary, physicians can put the records on their laps and continue to face the patient.

In addition to this disparity, the computer also performs actions and contributes to the topics of development mainly through on-screen prompts, while a paper-interview relies on the physician's thoroughness and observation of records. Arguably, paper records can elicit the same topics of conversation as computer queries, but the computer also utilizes set reminders to ensure that the physician does not overlook any health complications or questions. Because of this reciprocated engagement, we tend to regard the computer as more of an interactive third partner than a few pieces of paper. Additionally, medical students are often initially trained in taking notes with a pen and paper, rather than on the computer, so there is a slight learning curve when applying this new third partner system.

Finally, paper charts can be shorthanded, whereas the computer does not allow for shorthand that involves drawings and non-lettered abbreviations. Standard abbreviations are sometimes auto-corrected to text, while "dis-allowed abbreviations" may trigger a choice from the computer. The computer "audience" requires the physician to accurately design input. In the following chapters, further description of the computer's dynamics will illustrate that the computer has a significant turn in the conversation.

Treating the computer as a third partner is not something new in the field of human-computer interaction (HCI), and many people in the field of HCI have given machines social construction status. For example, it becomes difficult to disengage with a computer and focus on a patient, because if the computer is, as Reeves and Nass (1996) describe, a social instrument — one that communicates with, instructs, and interacts with the physician — the rules of etiquette seem to apply. Namely, just as it's polite to look at people when speaking, it's 'polite' to look at the computer when typing. It's also polite to match modality or, in other words, type responses to the computer's prompts (Reeves and Nass, ibid, p. 33-34). More specifically, "Computers, in the way they communicate, instruct, and take turns interacting, are *close enough* to human that they encourage *social* responses" (Reeves & Nass, 1996, p. 22). Given the predicted dynamic role of the computer in the light of its value in EHR implementation, I have decided to look at it as an active participant in the conversation.

2.6 PRELIMINARY RESEARCH: TESTING THE WATERS

In order to further augment my own understanding of doctor- patient-computer interaction, I conducted a preliminary probe into the field, soliciting opinions from two physicians[10] who have worked with computers in the outpatient setting: a first year internal medicine-pediatrics resident (Dr. Anna-Binney McCague) and an attending pediatrician (Dr. Monique Higginbotham). In their personal essays, they brought up many concerns that mirrored some of the problems noted above. These included disconnection from the patient, inability to keep up with the patient's story, and preoccupation with the computer during the interview. Regarding relating to patients, Dr. Higginbotham[11] states:

> I find it impossible to look at both the patient and the computer screen while taking a history. I fear if I turn my back to the client (or even turn sideways, losing eye contact) that I will be perceived as disengaged from the patient.

[10] For full access to these two physicians' notes, please see Appendices A and B.

[11] See Appendix B

She confirms that many physicians fear the dissociation that the computer can bring to the interview. In her piece, Dr. McCague[12] reiterates concerns over not being able to connect with patients at the deepest level when using the computer. Additionally, both physicians dwell on their inability to keep up with the patient's story. For example, Dr. McCague writes:

> All my skills for writing at high speeds have been shorthand learned with a pencil in my hand – never a keyboard and a screen. As a medical student I was required to hand-write my histories and physicals…With a screen in front of me I can't use an arrow, a diagram, or standard shorthand.

In the end, the physicians tell us, they have to choose between the computer (and lack of connection with the patient), the patient (possibly failing to record details), and resorting to pen and paper (relegating the computer to after the visit).

Our doctors are undoubtedly struggling to use technology that is supposedly meant to make their lives easier in the exam room. Dr. McCague comments, amusingly, on the difficulties of learning to use new software:

> I have literally spent minutes trying vainly to find a diagnosis to let me order a pregnancy test before someone shared that it was "pregnancy, unconfirmed" – I only learned that later of course; in desperation, I put "nausea."

Yet they both are quick to note the many advantages of computers as well: They can quickly review the patient's medical record, rooming form (vital signs, growth parameters for that day), immunization records, medications, medical history, and allergies. Additionally, both note the ability to minimize errors with a computer record of medications.

Furthermore**,** preliminary analysis of some segments from my previous studies (Soudi,

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[12] See Appendix A

2009a, 2009b) showed that doctors used abrupt topic shifts to funnel patients' concerns and to redirect the interview. They also may have been responding to on-screen prompts. Doctors additionally use multiple conversational floor-holding particles to maintain control over the encounter, and in this instance, perhaps to allow themselves time to wrestle with the computer. This is very analogous to my prior work (2009b) on some key discourse markers (such as "alright" or "okay") that doctors use when expanding, soliciting patients' concerns, and moving the conversation forward. The interplay of "alright" and "okay" and other similar particles presented an interesting opportunity to explore the degree of topical asymmetry in the medical interview, including the role the computer plays in fortifying this boundary.

2.7 THE PROBLEM

The perspectives provided by the above physicians indicate their accord with the perception that computers significantly impact language and communication, and that the doctors are often preoccupied with the computer. Their impressions prompted me to delve more deeply into this research from a sociolinguistic perspective. My review of preliminary data also confirmed that this was a real and practical problem from the very outset.

As mentioned previously, this issue has been traditionally described in the classic literature as multiple involvements (Goffman, 1963) and in recent conversation analysis literature as multiple courses of action (Schegloff, 1984, 1987b; Goodwin, 1981; Lerner, 2002). The exact theoretical roots and definition are cited specifically in Goffman (1963) where he notes that,

> Humans and other animals are capable of dividing their involvements, and are therefore capable of doing more than one thing at a time. Given this possibility, the numbers of concurrently unfolding activities in any gathering of two or more persons can pose complex demands on the coordination of action-in-interaction: Persons must not only manage their own multiple involvements, but also take into account the ways in which their conduct could (or has) become relevant for, or is enmeshed in, activities conducted by and with others. (p.43)

Though most people like to believe that we are able to pay the same share of attention to the multiple simultaneous responsibilities we engage in, we really can't do it all successfully all the time: We smile while we talk, we talk while we eat, we use an index finger to put people on hold while we chew fast to empty out our mouths to make it available for producing speech, but we always end up sacrificing one activity or the other. As technology invades our lives, it only adds to the number of tasks we attempt to juggle.

Additionally, there is a strong focus in ethno-methodological traditions (Goodwin, 1981, 2000; Schegloff, 1984, 1987b; Lerner, 2002) to account for interactional aspects in multimodal terms. This line of work focuses on how different modes contribute to make meaning in interaction. As mentioned above, I will examine how people arrange themselves posturally in relation to what they are doing and to others, or together. I will look at how these multiple involvements and multi-modal displays are managed via gaze and other resources.

Silent gestures, gaze, body posture, movements of all kinds, and sounds that require visual identification are all potentially important features of the interaction in any setting (Ford et al, 1996). It will be crucial to attempt to see through such symptoms and tools of engagement or disengagement, the doctor-patient relationship, organization of conversation, and participants' orientation to ongoing action or talk (Schegloff, 1984, 1987b; Goodwin, 1980).

In what follows, I summarize my research questions in the light of the above, introduce the parameters for viewing this issue, and relate how I managed to research the dynamics of the human-computer interface in doctors' consultations

2.8 TAKING STOCK: RESEARCH QUESTIONS

Informed by the previous discussion and the context in which the study took place, the research questions that I address are as follows: Broadly speaking, how is the computer introduced into the medical interview and how does it affect organization and structure of the medical interview? And specifically, how does the computer affect the conversation flow, topic development and management of openings and closings in this multi-party frame? In light of the answer to the previous questions, I analyze the effect of computer's presence in the exam room on gaze practices and other linguistic resources that doctors use for managing multiple involvements and the implications of all of these for various participation frameworks. Finally, it will be extremely important to analyze the physical setting in which action is happening. Spatial arrangements matter not only for understanding the relevance and orientation of participants' embodiments around the computer and around each other, but also for how their relationships and interaction frames are negotiated through verbal and non-verbal resources. Answers to the questions above will enable me to demonstrate the computer's role in the medical interview and understand how it shapes the interactions between doctors and patients. It will also form the basis for a descriptive analysis of the verbal and non-verbal resources that physicians use in such encounters. In the end, it will be important to at least ask how our understanding of the doctor-patient-computer conversation could be a basis for designing an Electronic Health Record (EHR) system that combines both technological and human aspects, and shape or guide expectations of bureaucratic organizations in their pursuit of routinizing EHR practice. In the conclusion, I share various recommendations for helping physicians overcome the difficulties of working with the computer in a patient context.

3.0 METHODS, MATERIALS, PROCEDURE & DATA ANALYSIS

In this chapter I describe my methods. In particular, I explain: the study materials; data handling; and the method by which I analyzed the results. Specific challenges to the research are addressed throughout.

3.1. SETTING: THE UNIVERSITY OF PITTSBURGH MEDICAL CENTER

In all medical contexts in the U.S., it is extremely difficult to get access to hospitals for research. The hospital belongs to what Hornsby-Smith (1993) describes as a "closed access group," but the collaboration I established between the Linguistics Department and Family Medicine Department, both at the University of Pittsburgh, helped me gain and negotiate access. It also helped establish trust with managers and other key stakeholders at the University of Pittsburgh Medical Center (UPMC).

UPMC is an $8 billion hospital system headquartered in Pittsburgh, Pennsylvania. It has more than 400 doctors' offices and 19 major hospitals. UPMC has worked with multiple health information technology software vendors to bring electronic records throughout its system (UPMC fast facts, 2010).

This particular study took place at one of the outpatient primary care centers affiliated with UPMC, located in the Shadyside neighborhood of Pittsburgh. It serves thousands of patients each year, and has been using an electronic medical record for many years. It also serves as a residency training center, where experienced faculty train younger physicians. Patients are seen by appointment in 20-30 minute time slots.

3.2 PROJECT PLANNING & ETHICAL APPROVAL

Cassel (1998) draws distinctions between the strategies of “getting in” or gaining access to the field the while underlining also that” getting on” or getting along with participants is also just as important as “getting in.” These steps are highly advisable in light of this research experience as I show below.

After securing Institutional Review Board (IRB) approval[13] on January 30th, 2008, I worked closely with Dr. Jeannette South-Paul, Chair of the Family Medicine Department at UPMC/University of Pittsburgh School of Medicine, to identify a faculty physician to work with before launching the study. Dr. Seth Rubin assisted with patient and physician recruitments. Mr. Mark Valenti, the Director of the Family Health Center within UPMC, helped schedule short presentations during their clinical and administrative meetings at the health center so that I could discuss my research. I also scheduled separate meetings with individual physician participants. In these meetings we discussed mutual benefits and potential advantages of this project for improving healthcare communication. I worked closely with the administrative and clinical

[13] Approval reference number: IRB#:PRO07120006

teams to minimize interruptions and work load. In 2010, round two of data collection went smoothly and also quickly because the center was very welcoming. I realized then the importance of "getting on" with participants.

3.3 PATIENT POPULATION, OPERATION ROOM, AND EXAM ROOMS

Patients were recruited from the outpatient population of the office described above. After meeting with the staff at the health center, I developed advertising flyers that were placed at the front desk on blue paper. These flyers described the study and its aims, as well as the benefits and risks to participants, and IRB approval. A copy of this form is in Appendix F. If patients expressed interest, a nurse came to find me and placed interested patients in a video-equipped room. I then discussed the study with the patients and had them sign consent forms. I also gave them a gift certificate to a common local grocery store chain that has a pharmacy. Physicians signed consent forms at the beginning of the day so they did not have to be interrupted repeatedly.

I switched the video recorder on as each consenting patient entered the assigned doctor's consulting rooms, and off at the end of the consultation. I monitored encounters from a separate room containing a video screen as seen in Figure 1.

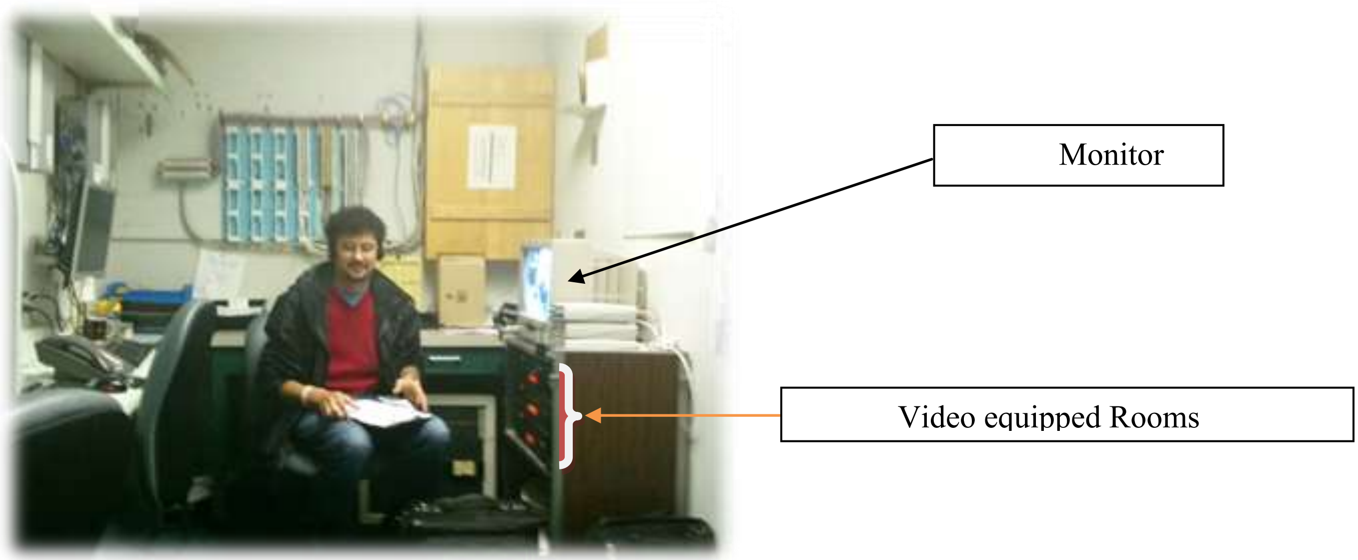

Figure 1. Control room: Encounters remotely controlled through monitors connected to fixed video cams and microphones in the exam rooms

A view of the entire arrangement[14] is shown in Collage 1 below:

[14] Room 18 (bottom right) is slightly different from rooms 9 and 11 because the patient is obligated to sit in the single chair, between the door and the computer. The patient’s chair is located next to the computer and positions the patient in a better visual range that is more accessible to the physician. Room 9 is nearly similar to Room 11, except for the fact that the patient sits to the right of the physician in 9 and to the left in 11.

Collage 1: Camera view from control of the three exam rooms used in this investigation

Physicians came to the control room during the day to notify me whenever they noticed that one of their visits would require the patient to disrobe. Over time, this became standard practice. I also watched all my tapes while they were recorded to not only take fresh field notes, but to also watch for when the physician unexpectedly ordered exams that would require the patient to disrobe[15]. The exams themselves were very basic, and possibility of occurrence of annual check-ups in a visit was pre-negotiated with the physician even before recording started. In addition to filming, doctors and patients alike completed a simple questionnaire[16] about their

[15] For more on avoiding the action in general filming, see Dant, 2004

[16] See questionnaire in Appendices C and D

experiences with computer usage at the end of their encounters. The doctors submitted their questionnaires at the end of the study. The patients' questionnaires were mailed in later.

The placement of the camera allowed for a wide view of the entire room, and there was no concern that patients or physicians would move out of the view of the camera unless they left the room. Though the cameras were not totally hidden, they were very unobtrusive, since they were difficult to recognize as cameras, and were situated in the ceiling of each exam room.

Overall, 37 total interviews were collected and coded. Fourteen were collected during my initial research in 2008, and 23 additional interviews were collected in 2010. Two additional patients were consented, but then not recorded. In one case, this was due to a companion in the room, and in the other, a shadowing medical student.

After collection, each videotape was coded to guarantee the patient's anonymity. Videotapes were kept in a locked cabinet to ensure the doctors' and patients' confidentiality. Videos were individually digitized to ease play back and durability. The videos collected were also checked at the end of each day to make sure technology was working properly and so problems could be fixed before additional collections are made. Additionally, although all participants agreed to use their images and videos unconditionally for research and education, or publication purposes, I still blurred, solarized and pixilated faces of participants as much as possible using both Illustrator C6 and Photoshop. All participants, both physicians and patients, were given fictitious names. Additionally, data was catalogued based on exam room number, first or follow up visit, date and time, and any pertinent observations made at the time of recording.

3.4 TECHNIQUES: RESEARCH BENEFITS OF FILMMAKING FOR THIS STUDY

The audio-visual details available through video recording doctor-patient interactions provide unique ways to assess the social interactions (Timka & Arborelius, 1990). In this particular study, videos captured events around the computer and helped illustrate the ways in which features of the exam-room influence the organization of the human-computer interface. For instance, video allows scrutiny of how talk, gaze, gesture or bodily comportment, and other objects in the room feature in and impact the activity. Looking at moving images with audio also helped to describe both the physical and linguistic multi-modal framing.

Further, according to William Labov (1972), a major challenge to researchers in the field of sociolinguistics is that the task of collecting natural data is undermined by the presence of the researcher. Labov coined the term "Observer's Paradox" to account for this situation. He explained that "the aim of linguistic research in the community must be to find out how people talk when they are not being systematically observed; yet we can only obtain this data by systematic observation." (1972, p. 209). Heider (1976:80, cited in Goodwin, 1981: 42) notes that "normal, naturally occurring conversation…is a relatively low-energy, fragile sort of behavior, which is easily disrupted by the camera." Eibl-Eibesfeldt (1974: 21, also cited in Goodwin, 1981: 42) states that hidden cameras are "a prerequisite for any documentation of natural undisturbed behavior." As mentioned above, the rooms had cameras and microphones in the ceiling and I was observing the interaction from the operations room, therefore the influence of the video recorder on the participants' behavior is minimized. In other words, this arrangement reduces awareness of the unnaturalness of the situation, thereby mitigating the problem of the Observer's

Paradox. To my knowledge, this study is the first instance in sociolinguistic research of observing human interaction using in-ceiling cameras.

It should be mentioned that not all subjects remained oblivious to the camera through the whole episode. One patient, for example, waved to the ceiling cam when leaving the exam room. Three patients referred to me directly, asking why I was not videotaping in the room. In addition, another patient commented on my friendliness during the interview with the doctor and how he did not mind being videotaped. In this instance, the physician thanked the patient for the reminder, since apparently she had forgotten she was being videotaped. Lastly, yet another patient shared with his physician his appreciation of the gift certificate and how it would help him get the medication she was prescribing for him. Despite this evidence of patients and physicians being aware of videotaping, I feel the camera location nevertheless significantly decreased the impact of the Observer's Paradox without straying into the unethical territory of videotaping without knowledge or consent.

Finally, visual media obtained including still images or screen grabs of a fleeting moment on video provide unprecedented opportunities for teaching and research into the dynamics of interaction. The use of images, as Heath (2010) describes, brings about space and context for analysis and discussion. The series of images used throughout this analysis will provide a mental bridge between the frames to be able to envisage the static images as a continuous series. Stills also allow magnification to investigate details and convey motion, such as in comic strips. Still images allow us to freeze a moment in time to examine it more closely and look at the details. For instance, by videotaping a galloping horse and then looking at individual frames, it was possible to establish that a horse has all four hooves off the ground while galloping (Prodger, 2003; cited in Heath, 2010, p. 3). Similarly, by freezing videos of doctor-patient encounters at crucial moments, we can more closely examine posture, gaze, and other physical signals during that moment. Thus, the use of images in this study provides a reliable measure for analysis.

3.5 DATA PROCESSING AND TRANSCRIPTION

Each video was watched several times. On each subsequent viewing, new actions and new patterns were discovered in the details. Managing and reporting all this data became a major challenge of the research. This inevitably led to further questions: How does one select which segments to present out of 37 full-length videos? How much video data is enough? Should everything be transcribed? In this section I discuss how the data were selected for analysis, and the measures followed to determine the deciding factors for choosing data extracts. I will also discuss data transcription and the coding scheme pursued in this process.

3.5.1 Video data management: Determining the analytic frame

Given the overwhelming amount of the information contained in the videos, it was impossible to transcribe the whole corpus. All of the videos were viewed several times, which enabled me to sort out the general underlying patterns in light of the research questions. From this, specific areas with representative data were selected to transcribe and focus my research on.

The selected video recordings were then analyzed in detail using an approach informed by Conversation Analysis. The various patterns that were repeated throughout the videos were noted and then summarized. Relevant segments were annotated to illustrate non-verbal and verbal arrangements around the computer, and segments that exhibited unique patterns or appeared useful for examples were noted.

3.5.2 Transcription

Transcription of any kind is intrinsically problematic. Even when the data is recorded, a problem persists in how to interpret what was said. Given the amount of detail available from audio-visual collections, the process of video transcription becomes increasingly challenging and remains ongoing depending on what the researcher is looking for. Video transcription is also very time-consuming, and it is impossible to transcribe every detail. The video recording also serves as a kind of second-order approximation of actual events as they happened at the setting, a data source which can be examined repeatedly for features that might go unnoticed in a first hearing or viewing (Sacks, 1992). Thus only that which was deemed relevant and important was transcribed.

The transcripts allowed me to evaluate the effect of the computer on doctor-patient interaction at different levels of the interview. For example, I was able to see how the doctor managed multi-party openings and closings with the computer and the patient. It was also interesting to transcribe the various frames in which the doctor activated his or her relationship with the computer and how he or she managed to satisfy both patient and computer needs. These transcripts allowed a description of the participants' verbal and non-verbal resources secondary to operating in such an interface and allowed also an examination of the spatial arrangements of the participants and how these impact the turn-taking system between patients and their physicians

I summarized below how I broke down data to gain a better understanding of it. The exact size of data selected for transcription remained a matter for continuous judgment during my report of results. Interpretation and discussion of these factors also required judgment. In transcribing this information, I defined participants in the interview as the patients themselves or patients in person, the computer (including its various accessories such as the keyboard and mouse), the electronic patient, (e-patient), i.e. the information about the patient contained in the chart, and the doctor.

Each video and conversation contained endless amounts of information that could be transcribed. This transcription coding adopted is far from exhaustive; if a new element was suddenly needed to represent a data segment, I added it between parentheses. But, overall, in line with the priorities I described above, I focused my attention on the following areas:

1- Following the classic transcription system in Gail Jefferson (1984) and Sacks et al., (1974), I began by transcribing basic information such as overlap, simultaneous talk, interruptions, silence, gaps, intonation, and stress.
2- Next, I searched for and underlined markers for turn beginnings, redirecting, and topic shifting.
3- I tried to identify where the primary focus of the doctor was at any given time: on the computer (MD-PC), on the patient (MD-Pt), or going back and forth between them (MD-PC-Pt) in a yaw motion[17].
4- Accomplishing this required me to analyze the doctors' body orientations vis a vis the patient and the computer. The doctors assume a number of positions through a flexible

17 Yaw motion in aircraft terminology is also known as "heading" and determines plane orientation.

keyboard, a flexible chair with wheels that allows side movements. Where necessary, I used still images/video slices.

5- Because I treat the computer as a partner in the interview, it was important to know what it was "saying". Unfortunately, there are no video shots of the computer screen at a high enough resolution to detect exactly what the screen is showing. But external clues from conversation and physician's onscreen commentary often allowed me to guess how the computer was participating. Instead of transcribing computer turns, however, I used images to illustrate its placement and role in conversation and used text to describe what was happening.

6- Generally, transcriptions accounted for some of the main ways doctors activated their relationship with the computer: reading vey silently/gazing, typing and finally onscreen commentary or doctor's talk on the computer.

7- I also was careful to pay attention to silence. But when trying to transcribe the silence, I encountered the problem of attribution. To whom does a silence belong? (Johnstone, p.c. –at a SMILE[18] meeting, Fall 2009). Following Jaffe and Feldstein (1970, Cited in Goodwin, 1981: 18), I treated the silence as a gap or a between-turn silence when not occurring after a question. This decision is questionable and may not be generalizable to all points of the conversation in the human-computer interface, as I explain below. Within a turn, I treated it as a pause, and transcribed it as such.

[18] SMILE is a weekly group meeting on Pitt's campus for those of us interested in analyzing social meaning of language and language variation. SMILE stands for Social Meaning in Language. My research has benefited from several SMILE discussions.

8- As for recording gaze, I used Goodwin's method (1981), and I designed a new system for capturing dynamics particular to the computer. Goodwin (1981), however, only focused on gazing patterns for hearers. Since this work uniquely focuses on the gazing patterns of both hearers and speakers, the speaker's gaze and physical orientation was always transcribed above his or her speech. The hearer's gaze and orientation are described below the speaker's speech in the line labeled (a). A continuous line indicates that the participant is looking at the co-participant. I have used a series of dashes (_ _ _) to show that the doctor is looking at the computer rather than at the patient. A complete transcription guide can be found in Appendix G.

Additional considerations while transcribing included attention to the flow of the medical interview. I examined the role of the computer along transitions or structural units of the medical interview. Understanding this will allow an easier understanding of the following discussion of the impact of the computer. According to the Calgary-Cambridge guide to the medical interview, the medical history takes place in multiple stages: history of present illness (HPI), past medical history (PMH), family history (FH), social history (SH), review of systems (ROS), exam, and closing. Thus, most of the transcribed interviews were then split in the three common stages of medical interviewing (opening, exam, closing) (Heritage & Maynard, 2006; Soudi, 2009a). The exact boundaries of the stages of medical interviews remain, of course, interview dependent, and cannot be uniformly delineated. I summarize these speech events, stages and sequences of the medical interview in Figure 2 below. It is important to realize that most interviews follow this general structure, which impacts the location of the patient and the relationship of doctor to computer. For example, while the opening, including the History of present illness, can take place on paper and be transcribed later, in the closing, the physician must use the computer to enter orders and prescriptions.

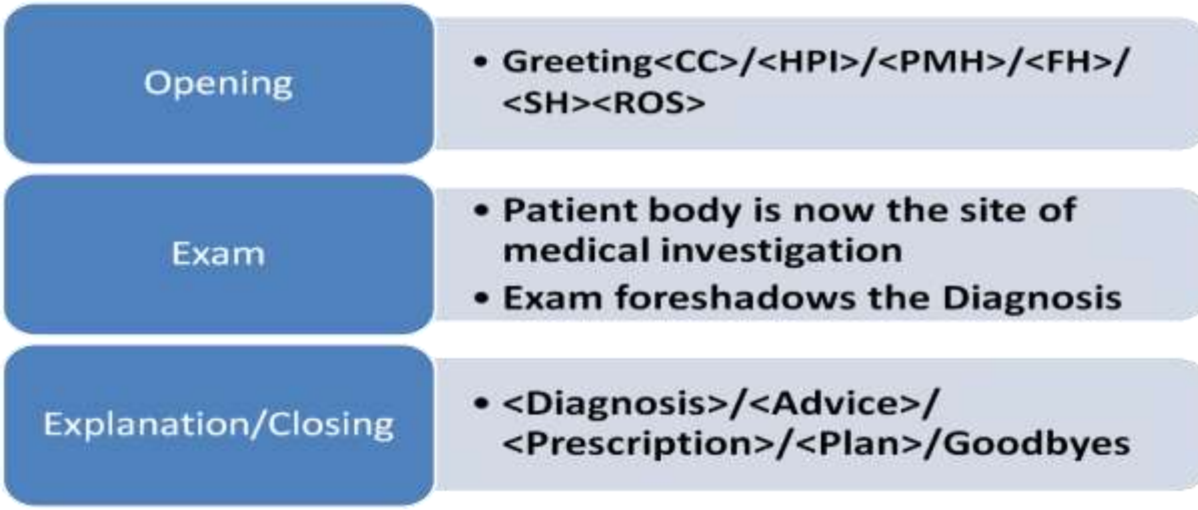

Figure 2. Structural units of a typical interview that doctors are trained to follow during medical training. Boundaries and distributions of units are interview dependent (Soudi, 2009a).

In this work, I considered giving a turn to the computer several times, given its active participation in the progression of dialogue, as explained in section 2.4. The computer had a distinct voice: It contributed constant clicks from the keyboard, and showed a box if orders were not properly tied to diagnoses. Additionally, the computer had on-screen reminders which sometimes blocked the physicians from proceeding until they attended to them. The only thing missing that would have qualified the computer for interactional turns was access to the screen content, which the video did not capture. Instead of transcribing computer turns, however, images were used to illustrate its placement and role in conversation. Text descriptions were also given with the image to describe the surrounding actions as mentioned above.

3.6 SUPPLEMENTARY RESEARCH

In this section, I review research I did outside of the video encounters. I knew that the video camera, while it captured many of the interactional detail I was interested in, could not fully communicate what using an EHR is like for a physician. Nothing can be perfectly reproduced, because every event is colored by things that cannot adequately be captured on the video-camera, such as temperature, mood, and personal experience. As the primary users of the software, it is critical that physicians' experiences and feelings be incorporated in trying to improve the doctor-patient relationship.

In order to better understand, I had a conference call in the Fall of 2011 with the team of Dr. Chrono, a company that specializes in providing EHR platforms, to explore options of having access to their system using fake patients. They agreed to sign me up for a replica account, and I started managing the care of the non-patients to learn more about the process, on screen prompts, patient reminders, e-prescribing and other aspects of the system. I also received a personal orientation to the software to understand the various online forms and steps physicians must perform while conversing with patients. Nevertheless, my experience can never replicate what actual physicians go through.

I also visited Erie Northwestern Hospitals of Erie in my quest to discover alternatives to existing EHRs. After talking with Dr. Jack Anon, I visited the ENT for a full day to watch their use of the scribe system and remote Bluetooth to accomplish the necessary documentation.

This chapter has reviewed the baseline conditions that enabled me to answer my questions. My research developed over time out of my interest in closings in the medical fields. While investigating this, I became more interested in how the computer affects the relationship between physicians and patients, a historic partnership which has now expanded to include the computer. The in-ceiling camera allowed for a unique perspective on the doctor-patient relationship. It was less intrusive than a traditional video-camera or researcher, thus decreasing the impact of the Observer's Paradox, though many subjects certainly continued to be aware of it. In all, I collected and viewed 37 videos, transcribing key parts. In the transcription I paid special attention to the physical framing of the conversation, noises and interruptions from the computers, and the flow of the interview, as well as gaze and other grammars of doctor and patient.

In what follows, I proceed to report my results and analyze my findings. Each research question is addressed separately. I also compare the main questions of my investigation to related studies and contexts or other examples of multiple involvements from daily life to explain even more explicitly the dynamics and competing lines of action in Doctor-Patient-Computer interaction, which remain the primary goal of this dissertation.

4.0 ESTABLISHING THE FRAMEWORK AND CONTEXT ANALYSIS

In this chapter, I examine how the computer affects the conversation: flow, topic development, and particularly management of openings and closings in this multi-party frame. To do so, I will share various interactions from different stages of the interview and discuss the impact of the computer in each specific stage. However, we do need first to establish the framework by describing the rundown of a typical visit in this investigation in order to provide a summary of structural units of a medical interview involving the use of a computer, as well as various organizations in which this new partner is added to the experience. The summaries and generic organizations provided in 4.1 will be exploited in the rest of the analysis to exemplify how the computer is impacting doctor-patient interaction.

4.1 SUMMARY OF VISIT AND GENERIC ORGANIZATIONS

The following breakdown of the visit will elucidate the general frame in which the computer is activated in the relationship which will help us understand how it affects doctor-patient interaction and the structure of the medical interview in general. Just like any other interview, the clinical encounters observed involve the repeated production of particular events and tasks. While each encounter is distinctive on its own, according to the occasion in which it was accomplished, it was possible for me to identify some generic features, units, interactional phenomena and patterns of these interviews on the basis of a detailed analysis of the selected data which is representative of the larger database. I summarize the styles, postures and patterns of physicians, patients and computers in the context of 10 generic organizations in Table 1 in section 4.1.1. The summaries below define the precise localized context in which I answer my questions and define broadly the interview stages at which the computer is activated in the relationship. I will start now with identifying where exactly the computer is activated in the relationship.

The computer claims its place early in the interaction. The sequence of events depicted in Collages 2 and 3 below feature the various configurations between Dr. Spire and Dr. Ceremuga and their computers and patients. Greeting the patient, and proceeding to greet, or at least face the computer, all the while maintaining the conversation with the patient is the first indicator that the physician intends to work with both and that the patient must collaborate with that. This initial action of opening the conversation with both the patient and the physician defines the physician's first attempt at negotiating a "working consensus" (Goffman, 1959, 1969) or tentative agreement that all subsequent talk will be based upon this format:

Collage 2. Row 1: Dr. Spire and Patient Carly.
Row 2: Dr. Spire and Patient Na'vi.

Collage 3. Row 1: Dr. Ceremuga and Patient Lisa
Row 2: Dr. Ceremuga and Pt Tina

The collages above show the physicians' initial actions with both the computer and the patient. Dr. Ceremuga claimed space for herself first at the computer station, then she extended her hand to shake the patient's hand from there[19]. Dr. Spire, on the other hand, greeted the patient first before heading to the computer station[20].

Both strips reflect physicians' regular involvement with both partners in the first minute of the visit. Though greetings vary between doctors, in each case the doctor entered the room and greeted the patient. Sometimes the doctor also acknowledged the patient's reason for visiting clinic that day[21]. Some encounters are marked by a handshake as in Collages 2 and 3 above and a few with hugs. Other encounters included a hello from a distance, marked by a nod, rather than a handshake[22]. The frontal orientations of patients and physicians towards each other last a few seconds and come to a halt as the greeting ends, and the physician turns away to face the computer. Though, this action is likely expected by patients who have been seen in this facility, it is perhaps unexpected by others who have not been interviewed in the context of a computer.

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[19] I can't speculate on the meaning of such varying moves given that they are outside of my research scope, but they are interesting to note.

[20] Although I will not analyze the differences in interviewing styles between the two physicians, these stylistic differences must have implications for the progress of institutions moving to paper-free clinics. Physician participants entered additional data occasionally outside of the recorded interviews according to the questionnaire. Given physician's varying styles around the computer it is very crucial to note that the impact of the computer on the interaction might vary from one encounter to the other because in many encounters Dr. Ceremuga does not actually log in to the computer right-away even if she seems to be facing it. Based on my observations, this seems to happen especially with new patients (Row 1 in Collage 3). She faces the computer screen but starts with a paper chart[20]. She appears to continue to jot notes throughout the interview on paper, later typing them on the computer. Additionally, Dr. Ceremuga sometimes socialized with the patient while typing, since she was typing up notes and not actually "interviewing". In Row 2 of Collage 3, Dr. Ceremuga activates the screen but initiates the encounter with the paper chart for about thirty seconds, and after that she turns back to the chart facing the computer.

[21] This is usually based off patient's preliminary information or charts they fill before being seen

[22] For more on dyadic greetings, head, face and trunk displays see Kendon, 1990

Once the doctor is ready, the patient is prompted to expand on the purpose of his or her visit, while the physician listens and take notes as necessary. The doctor greets the computer with multiple gestures, including placing his or her feet under the desk station and right hand on on the mouse in a "handshake" as in figure 3 below. Another way the doctors greet the computer is through entering their log in on the screen. They also adjust the screen or computer's "face" to secure a more comfortable position:

Figure 3. Encounter between Pt. Carly and Dr. Spire in process of activating log-in screen and adding the computer to the meeting

The computer's screen opens up, acknowledging that it also recognizes the physician's access credentials, while the doctor in the meantime continues with the medical interview. On some occasions[23], the greeting of the computer overlaps doctor-patient greetings, which is not typical of human encounters in general. This is because when an individual turns away to greet another person, he or she has to close the pre-interactional with the first person most of the time. In this human-computer interface, however, is possible and allowable because the computer in this setting does not require a voice greeting, only a typed login username and password. It is,

[23] There are a few exceptions where the greeting on the computer does not take place until well into the interview. This happened in particular with two patients who were new to this facility.

nevertheless, this exact overlap that is the focus of this discussion, as it is a feature of interaction sustained throughout the interview.

At this time the computer is up running and in "conversation" with the doctor. The physician pulls up the patient's history on the computer — the current patient's electronic representation, or electronic patient (e-patient) (Soudi 2010b). The doctor starts updating the software fields following the medical structural units outlined previously and navigating the history of the e-patient. At the same time the doctor also listens to the patient in person, and further interviews them to extract more information as required by the medical interview and the software. Figure 4 below illustrates these dynamics of partners in competition for the physician's attention: interview protocol, software application, patient in person and e-patient.

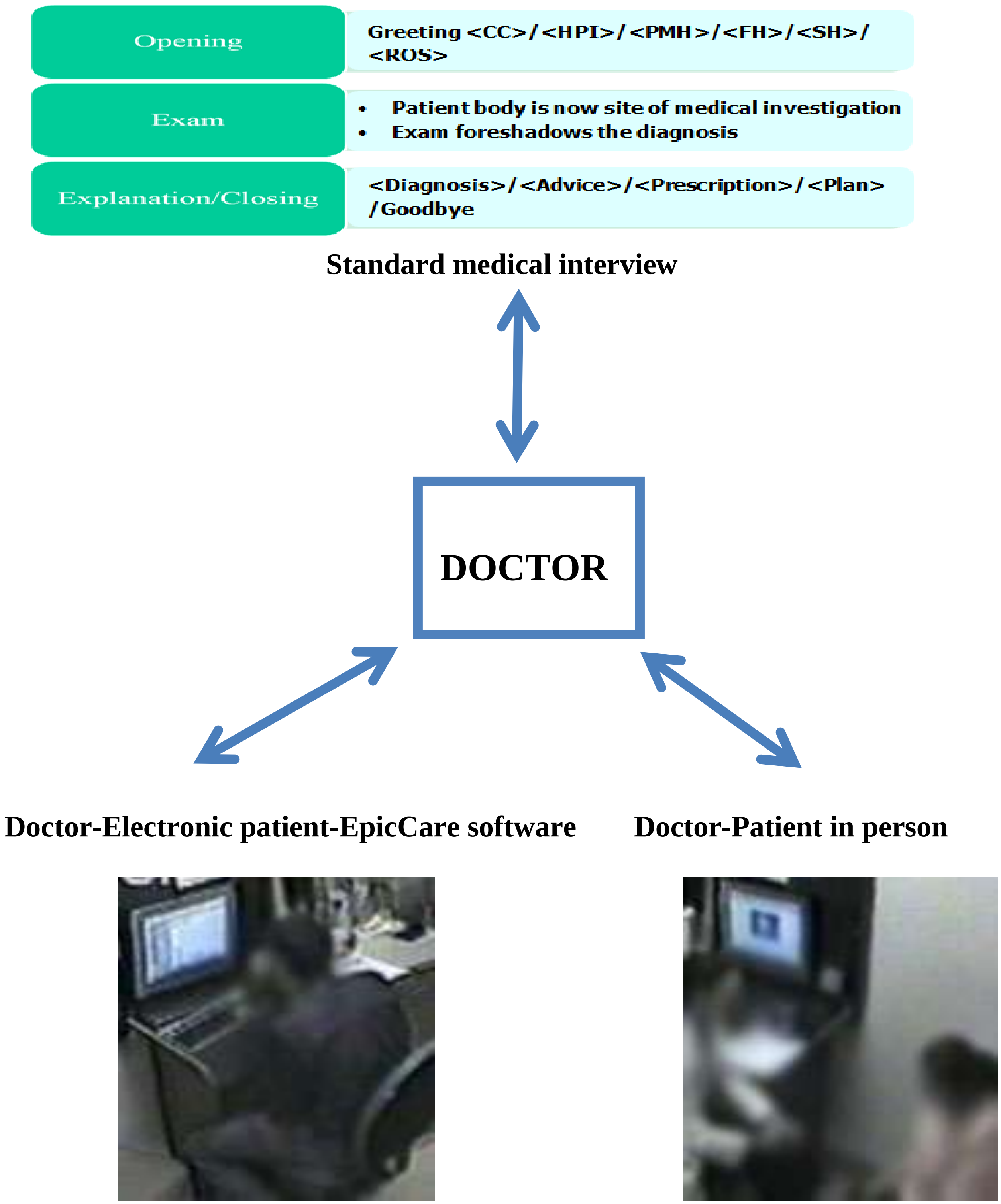

Figure 4. Doctor involved in multiple courses of action

Figure 4 above shows competition and overlap of several agents in the room: The standard medical interview which provides the doctor with the methodological scheme for conducting a medical interview, the patient in person, the e-patient and clinical data documentation system. These partners have different, often conflicting, agendas: the patient is trying to get care, the doctor is working in an increasingly compressed schedule while trying to keep up with an increasing amount of documentation requirements; the computer has recently barged into this previously complete dyad, with reminders and checklists. The physician is responsible for managing the interaction and must work with both the computer and the patient. He or she must update the patient through information located on the computer by looking up lab results and histories or findings from past visits. The physician must also update the computer by logging in new information presented by the patient.

The machine demands attention from the doctor, supplying an almost overwhelming amount of information and requiring the completion of its multiple internal checklists. This competition for attention and primacy of goals leads to even more asymmetry in the exam room. Additionally, the physician must elucidate any areas of the history that were unclear by asking further clarifying questions, communicate their findings, formulate a plan with the patient, and bring together all the necessary things to carry out that plan. This often includes: laboratory and imaging testing, return visits, referrals to specialists, and prescriptions. At the same time, doctors' rushed schedules prompt them to move the interview forward to attend to other patients waiting to be seen.

The physician's interaction with the computer leads to a division in labor between the physician's embodied resources: The physician's hands are now available for typing on the computer and gesturing to the patient by way of grounding his or her verbal presentation.

Sometimes the hand is also used to signal the physician's involvement with the computer, point to the screen and reach out to the patient's paper chart. Hand and arm gestures also accompany the physician's speech directed at the patient to facilitate the patient's comprehension when things seem ambiguous and also to indicate his/her involvement with the patient. The physician's voice, and occasionally hand gestures when the physician is reading on-screen information, are available for both engagement with the patient, but also for protecting the interaction with the computer. Physicians also point to the computer sometimes to communicate their need to look up information or type.

The physician's gaze is divided between the computer and the patient. This exchange of glance/gaze at the patient while using the computer is consistent throughout all the data. This fleeting look or peek into the patient's domain is similar to Goffman's observation (1963) that an exchange of glances is one of the ways individuals give one another "clearance" for further interaction, and perhaps in this case, for temporary availability for collaboration. Goffman's concept was mostly applied to greetings (See also Kendon, 1990). In this context, however, the continued patterned occurrence of this sideway gaze also stands as an explicit acknowledgement of assurance and interest in a continued companionship with the patient, despite the fact that the physician might seem temporarily busy with the computer[24].

The responses to the doctor's questions throughout the interview fill the required fields on the computer which also legitimizes the doctor's gaze back at the computer. The physician transcribes the patient's response. The physician asks more questions while still typing, the patient answers more questions and the doctor controls the length of the responses so as not to

[24] I will expand more on gazing and speaker-hearer relations in section 5.0.

fall behind on typing. Sometimes the DGAP (doctor gazing at patient) time starts to decrease if the physician actually falls behind on typing. For some patients, though not all, this decrease in gaze occasioned by the physician's intensive labor on the computer leads to a decline in the patient's contribution to the conversation. The patients' willingness to break into the MD-PC domain depends also on how long the patient has known the doctor, their familiarity with or adaptability to the working consensus around the computer, their personality, and the conversation activity. Physicians also redirect the patient to provide only pertinent information, reducing the amount of intake through various linguistic strategies, which I explain in 5.0.

Together the physician and patient negotiate the physical and verbal framing of the interview, establishing jointly the format in which this seeking of medical advice will take place. The doctor gazing at computer (DGAC) is placed on hold when the visit requires an exam. In such organizations, the physician breaks his or her relationship with the computer to attend to things that require more attention than just a sideways gaze or a yaw motion. Then they move to the physical exam portion of the interview, and the computer is ignored for a time[25].

Towards the end, the physician asks the computer to conclude the visit by writing a prescription, printing a visit summary, and ordering additional medical tests. The computer sometimes challenges the doctor's authority to close when it raises new topics as I explain in section 4.2 below. The medical interview ends. The physician logs off and the patient and physician walk out, leaving the computer behind in the scene, and disappear from the view afforded by the camera.

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[25] Doctors shared that sometimes they did not use the computer because they decided to enter information later in order to focus solely on talking to the patient (this is supported by questionnaire)

4.1.1 Generic organizations and structure of medical interview

Based on the above report of the overall structure of a typical visit, the medical interview in this human-computer interface generally proceeds following the gaze and verbal order of moves described below (a); the physician leads the interview and redirects the patient as required by the PC, doctor or the patient and the context of the action:

(a) Gaze and verbal moves:

----> Doctor greets the patient
----> Doctor greets the computer (sometimes simultaneously as he or she greets the patient and elicits CC/HPI
----> Doctor pulls up patient's electronic chart (paper will do for some occasions to get the interview started for new patients)
-----> Doctor gazes away from the computer (DGAWC) as he or she prompt the patients with a question or statement
----> Doctor gazes at the patient (DGAP) to secure a reply; patient might also be gazing at the physician (PGAD) to provide a reply resulting momentarily in mutual gaze (DGAP-PGAD=MG)
-----> Doctor gazes away from the patient (DGAWP) and back at the computer to enter the reply (or verify the reply against previously entered data)
-----> Doctor confirms patient's questions against PC data where applicable
-----> Doctor proceeds to next question/step (dictated by either the computer, or medical interview
----> Exams (on table or by the computer's station) will break the MD-PC relationship as will interaction frames wherein the patients suffer from depression or traumas that require a human touch/attention

Below, in structure **(b)**, I summarize gaze grammar referenced in **(a):**

(b) Gaze structure:

Greetings, DGAC#1(home or rest position[26] *(HP)), DGAWC, DGAP-PGAD (MG), DGAWP, DGAC#1 (returns to HP)*

Between DGAC#1 (home position) and DGAP (DGAWC or DGAWP) there are other secondary or intermediary departing moves where the physician's gaze stops somewhere halfway

[26] I expand on this point in section 6.2

between the computer and the patient, and travels back and forth from that point towards either the patient or the computer. This halfway zone allows for quick transitions[27].

Based off (a) and (b), the very basic verbal structural unit of a medical interview mediated by a computer consists of four regularly occurring steps and proceeds as follows:

(c) Basic structure of computer-mediated medical interview:

(1) A physician's question (gaze resting on computer's field, or on MD-Pt domain, or split over two domains), (2) a patient's response which involves gaze away from MD and gaze back towards the end the turn (3) the physician's response to the patient (4) MD-PC turn, typing up of the response.

The response usually begins with an assessment followed by a second question or simply a minimal acknowledgement to allow them to type. These steps above might overlap with each other in varying degrees as I will show in the interaction frames in 4.2.2. The asymmetric structures depicted above (a,b,c) reflect the same classic pre-computer conclusions on doctor-patient asymmetry represented in (1) (Mishler 1984, Heritage & Maynard, 2006).

(1) Classic characterization of the medical interview:

Dr.: (Symptom) question
Pt.: Response
Dr.: Evaluation or acknowledgement (e.g., "Ok") and/or Next question

The introduction of the computer, however, has two opposite effects which might also vary from one encounter to another. On one hand, it adds additional dimensions of asymmetry where some patients remain at the mercy of the doctor's gaze and questions in order to accommodate both the needs of the medical interview and the needs of the computer. On the

[27] I will elaborate on this type of action in section 6.2. I will also expand on gaze behaviors and the linguistic resources that make such transitions possible in chapter 5.0

other hand, the computer might also serve as an asymmetry reducer for some patients who are able to interject additional concerns when the physician is busy on the computer. Based on my observations, this enables some patients to self-select themselves as speakers. Whether these concerns will be attended to with the physician's fullest attention or not remains another story.

The summaries (a-c) above are not always rigid, and it might well be that DGAC is not always the home station of action, because that also depends on the conversation, organization of turn-taking and generic organizations depicted in Table 1 below. Sacks et al (1974) confirms how the turn-taking system adapts to or is constrained by the activity it operates on. Since turn-taking systems, as Sacks (ibid) argues, are used to organize very different activities, "it is of particular interest to see how operating turn-taking systems are characterizable as adapting to properties of the sorts of activities in which they operate" (p. 696). To provide such characterization and show how the system works in this human-computer interface, I locate various generic organizations[28] in the 37 medical interviews collected. This framework narrows down the context for each sort of activity, and illustrates how the system operates and adjusts itself, allowing for conversation to continue smoothly[29] throughout the medical interview.

The organizations in Table 1 will be exploited in the contexts of transcripts to give a clear picture of the following: how the talk is distributed in particular interfaces among participants (MD, Pt, PC); the sequences in which the talk moved from one participant to another or was held by a single party; and the way such transfer to the computer or patient or retention by the physician was coordinated or managed in this particular human-computer interface, and finally

[28] These are simply idealized types of interactions or regularities which I managed to distill by watching interactions and examining transcripts.

[29] Conversation going smoothly does not mean that the computer is not impacting negatively the interview and it also does not mean the interview is not asymmetric

the implications of entering into MD-Pt or MD-PC formations for the doctor-patient relationship. These generic organizations may or may not all occur in one single interview, but sum up most ongoing frames representative of interactional phenomena (sans greetings):

Table 1. Generic organizations (1-10)

	Description of Participants' arrangements, actions and implications for gaze and focus of interaction
1	MD *exclusively* interacting[30] with PC. Pt occasionally interrupts this configuration through inviting the MD to gaze at ailing area by computer area (e.g 7). Exclusive gaze at PC
2	MD *predominantly* interacting with the Pt while continuing to work on PC only to look up or input new information. 2 is MD or Pt initiated.
3	MD *predominantly* interacting with the PC. There may be sporadic gazes at the patient to communicate availability and secure necessary responses etc
4	MD *exclusively* interacting with the Pt and disregarding the PC. Exclusive gaze at Pt. The duration is usually controlled by the MD who must move conversation forward, redirect the Pt or reactivate the PC into the relationship as needed etc
5	MD interacting with both PC and Pt. MD oscillates between PC and Pt through yaw motion. Depending on how quickly the MD needs to type information on the PC, MD's gaze may only reach the halfway point between PC and Pt
6	MD examining Pt on exam table. This is always initiated by MD, computer left out.
7	MD examining Pt by PC area. This can be initiated by MD. Occasionally, Pt forces entry into the MD-PC domains such as 1 and 3 by inviting the MD to look at their ailing body part.
8	Pt remains on exam table. MD on PC to finish closing the charts with <u>no</u> further interviewing. This is typical of post-exam stages occurring near the end of the interview.
9	MD on PC to finish closing the charts. Unlike 8, MD continues the interview either by oscillating between Pt and PC, or by fully facing Pt on exam table to review exam findings, etc.
10	Physical parting. MD at this point has already logged off the system, brought back transcription notes and is in process of saying goodbye to patient.

[30] I break down the MD-PC relationship/interaction into three broad frames: typing (loudly, or quietly), gazing/scrolling or skimming silently, engaging in an on screen commentary or reading aloud electronic charts. I will expand on this point under gaze

Collage 4, below, provides visual representations of the above generic organizations which will also be exploited to evaluate how the computer impacts the interactional space between the doctor and the patient and the implications of the MD-PC face-to-face arrangement for turn-taking and participation framework.

It is worth noting that these organizations embody only the primary interactional phenomena needed to describe the dynamics of medical interviewing between doctor, patient, and computer. While other types of interactions may exist, they were not prevalent in the research conducted, and furthermore, describing innumerable configurations of relationships would be deleterious to the systematic description of these interactions. In addition, these other types of communications are not as easily discernible or isolatable as the descriptions above.

1: MD exclusively gazing at PC

2: MD predominantly addressing Pt

3: MD predominantly addressing PC

4: MD exclusively addressing Pt

5: Yaw motion. MD oscillates between PC and Pt.

6: Exam on table

7: MD examines Pt by PC

8: Post-exam

9: Post-exam DGAP

10: Physical parting

Collage 4. Video slices[31] for the generic organizations 1-10

The series of still images between Dr. Spire and Pt Na'avi in collage 5 below allow us to freeze continuous moments from the organizations depicted above where the patient in this context progressively breaks into the MD-PC frame. The patient takes his socks off to show the physician the location of pain and skin discoloration, forcing the doctor to place the computer on hold. These screen grabs show from left to right a movement from exclusive or predominant use of the PC (generic organizations 1 and 3) to interaction with both (5) to predominant and exclusive interaction with the patient (2 and 4) upgrading matters to an exam by the PC station (7). While the exam on the table (6) is always initiated by the doctor, this example shows that exams by the PC station may be requested by the patient. It also shows the active work by

[31] some postures possibly exemplify multiple interaction frames, but again that is why I referred to the arrangements above as generic organizations

patients and an orientation that the patient is requesting full attention from the physician. Some patients are able to break the doctor-computer interaction in the same way the computer can also break the doctor-patient frame:

Collage 5. Screen grabs from the opening stage between Dr. Spire and Pt Na'avi

The strips above also show how local context and participants' negotiation of meaning determine how interaction unfolds as well as the appropriate generic organization. Collage 5 also shows clearly competition between the computer and the patient over the doctor's attention. Doctors are struggling to accommodate the needs of both computer and patient by shifting attention to one or the other or focusing conversation completely with one at a time even for a very limited duration.

4.1.2 Conclusion

The summary of visit, its structure and patterns in addition to the generic organizations observed within a typical interview elucidate the general framework in which computer is activated in the relationship and help show where it impacts doctor-patient interaction and the structure of the medical interview. The organizations illustrated above, particularly collage 5, show, in turn, the physician's effort to split attention between the patient and the computer. This strip shows that the doctor-patient frame might also affect the progress of recording on the computer. They show how context might interfere with the use of the records, and reveal ongoing competition between the patient the computer over the doctor's attention.

Physicians are simultaneously performing multiple tasks during an interview. Ultimately, the responsibility falls on the doctor to manage and control interactions with their patient and with the computer. The decision concerning when to use the computer rests with the physician and occasionally the patient, too.

The generic organizations in Table 1 show how participation frameworks are "consequential for a range of phenomena central to the organization of human interaction" (Goodwin, 2007, p. 70). They exemplify a range of embodied practices through which participants coordinate their involvement in multiple, simultaneously relevant, unfolding activities. In the contexts shared below, they will be used to illustrate the ways in which participants use verbal and non-verbal resources such as head movement, body orientation and gaze practices to negotiate meaning and manage the intersecting demands of multiple involvements and the spatial arrangements or physical space in which these involvements are conducted in the context of the computer.

4.2 CONVERSATION FLOW, TOPICAL DEVELOPMENT AND MANAGEMENT OF OPENINGS AND CLOSINGS

Having established the framework and summarized the general context in which the computer affects doctor-patient interaction, I will proceed to exploiting this framework in order to investigate how the computer affects the structure of the conversation flow, topical development. I will primarily focus on two significant stages of the interview, openings and closings, and build off those observations thereafter to answer additional research questions. I will refer to gesturing and gaze only briefly as they become relevant in the contexts below, but I will expand on these items in more detail in Chapter 5.0. The contexts shared here are also representative of the main interactional phenomena observed in the data and, as such, will help to illustrate the overall impact of the computer in various stages of the interview throughout the data set.

4.2.1 Contextual configurations during the opening

First, I examine an encounter between Dr. Spire and Patient Kevin from the opening phase: chief complaint (CC). Let me provide a brief background about this meeting and also about the patterns observed not only in this interview but also in the rest of medical interviews: Patient Kevin, like other patients with many concerns, has many questions and concerns, but does not necessarily present them as a cohesive package. The doctor in this interview is working with a list of diagnoses throughout the patient's history; a history that the doctor is constantly refining and that helps to drive both his questions and the exam as a whole. It seems like this is a pattern and a protocol that doctors follow across all interviews.

In this specific encounter, Dr. Spire's redirection, clarification and complaint-soliciting do not help him to further understand the patient's pain, because the patient is unable to be specific and goes off topic. The review of systems (a part of the interview designed to elicit overlooked symptoms that may be important) is lengthy and causes detours that are not pertinent to the present complaint. Thus, the doctor ultimately suggests performing a physical exam on the patient.

It is at the post-exam stage that the doctor and patient communicate a narrowed list of possible diagnoses and outline the additional steps that must be done to determine the final diagnosis and decide on the course of action. The doctor further escalates the interview and moves it forward to the closing by suggesting a prescription. A prescription for drugs or further testing and exams or therapy sessions all validate the diagnosis. The prescription stage is a clear indication that the doctor has reached a verdict and is simply writing a note to deal with the diagnosis. The completion of typing up the prescription concludes the treatment stage of the activity and thus constitutes a closing-relevant environment (Heath, 1986). In the videos watched, many patients start preparing for departure after the doctor mentions that he or she sent the prescription notes to the printer. When the doctor leaves to get the printed notes[32], many patients seem to be ready to leave unless they, or the doctor, decide to raise a new topic (Barsky, 1981; Robinson, 1998; Soudi, 2009a; White et al, 1994; Zoppi, 1997). But, their ability to leave is sometimes dictated by the computer as I show below how the computer competes with the closing by raising new topics as well.

[32] I understand that as E-prescribing is now required by law, most doctors no longer print the majority of their prescriptions as they go directly to the pharmacy. However, Dr. McCague shares that this adds the step of discovering what pharmacy the patient is using. She also adds that for some of her poor patients with diabetes, she would send their HTN to certain drug stores where they are free, and others to the on-site pharmacy or CVS or whatever was cheapest. She also reports that she sent transcription to 2-3 different pharmacies in one visit before.

Extract 1, below, features various generic organizations 1-4. The doctor seems to be shifting focus between the doctor and the patient. Just like patient N'avi in collage 5 above, patient Kevin eventually manages to break the MD-PC arrangement in later stages of the opening, which leads to generic organization 7 or exam by computer area. Part of this extract also demonstrates how the yaw motion is exercised. This is typical of generic organization 5 which exhibits doctor's stream-lined transitions back and forth. Refer to appendix G for the transcription codes.

Extract 1:

1- (Pt gazing at the doctor and narrating what led to his pain)
[[
2- Dr. Spire: ___>>>.X<<<. X________>>
So that hit your shoulder?
2a- Pt. Kevin: _______________________
3- Pt. Kevin: ___________________________________
<Yeah> hit my shoulder and my head (xxx)
3a- Dr. Spire: : _
4- Dr. Spire: _ _ _ttttttttttttt
Okay
4a- Pt. Kevin: (no gaze, patient is looking down)
5- Pt. Kevin: (patient is looking down)
Mostly my shoulder
5a- Dr. Spire: tttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttt
6- Dr. Spire: _
Was that the same shoulder that was already bothering you?=
6a- Pt. Kevin:….____
7- Pt. Kevin: _______________,,,
=hehehehe-**yea(h):ah (xx)** heheheh
7a- Dr. Spire: _ _ _ _ _ _ _ _ _ _ _ _ _
8- Dr. Spire:_ _ _ _ _ tttttttttttttt
alright
8a- Pt. Kevin: ..__________
hehehe
9- Pt. Kevin: ____
you know (xxx) it's just hard for me to heheheh-laugh-hehehe
[
9a- Dr. Spire: ttt<<< .X__>>>_ _ _
10- Dr. Spire: _ _ _ _
Ri:ght=

10a- Pt. Kevin: ____
=hahah
11- Dr. Spire: __ _ _ _ _ _ _ _ tt
<sometimes you might have to laugh or else you might cry>=
11a- Pt: Kevin: ____
= hehehehhe
12- Dr. Spire: _ _ _
>**So:**<=
12a- Pt. Kevin:
13- Pt. Kevin: … _________________,,,
=I have done that one hehe
[
13a- Dr. Spire: _ _ _ _ _ _ _ _ _ _ _ _ <<<X__>>
heh
14- Dr. Spire: _ _ _ _ __ _
Alright, **so u:m, s**-this thing hit your shoulder and **now, now** your shoulder is hurting
14a- Pt. Kevin:…. ____
15- Dr. Spire: _ _ _ _ _ _ _ _ _ _ <<(.1)__>>>
you worse, **ehn?**
15a- Pt. Kevin: __________________
16 - Pt. Kevin: _________
(.1) %**yea:h%**
16a- Dr.Spire: _ _ _ _ _ _ _
17- Dr. Spire**: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ tttttttttttt**
okay, u:hhhhhm, okay(.4)

Positioning of Doctor's lower body segments communicates long term prevailing orientation to the PC

Figure 5. DGAC, body orientation, and reactive particles show his continued engagement with the e-patient on PC

I proceed now to analyzing some of the verbal details of the extract above in order to show how turn-taking is negotiated around the computer in the opening or information gathering stage. In this extract, Dr. Spire is guiding the patient in order to locate or at least narrow down the area of his pain, as he listens to the patient's narrative and types his responses at the same time. Following a burst of laughter initiated by the patient as he describes how his already injured shoulder was hit again, Dr. Spire redirects talk back to the pain. Dr. Spire uses various markers (so; ri:ght; okay; alright) and other cues to manage turn taking between himself, the computer, and the patient, as well as to coordinate speaking roles. Following Duncan (1972), these cues can be categorized into: turn-yielding cues, back-channeling cues, and turn-maintaining cues, in addition to what Wiemann and Knapp (1975) identified as turn-requesting cues. To advance his interactional agenda, Dr. Spire initiates his sequence with an inferential "so," in line 2 drawing a connection to the patient's statement about his pain. This same turn ends with a question, which indicates his readiness to relinquish the floor to patient Kevin, thus serving as a turn-yielding cue. This turn sets a topic for discussion: The question serves as a "topic sequencer" or "topic beginner" (Schiffrin, 1987), and also as an organizer, given Kevin's earlier detours. Patient Kevin responds in line 3, which is followed by a doctor's "continuer" of "okay" (Schegloff 1982), indicating "passive recipiency" with the patient, or a back-channeling cue. This continuer, "okay", affords Patient Kevin the chance to expand while Dr. Spire maintains active "speakership" with the PC, as he upgrades his action from gazing at the screen (line 3a) to typing (lines 4,5a, 8). The "continuer" gives the patient another opportunity to extend or post-modify his earlier statement that indicated the acuteness of the pain in his shoulder.

An analysis of Dr. Spire's turn taking shows his commitment to staying on topic by regaining the floor, using terms of reference, and utilizing back-channel turns. Dr. Spire's turn in line 6 prompted the patient to laugh. Dr. Spire attempts to recover the conversation with his "alright" as he continues to gaze at the PC. This marker is intended to regain control of the conversation and bring it to the topic he had begun in line 2 — the "main sequence" so far. The patient, however, continues to laugh, and Dr. Spire back-channels the event once more, in line 10, displaying his understanding of the patient's laughter while also maintaining his position in relation to the PC. He reinforces his position by resisting full engagement in the laughter. Dr. Spire remains almost entirely focused on the issue at hand, though he joins the laughter very briefly in line 13a as he gazes quickly sideways at the patient. Dr. Spire's attempts to go back to the main sequence are evidenced by his multiple "turn requesting cues" in lines 8, 12 and 14. However, the patient keeps inadvertently suppressing Dr. Spire's requests with the pauses filled by his laughter.

The vowel lengthening in lines 10 and 12 shows that Dr. Spire is also holding a turn on the computer to process information. The doctor also turns back to the patient right at the end of line 13a to display orientation to the laughter, but with limited potential or intention to participate in it, as mentioned above.

In line 12, the doctor's turn is initiated by what looks like a 'stand-alone' "so" — a marker that Raymond (2004) discusses extensively as a tool deployed to recover conversation from overlap. It is a stranded 'stand-alone' in this context because the clause that would adjoin it has been postponed to line 14, when the doctor finally manages to secure full access to the turn using the adverbial marker "alright" as a turn-beginning to regain control over the conversation after this recent turbulence and resume the main activity from lines 2 and 6. Basically, he suspended completion of his turn before proceeding to further business, knowing that Kevin's response to his first pair part in line 11 was imminent. Dr. Spire who continues to gaze at the computer ends his sequence in line15 with a turn-yielding cue; his "ehn" produced with high intonation marking it as a question is also followed by a short gaze to motivate the patient's slightly delayed response in line 16. Participants in a conversation can suddenly orient themselves to a very brief silence in a conversation characterized by latched talk.

In line 16, the patient issues a parallel token response to the one he issued in line 7, although the token shape in line 16 is different. A laryngeal activity inhabits the patient's "yeah" this time: a creaky voice broken off immediately with a breathy tone which may be meant to act out or indicate the pain. The patient's creaky voice is a minimal response as it is not accompanied by other speech and indicates passive recipiency (Jefferson 1984), which might serve to show that the patient has nothing new to add to this topic. The patient's response gives an indication that he supports the doctor's summary and also relinquishes the floor to him. The doctor accepts the conversational floor but, not yet knowing what to do or say, he continues to gaze at the computer as he figures things out on the screen and holds the floor with a long space filler "U:hhhhhm" as in line 17. Space fillers are common throughout the doctor's interaction with the computer since they enable the doctor to neutralize any floor-yielding signals he is displaying with them. In this way, they function as 'attempt-suppressing signals'. Dr. Spire also does not seem to be typing when talking as seen in lines 4, 8, 11, 17. He usually gazes at the computer while he speaks and then falls silent to type.

Figure 5 above puts the multimodal analysis into a visual format. Dr. Spire seems to be focused on the computer, trying to complete the information extracted from the patient while acquiring more from the e-patient. Likely, this is an attempt to connect the pieces together between the e-patient, the patient in person, and his own insight as he continues to formulate his analysis. As the image shows, Dr. Spire's body orientation and reactive particles such as *okay, u:*

hhhhhm in line 17 show his continued engagement with the computer. Another version of this space filler "u:m" which buys a time-out with the computer also occurs with phrasal breaks intended to hold the patient's attention and a simultaneous turn with the computer as in line 14 repeated below with phrasal break marked in bold:

14- Dr. Spire: Alright, **so** u:m, **s**-this thing hit your shoulder and **now, now** your shoulder is hurting

These frequent reactive sound/space fillers "u:hhhhhm/u:m" are primarily used to buy time with the computer, but have other potential functions. Because they occur in this context mostly in organizations 1 and 3 where orientation or focus are more on the computer or equally on both the patient and the computer as in organization 5, they may serve as a back-connective device that enables the doctor to return to previously initiated conversations with the computer, or at least to bring the conversation back home: MD-PC. In figure 5 in line 17 above, this space filler also follows a minimal response, "okay", which functions as a receipt token but also as an "ineffective continuer" as I explain below. The [okay + u:hhhhhm] configuration displays the physician's continued orientation to the screen but does not provide a clear follow up on the content of the doctor's next move. These tokens consume an opportunity to produce a longer spate of talk and additionally note that a not-yet-complete moment of talk is underway; therefore, a token gives the doctor a chance to finish work on the computer and limits the size of talk on the table by enabling him to hold the floor in order to interact with the computer. The sequence helps to minimize pause and even appears to fit what Jefferson (1984) called a "perverse passive": the doctor's movement to speakership is relevant but not happening "directly" with the patient, instead it is activated with the computer. "U:hhhhhm" occurs earlier in line 14 (with a shorter duration, u:m) alongside the slightly dismissive adverbial “alright.” “U:m” or “U:hhhhm” are suggestive of the fact that the doctor needs to return to the original ongoing activity or the main sequence after this break (See Jefferson,1972). The patient’s prior utterance is positioned as “a side sequence within an on-going sequence” (Jefferson 1972: 294). The moves prior to such tokens (so + u:m, or okay/alright + u:hhhhm) could also arguably position the patient’s expansions as detours or “insertion sequences” (Schegloff 1972, 2007), which inevitably demand that the conversation must return to the base at some point. This seems to explain the computer and the doctor’s ‘topic sequencer’ described above.

Additionally, these space fillers produced while interacting with the computer enable the doctor to remind the patient that the computer has a turn in the conversation as well. Because the computer’s turn is hardly ever available to the patient (or the analyst), it becomes extremely difficult for the doctor to manage it and for the patient to participate in it as I show in sections 5.2 and 6.0

From this point in line 17, Dr. Spire moves on, transitioning and transferring talk back and forth between the patient, the computer and his self-analysis, but he continues to orient himself to the computer, which remains the “dominant involvement” or the main line of action (Goffman, 1963). As the interview progresses, he inquires about the location of pain, and redirects the patient in order to attend to the original question of narrowing down the precise location of the patient’s pain. Dr. Spire continues to use minimal responses in an attempt to communicate engagement without falling behind on typing. In the middle of all of that, the patient provides examples from real life such as carrying grocery bags to show how this is affecting him and to help describe the pain and make a case for his condition[33]. In Figure 6 the patient gestures to illustrate the example of being on the phone and how his hands get locked as a result of that motion. The doctor turns[34] his gaze away from the computer to attend the patient's demonstration and help construct the activity in progress as shown in Figure 6:

Extract 2:

1- Dr. Spire: tttttttttttttttttttttttttttttttttttttttttt (typing Pt's prior responses)
1a- Pt Kevin: (Pt looking away)
2- Pt Kevin**: …**______________________________
I was on the phone like this
[
2a- Dr. Spire: ttttttttttttttttttttttttttt<<.**X**______
uhuh

Figure 6. Patient Kevin prompted to expand on his HPI. Doctor gazes away from PC to Pt to communicate his availability.

[33] This perhaps marks the patient's affective stance. For the key stances see Goodwin (2007:70-71)

[34] The doctor's turn represents a visual display which marks a cooperative stance to sustain or help construct activity in progress (See Goodwin, 2007)

In Figure 6, the patient breaks the MD-PC interaction. Patient Kevin has just been prompted to expand on his HPI. The re-orientation of the doctor, from the e-patient to the patient in person, gains its significance by virtue of the patient holding a sequentially appropriate response. The patient's sequence, "I was on the phone like this," forces the DGAP frame to occur because it holds the doctor responsible to expert-witness the act and represents an orientation to the summoner (See Goodwin, 1980, p.80-81). The patient is signifying an action verbally and non-verbally that the doctor must watch to grasp the full meaning of the gesture. The fragment reveals not simply the interdependence of talk and bodily conduct, but also the interconnected sequential relations that enable the participants to accomplish smooth transitions in such a context. The patient produces a description of his pain by relating it to his life with regard to the invitation to disclose his reason for seeking medical help, and within that sequence we find the doctor's shift in orientation[35] encourages the production of the reply as shown in summaries a-c in section 4.1.1. The doctor gazes away from the computer to help secure mutual gaze and communicate temporary availability or 'clearance' to participate in collaborative action with the patient and then resumes work on the computer.

Yet Figure 6 also illustrates how Dr. Spire is engaged in multiple courses of action. This is indicated mainly by his postural instability. The doctor's intermittent gaze at varying angles and keyboard adjustments — which reflect the doctor's awareness of the need to face the patient and to establish a more participative frame — may not actually be very conducive to genuine engagement because they imply only temporary attention and availability to the patient. After all, the patient realizes that a potential postural resolution to Dr. Spire's physical instability would be

[35] This is another action that marks the doctor's cooperative stance as we saw previosuly

for Dr. Spire to resume his original position facing the same direction as his lower stable body segments, in other words, towards the computer[36]. Given the template I shared above in summary (b) in section 4.1.1, the patient's reply is issued along with an anticipation and expectation of the doctor moving back to his bounding area with the computer. The physician returns after quick departures or "side sequences" to attend to the patient in these various ways, and the patient is also capable of breaking the physician's relationship with the computer.

Patient Kevin continues to address his pain, and the physician responds with "completers," indicating explicit acknowledgement while still shifting gears with the computer as in Extract 3 below:

Extract 3*:*

3- Dr. Spire: _ _ _ _ _ _ _ _ _ _ _ _ _tttttttttttttt

Yeah, okay, alright↑

Figure 7. Patient Kevin continues to expand on his pain.

The patient's behavior is erratic at this point, which complicates Dr. Spire's attempt to localize the pain. About 30 seconds after the transaction above in Figure 7, the doctor ultimately suggests performing a physical exam on the patient to locate the pain. Dr. Spire proceeds to break his relationship temporarily with the computer disengaging himself from the MD-PC

[36] For more on body positioning see Schegloff, 1986b; Kendon, 1990. I also expand on this analysis in 6.0

frame to conduct an exam by the computer station typical of generic organization 7. He moves towards the patient while seated on his chair with wheels but remains closer to the computer in Figure 8:

Figure 8. Dr. Spire performing an exam by the computer station on Pt. Kevin (Generic organization 7)

About a minute later, it became clear that the "by the computer station" exam was not enough, and Dr. Spire determines that a much more extensive exam on the table is called for to grasp the situation, as seen in Figure 9 below. The physician invites the patient to sit on the exam table for further scrutiny of his pain.

Figure 9. Exam on the table (Generic organization 6)

After about five minutes of the physical exam, Dr. Spire returns to the computer station to complete the interview in a closing environment while the patient remains seated on the table for another five minutes. The post exam return exemplifies routine generic organizations 8 and 9.

This section has demonstrated in various ways the many competing lines of action in the human-computer interface in doctors' consultations in the opening stage leading up to the exam phase. It clearly shows the doctor's divided attention between the patient and the computer and his struggle to remain focused on one action or the other.

4.2.2 Competition over the closing

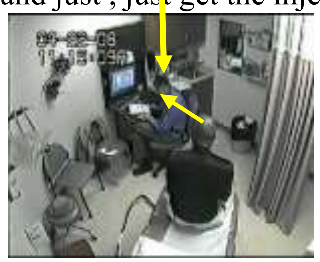
Extract 4 illustrates yet another example of multiparty conversational structure. This extract comes from the closing phase of the interview and shows how the computer's onscreen prompts dictate forthcoming courses of action and also shapes possible physical arrangements. This speaks to the dynamic role of the computer in the interview and interaction management, and particularly topical development. It also speaks to the dictatorial nature of the computer in guiding the interview sometimes.

In this extract, the doctor leads the final moments using both the paper chart and the computer. As mentioned above, this post-exam routine is typical of organizations 8 and 9. I will mainly use images to illustrate involvements on the computer and with the paper chart. The patient continues to share how his pain is affecting his daily routines as Dr. Spire sums up notes on the chart:

Extract 4:

1-Dr Spire: (writing up notes on paper chart)

(0.03) Would you (HT) be able to come back in a week (.1) or so
… ____________ ,,,,,, (Dr. Spire looks back to chart)
and just , just get the injection done then?




2- Pt. Kevin: ____
Yes=
3- Dr. Spire: (Dr. Spire writing on paper chart this entire turn)
=<Ok> cuz I 'm afraid we're sorta running over on time here, and if I take, take
_ _ _ _
the time to do that then I'm gonna be making somebody else wait for a long time
4- Pt. Kevin: __________________
ok I //understand that
5- Dr. Spire:
//U:hm
6- Dr. Spire: Okay
7- Dr. Spire: (Continues to gaze at paper charts)
So let's plan to have you come back next week and we'll, we'll do an injection=
8-Pt: Kevin: = <ok>
(.4) (Gap= filling paper chart)

9- Dr. Spire: _

aa:nnd, I think that <should (0.03, mouse joggle) straighten us out for today>

(.15) (Gap= Dr. gazing at computer silently & joggling mouse here and there)

10- Dr. Spire :_ **(Fig. 8**)

It Looks, like, (0.01) ahh, (0.02) **looks like** we should be , checking your

<<<<<<<<<<<<_________________________________

cholesterol also. Have you eaten already today?

Lower body segments communicate long term dominant orientation to PC

Figure 10. Dr. Spire and Pt. Kevin post physical exam. Dr. Spire having initiated the closing now redirects conversation flow to a new topic

As mentioned above, after the exam is performed, doctors usually engage the patient and talk about the diagnosis, thereby signaling that the conversation is now taking place in a sum-up environment and should move forward to the closing. Patients familiar with the medical system in the US usually recognize this signal and comply with the closing, by forbearing to take control of the floor. In this particular movement toward the closing segment, the physician has established the patient's high likelihood of carpal tunnel syndrome. By now, he has discussed the need for definitive testing, pain-relief injections, and possible surgery, bringing the patient Kevin along with him through the discussion as he (the doctor) attempts to develop a shared plan. By doing this, Dr. Spire accommodates the patient's need for a solution — the very reason the patient set up an appointment in the first place.

Dr. Spire slowly draws Kevin towards the close of the visit in line 3 by expressing his desire, yet inability, to hear about all of Kevin's concerns in this one visit due to time constraints. He proposes a solution in line 7, suggesting that Kevin return in a week or so to discuss his progress and any issues they were not able to discuss today. In doing so, Dr. Spire is bargaining with Kevin, creating a deal that they both can agree to, and offering an incentive for Kevin to return. With a return date set, Kevin's needs will be met, and his many issues will not have a chance to get out of hand. The release of such a bargain projects a contingent shift into a closing phase that is reliant upon the patient not relapsing to discussions of his or her main complaint. In this instance, the patient aligns with the doctor's proposal in line 8.

When the physician says *"aa:nnd"* at the beginning of line 9 he communicates that he will eventually produce a turn of talk and thus holds the floor. It could also be argued that "aand" is used in repeated attempts to ward off any threat of patients' alternative or intrusive talk. The [aand+discourse unit] implies that the doctor has more to say, and is putting his thoughts in order, or finishing a thought on the computer, regardless of any other potential alternative activity proposed by the patient. In line 9, Dr. Spire states that the goal of the conversation has been reached. His closing strategy attempts to ensure that all participants in the conversation have had the opportunity to talk about everything and that the conversation does not need to continue.

It is clear that the context for closing the interview is now available for both parties. Any hearer would expect Dr. Spire to go ahead and close the encounter after the patient has agreed to all of the proposals. However, this is not what Dr. Spire does. Dr. Spire opens a new issue and directs the patient's attention to the fact that his cholesterol also needs to be checked today, and discusses a plan for doing so. This seems to be prompted by something he sees on the computer. Thus, although the design of the arrangement and summary sequences project a contingent shift into closing, the move taken by Dr. Spire seems to be misplaced. That is, to bring up Kevin's cholesterol within this context is noticeably inconsistent with the ongoing sequence of closing. Dr. Spire's "*looks like*" turn is comparable to what Schegloff and Sacks (1973, p. 320) referred to as 'misplacement markers' in their discussion of 'by the way' because it is produced inconsistently within an environment where 'proceeding to close' was the most relevant trajectory. Dr. Spire's "*looks like"* turn is misplaced relative to the closing because it is interjected among talk that is building toward a closing. "*Looks like*" acquires also its literal or physical meaning in this context because the physician is actually looking at the screen where the information is located.

The turn originates from the computer. Even though the computer is supposed to be a tool, it is here dictating the flow of interview in a tangible way. It is therefore essential before closing a conversation to establish if all potential '"mentionables' (Schegloff &Sacks, 1973) have been covered. These can include not only patient and doctors' 'mentionables', as has been traditionally explored in all the research done on closings thus far, but also the computer's 'mentionables'. With the initiative of the computer; party responsible for raising a new topic, Dr.

Spire directs the patient’s attention to the fact that his cholesterol also needs to be checked. The doctor discusses a plan for doing so. This diversion in the interview direction shows clearly that the computer participates actively in the development and progression of talk.

Dr. Spire subsequently begins plans for exiting the exam room. He closes off the conversation with the e-patient by logging off the system and leaves the room assuring the patient in person he will be right back with a prescription and copies. The physician is now required to manage a multi-party closing that involves the computer and the patient as well:

Dr. Spire comes back and resumes the closing with the patient in person in Extract 5.

Extract 5:

1- Dr. Spire: **Alright**. Tell xxx I said hi // **Alright**
2-Pt. Kevin: // **Ok**, I will.
3-Dr. Spire: Alright, See you next time. =
4- Pt. Kevin: =Hey, Doc, Can you, can I have anything for this pain?
5- Dr. Spire: u:h..emmm…<*I already jumped out of the system*> what d’you need? Um, what’s, what are you usin-, what are you using now?
6- Pt. Kevin: **Well**, I’m not using anything now,
7- Dr. Spire: Ok (.1) can you -uh, can you cover things with some u:h-ibuprofen till I see you next week and we’ll figure out what’s going to work best for you?=
8- Pt. Kevin: =ok=
9- Dr. Spire: **=Alright=**
10- Dr. Spire: =sounds good=
11- Pt. Kevin: =**Alright**-then=
12- Dr. Spire: See you next week, xxx

In the excerpt above which occurs after the physician logs off the system, Dr. Spire comes back with his prescription note and reiterates the arrangement plan made earlier. The doctor verifies the circumstances for that arrangement by using a second pre-closing sequence in line 3 initiated by (“*alright”*) and followed by an arrangement sequence. As an initiating action in an Adjacency Pair, “*alright”* (Soudi, 2009b) limits the patient’s options for continuing talk insofar as it heavily projects termination of the visit by proposing that the doctor has potentially dealt with the patient's needs. However, if the patient is to extend the interaction by moving out of closings, which Kevin does in line 4, that makes him responsible for achieving coherence and involvement. The doctor's effort to close in line 3 does not run off smoothly because Kevin challenges the doctor's proposal to proceed to the closing. He in fact manages to launch a new concern in line 4, or a 'non-collaborative sequence', as in Schegloff (2007). The turn taken by Kevin, in what has been made relevant to become a closing context, throws the visit backwards.

Just like the computer's contribution in line 9, Kevin' s increment in line 4 renders his 'move' (Goffman 1981) misplaced as well because it constitutes a noticing among other ongoing sequences of recent prior talk and, further, because it is produced irrelevantly. Dr. Spire, however, deals with the concern in the context of the closing. The doctor simply recommends an over-the-counter medication, and assures the patient that they will talk further about it. This solution means the doctor does not have to re-open the conversation with the computer and doesn't have to modify the after-visit summary or print new prescriptions since he has already logged off the system (line 5). He then proceeds to re-close the conversation, initiated again by "*alright"* in line 9. The ratification of the closing is followed by the patient's "alright" in line 10 in low intonation which also means okay.

A very similar analysis can be adopted to evaluate the progress of the interview towards the closing between John and Dr. Spire in extract 6. In here, however, the doctor has not jumped off the system yet, and the computer this time 'collaborates' with the patient's last minute request in helping the physician look up information and save face with the patient.

Extract 6 (Dr. Spire and Pt. John)[37]:

1-Dr. Spire: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
You went to Shadyside, right?
1a- Pt. John: ________________________
2-Pt. John: ___
Yes.
2a- Dr. Spire: (switches gaze to paper chart)
3-Dr. Spire: ..
Ok. I don't think we're going to have time to, to talk about the, the thing that's going
…____
on with
3a- Pt. John: ____
4- Dr. Spire: ____,,,,,,,,…______
your scrotum today, but we can have you come back in a couple of weeks and sorta
4a- Pt. John: ____
5-Dr. Spire: __________________________________,,,,,,,,, (back to paper chart)
recheck on how your legs are doing, and, and plan to=
5a- Pt John: ____
=okay=
6- Dr. Spire:
= address that <at that time>=
6a- Pt. John: _______________________
7 -Pt. John : ,,, ____
= now, u:m, um (.2) I know you asked me this the last time I, I was here,
7a- Dr. Spire: …_________
8- Pt. John: ,,,,…____
You asked me if I wanted to (0.3) (sigh, sigh) take the, um, Viagra=
8a- Dr. Spire: _____________________>>>>> _ _ __ <<<____>>>_ _ _ <<_______
=mmhm
9- Pt. John: **_____________________**
=Is that still (.1) possible?
9a- Dr. Spire: _________________

[37] Given the limited view in the generic organizations 8 and 9, the patient's gaze to the doctor is not very clear. I assume he is looking towards Dr. Spire

10- Pt. John: ____

Can I still take Viagra with the medication that I'm taking?

10a- Dr. Spire: _________>>>_ _

11- Dr. Spire: _

Um-hmm (.2) I don't –let me look here. Mmm

(.10) (Gap= Dr. gazing at computer) ---> INCREASED TRANSITION SPACE

Figure 11. Dr. Spire preparing a response for Pt John

11a- Pt. John: ____

12- Dr. Spire: _ <<_

//D-Did we: (0.03) I see coronary artery disease on your list.

12a- Pt. John: ___________ ,,,,… __________________________________

//(xxxxx)

13- Dr. Spire: ____

Did you have a (.2) What did you have, a stress test?=

13a- Pt. John: ____

14 -Pt. John: ___________________________________

=Yes

14a- Dr. Spire: ___

[Dr. Spire continues to look at the computer to examine medication interaction]

Dr. Spire in this conversation also draws John toward the close of the visit by expressing his desire, yet inability, to hear about all of John's concerns in the present visit due to time constraints. He proposes a resolution, suggesting that John returns in a couple of weeks to recheck on how his legs and scrotum are doing (lines 3, 4, 5, 6). It is clear that Dr. Spire has imperatively indicated that he does not have time to talk about the patient's scrotum today and that an arrangement is in place for him to be seen again in a couple of weeks. However, John intercepts the course and subsequently adds a new concern 'non-collaborative sequence' (lines 7, 8, 9, 10) expressing his need for Viagra®, which opens a series of questions and shifts the visit backwards. The full implications of John's request cannot possibly be dealt with in a closing context, though that may have been part of John's intention. John's disjunctive attempt to keep the conversation open is advanced hesitantly, showing how he is aware that he is clashing with his expected job in the ongoing conversation. John's latched pre-announcement **"= now, u:m, um (.2) I know you asked me this the last time I, I was here, you asked me"** positions his proposed activity of asking "questions" as competing with an alternate activity, namely that of closing. The patient's announcement that he has more questions to ask communicates in this circumstance that the projected question concerns a delicate matter. John implies that this is not a new 'telling' by giving evidence of the recent and shared history of the upcoming concern **"*you asked me this the last time,*"** and uses this as evidence of its worthiness to reduce the imposition. John's sequence also fits Sacks' (1973) general rule in conversation that "one should not tell one's co-participants what one takes it they already know" (p. 139). Additionally, it might also imply that John may have been hoping the doctor would bring this topic up based on their previous discussions, and is inserting it now because that expectation was not met. John's pre-sequence projects the contingent possibility that a base first pair part (FPP) (main question) will be produced, and it makes relevant next the production of a second pair part (SPP), namely a doctor's response to the pre-invitation.

It is worth noting that, unlike in previous situations, Dr. Spire gazes back and forth between the patient and computer quite frequently during this time, perhaps providing encouragement and support while the patient brings up this very personal concern. It is on this response that the projected occurrence of the base First Pair Part (FPP) which is John's concern is made contingent. The doctor's gazing away from the computer (GAWC) to Doctor's gazing at patient (DGAP) with a go ahead nod, which stands as a response to the pre-sequence (John's hesitation), leads to the immediate production of base FPP. In this context, Dr. Spire's gaze and nod (SPP) amidst John's utterance serve as 'continuers' to John's hesitation material (FPP/pre-sequence). Dr. Spire's affirmative gaze and gaze away from the computer may be classified along what Schegloff (2007) described as 'go-ahead' responses. These actions promote progress of the sequence by giving John 'clearance' to go ahead with the base FPP which the 'pre' was projecting thus forestalling the possibility of making things more delicate and blocking plain rejections. One main thing that the pre-sequence FPP itself does is help John to quickly examine the context of proceeding with further talk that is not only positioned as intrusive or intercepting to the ongoing flow but also delicate given the nature of topical material. In this human-computer interface, pre-sequencing material serve the same function as Goodwin's phrasal breaks, which are intended to secure the recipient's gaze. In this context, pre-sequences allow the patient and doctor to effectively engage in direct collaborative action with each other away from the computer.

The safe prescription of Viagra® requires more information about John's history of coronary artery disease and medication use in particular. This legitimizes the doctor's gaze at the computer[38]. Dr. Spire seems hesitant and transfers responsibility to the electronic patient, thereby relegating matters to the computer in line 11. Dr. Spire turns back to the computer to help him make the decision of whether Viagra® would be safe for the patient. The doctor's "um-hmm" is advanced to buy time with the computer and search for an answer. One might argue also that the

[38] See summaries a, b, c in section 4.1.1

doctor's latched "um-hmm" can also be categorized as sort of 'hedging' which can make a full response contingent on what the computer says; an 'insertion sequence' (Schegloff 2007), to gain additional information before committing. As a matter of fact, Dr. Spire actually asks the patient to allow him to look up information to prepare a response in line 11. The doctor then proceeds to solicit and verify all the required information in subsequent talk, almost like opening a new visit and going back and forth between John and the computer.

After a series of polite exchanges and thanks, Dr. Spire exits the scene to break the co-presence and terminally end the conversation. The sequential organization of closings has to do both (connectedly) with the turn-taking machinery, as discussed in Schegloff and Sacks (1973) and Sacks et al. (1974), but also with issues concerning the relationship between the participants and their societal roles (Goffman, 1967) as they negotiate ways of satisfying their 'mentionables' (Schegloff and Sacks, ibid). By moving to end a conversation, a series of interpretations leading to negative conclusions about the other are at stake. Face and solidarity are brought into question. Closing a conversation may be taken to mean that one is not enjoying the other's company, or that the other person's company is not desirable. When people close, they deploy different face saving strategies to combat such face threats and to save face. Equally, continuing the conversation beyond closing points or resisting its closing can be face-threatening. Closings or re-openings can be regarded as imposing on other interlocutors. The computer adds many dimensions to face threats involved in closing conversation or closing sequences within it. The burden rests on the physician to satisfy both before closing. Unlike the last conversation above between Kevin and Dr. Spire in extract 5, re-activating the computer into the relationship was not an issue in the encounter between John and Dr. Spire in extract 6, since the computer was still active.

Dr. Spire is not unique in deploying various face-saving strategies to disengage or engage in talk with either the patient or the computer. Such strategies ensure that all participants in the conversation have had the opportunity to talk about everything they need to deal with in their meeting. A question remains as to whether the physician actually closed the encounter when he logged off the computer, or whether he intended to return to type further thoughts and possibly further orders or diagnostic codes at a later time. For now, I will take logging off as equivalent to a terminal closing sequence. I know based on the conversation that an arrangement has been made to take care of some patient's 'mentionables' in later visits but I do not know for sure if all PC 'mentionables' or fields that need to completed are all satisfied during the time of this visit or later. In order for us to fully appreciate and assess more accurately the effect that the computer has on the dynamics of medical interviewing we must take into account if all PC 'mentionables' and doctor's 'mentionables' on it are fully satisfied in the visit itself [39].

The overall structural organization of adult medical closings shows ongoing competition between doctor, patient and computer attempts to close conversations and their efforts to keep them open. Patients' options for continuing talk about their concerns are constrained by the sequential organization of the interview, and efforts made by them to expand on a topic or introduce a new one are often perceived to be intercepting the course of ongoing talk between the computer and the patient which can be face threatening to both patients and physicians. From an adjacency pair principle, the speaking slots made available for the patient's turn are usually overlaid with the physician's turns on the computer which creates additional competition.

[39] A resident doctor told me that during four years of seeing pediatric and adult patients, she rarely closed the chart during the visit, but rather completed them after the clinic was over.

With this in mind, the current format described above is carried over from our daily speech patterns into the clinic. It represents an attempt to be polite and save face on the way to creating a mutually agreed upon close to the encounter. Yet the clinic is not the same as the social situations we encounter in our daily lives, and a more formal and enabling way of soliciting concerns and shifting attention between the patient and the computer might be more beneficial, resulting in less discordance for both patients and doctors. If patients are more actively involved in the interview from beginning to end there will be fewer reasons for them to bring up "surprises" at the end. Both patient and doctor can proceed through the interview with the same goals in mind. This will allow the interview to proceed and end on symmetric terms, with all concerns addressed, rather than being broken off secondary to time constraints with main issues left unaddressed, or addressed in a closing context. The patient should be enabled, just like the computer[40], to proceed with bringing up new topics in less face-threatening ways. The computer's reminder sheet in the closing is a useful tool, but it should not be taken to mean that it covers all possible last minute concerns because patients might have additional questions as well that can never be computed ahead of time and the physician therefore must allow them a formal opportunity to share such before logging off the computer. In other words, human-human closings must be prioritized over human-machine closings.

[40] This is not to imply that when the computer is issuing a reminder it is not imposing on the doctor.

4.2.3 Interactional asymmetry

Interactional asymmetry is a term that refers to power differentials in interactions. These are implicit in the doctor-patient relationship, and only intensified by the addition of the computer. Here I will review how the computer shapes the topical development of the conversation, and also decides the order in which 'mentionables' are advanced and the consequences of that on turn-taking and communication. In the encounter in extract 7 below, patient Lauren has been prompted to elicit and expand on the main purpose of her visit today since the nurse had already discussed the chief complaint with the physician. Lauren suffers a problem with her ear. She has other health concerns too, and the full description of her chief complaint itself does not get fully addressed until line 1 of extract 8, where it gets picked up again by the physician after it has been abandoned in line 36 of extract 7:

Extract 7:

1- Dr. Spire (addressing Nurse who just gave him a brief report): **Ok. ALRIGHT**
Pre-interactionals:
2- Dr. Spire: .__
Hello:↑
3- Pt. Lauren:
Hello
4- Dr. Spire: .. ___________
How's it going? (**Patient and doctor shaking hands)**
[
5- Pt. Lauren: …X_________________________
I don't know what's up with this ear

6- Dr. Spire:
=somethin's going on,//huh (**doctor walking away to face computer station**)
7- Pt. Lauren: ______________________
//I guess

8-Dr. Spire: ……___________________________

ok. It's a new (↑) thing, **huh**, just //**started a couple weeks ago**?

9- Pt. Lauren: ____ (pt nodding)

//yeah

10- Dr. Spire: ,,, ..____________________ ,,,,

Okay, um could it be earwax?

11- Pt. Lauren: ____

//I am ho:ping (↑) //something like that, but I don't think so. (laughs)

12- Dr. Spire:

//**Okay Okay**

13- Dr. Spire:

You don't think so?=

14- Pt. Lauren: ________________

=No=

15 - **Dr. Spire:**

=Alright, well, we'll take a look **(Doctor puts paper chart away to face computer)**

16- Pt. Lauren: ,,,

=xxx get blood out of there or something, I don't know=

17- Dr. Spire: ___>>>tttttttttttttttttttttttttttttttttttttttttttttttttttttttttttt (**Dr. logs in on computer**)

=**Alright**, are you having any (0.01) any problem with pain or=

17a- Pt. Lauren:____

18- Pt. Lauren: _____

=It was=

18a- Dr. Spire: _ _ _

19- Dr. Spire: <<___________________

=anything discharging out?

19a- Pt. Lauren: ___________________

20- Pt. Lauren: .________________

No:, no, discharge ever, a little pain here or there but also I have a toothache

20a- Dr. Spire: tttttttttttttttttttttttttttttttt<<<.____

21- Pt. Lauren: ____

but I don't know if it's from the ear//or if the ear is from the tooth =

21a- Dr. Spire: ___>>>>_ _ _ _ _ _ _ _ _ _ _ _ __ _ _ _ _ _ _ _ _ _ _ _ __ _ _ _ _ _ _ _ _

//**ok.**

22- Dr. Spire: _ _ _ _ _ _ _ _ _ _ _ _ _ _

= **Ok**, we'll take a look

22a- Pt. Lauren: _____________________

23- Pt. Lauren: .X __________________,,,,

So, I probably need antibiotics, so I don't,

[

23a- Dr. Spire: _ _ _ _ _ _ _ _ _ _ _ <<<.X _______>>>_ _ _ _

24- Pt. Lauren:
//but you know

24a- Dr. Spire: _ _ _ _ _ _
//**Ok=**
25- Pt. Lauren:
=my body=
25a- Dr. Spire: _ _ _ _ _
26- Dr. Spire: _ _ _ _ _ _ _ _ _ _ _ <<<<____________________>>>>
= So:, you are, you are (↑) on antibiotics **//already?**
[
26a- Pt. Lauren: . X____
//No, I said I probably do
27- Dr. Spire: _ >>>>
You per-, you think it might be an ear infection. OK**=**
27a- Pt. Lauren: ____
28- Pt. Lauren: _________________,.__________________________’’’’’’’’’’’’’’’’’’’’’’’’________
=because I was getting those little, um, like I told you, the little boils or whatever I
[
28a - Dr. Spire: >>>.X______________________________,%.X_____________________
29- Pt. Lauren: _______
would get=
29a- Dr. Spire: ____
=yep=
30- Pt. Lauren.: _______________
=Well I had got one=
30a- Dr. Spire: >>_ _ _ _ _ _ _ _ _
=ok=
31- Pt. Lauren: _________________________________
=and it had pus and stuff coming out of it//
31a- Dr. Spire: _
//Okay=
32- Pt. Lauren: ____
=and I soaked in the bathtub you know, and treated it with some hydrocortisone cream 1%=
32a- Dr. Spire: _
=ok=
33- Pt. Lauren.: ____
=and it made it soft, where when I, you know, sat in the bathtub, it just busted on its own.=
33a- Dr. Spire: _ <<.X_________>>_ _ _ _ _ _ _ _ _ _ _ _
34- Dr. Spire: _ _ _
=**ok =**
34a- Pt. Lauren: ↑____
=but that’s how I figured I might have an infection somewhere in my body-hehe

35- Dr. Spire: _(Dr. Spire pointing to screen)

Figure 12. Dr. Spire pointing with his left hand to the screen perhaps inviting attention to the screen or preparing to launch a new topic

36- Dr. Spire:= _

Alright (.1) >we will address that < before (.1) we: get too involved in your ears

36a. Pt. Lauren:________,,, ...____

[

_ <<<<.X_____

37-Dr. Spire: (.1), um, tell me: (.1) what the p- plan is with birth control?

Figure 13. Dr. Spire projects a shift to a new activity. Pt. Lauren shifts her gaze to Dr. Spire who is fully engaged with patient on computer. Mutual gaze is achieved at end of turn

The extract shows the many things the physician is juggling: addressing patient's CC, obtaining the HPI, checking information on the paper chart, and getting ready to log onto the computer in line 17. The overlap in lines 6-7, 8-9, 11-12, 21-21a, 26-26a, 31-31a, where both patient and doctor are going beyond their transition relevance points, show the difficulty underlying obtaining interviews with the patient and the computer at the same time. This is all in addition to consulting the intake chart and getting settled in. In these few seconds of the extract, there are 6 occurrences of overlap. In the remaining instances where overlap is not occurring, we see latched talk. The "beat" of silence, which is the normal value of transition space, is null (See Jefferson, 1986). Latched talk interpreted as speeding up to claim the turn is occurring, possibly to rescue the conversation from overlap and also effect repair by rushing to talk to prevent overlap at what mistakenly appears to be a completion point, or 'transition relevance point' (TRP) (Schegloff 2007), which leads to even more overlap[41]. Instantiations of overlap in the lines indicated above are largely the result of miscommunication, where the patient or the physician thinks that the other party has finished their turn. It is also the result of the patient having their story, "their new thing", being formatted and narrowed through the doctor's questioning.

This segment illustrates how the doctor is moving the conversation forward through the structural units of the History stage. He is doing so through closed-ended questions as a grammatical resource to manage overlap, which I will discuss in detail in section 5.2.1. For example, in line 10, the doctor asks the patient a closed-ended question ("could it be earwax?") to control topical development, prevent miscommunication, and also narrow the response length. Contrary to the physician's expectations, the patient reply was not simply a yes/no token. The patient expanded on her initial long reply with "I am ho:ping" in line 11. Dr. Spire originally

[41] More research might be needed to confirm this finding, however.

mistook that for a TRP, as he overlapped the patient's expansion ("something like that, but I don't think so") with his acknowledgement token "okay" in line 12.

The doctor continues to exercise control through the structure of their exchanges with patients in the course of an interview to manage the overlap and competition over his attention by both the computer and the patient. When the patient attends to the doctor's closed-ended questions with more than one turn construction unit (TCU), she activates spots for overlapping talk. One way of reducing transition space is done with what Jefferson (1986) calls "absolute adjacency", where one party is barely done when the other person starts talking. This may be due to participants competing over speakership. But this "absolute adjacency" itself could lead to even more overlap in what "hearably" appears as TRP, simply because overlap is usually occasioned by a speaker going past their possible completion point (TRP).

Thus, Dr. Spire's question in line 8 is very interesting because the doctor's turn consists of three units or TCUs as in structure (d) below. TCU2 and TCU3 appear to be questions:

(d)

"**ok.** It's a new (↑) thing, **huh**, just //**started a couple weeks ago**?"
[**TCU1**: Evaluation "ok" + **TCU2**: It's a new thing + **TCU3**: Just started a couple weeks ago]

The patient overlapped the doctor at around the end of TCU2 with an affirmative response "yeah" in line 9. The overlap is mainly due to two reasons: The transition turn was complete at end of TCU2, and also because it contains another 'floor yielding cue', "huh". The patient follows that answer with a "nod" perhaps as an answer to TCU3 this time. The patient's affirmative answer seems only available to the analyst, but not the physician, since he has already turned away towards the computer. He might have taken the patient's overlapping "okay" as answer to both, since he already knows it's a "yes" based on initial intake, and was just confirming what time the ear problems started. The physician puts away the paper chart away to face the computer, and initiates his sequence with the adverbial “alright” in line 15 to regain control over the conversation and address this problem in another social frame. Dr. Spire introduces the computer into the interaction at line 17, where he also launches a new question prefaced with the same adverbial “alright”, and follows with a closed-ended question intended to also narrow down the field of talk. Dr. Spire’s attempt to limit turn size helps him avoid falling behind on typing. The conversation accrues a new cost, evidenced by the physician misunderstanding whether or not the patient is on antibiotics (lines 26 through 33).

The doctor’s investment in the MD-PC is also evidenced by allowing the patient to go on a ‘solo’ talk in lines 18 through 26 (See Schegloff 2000a). Dr. Spire continues to supply ‘minimal response’ answers to allow the patient to continue as he addresses the PC. This can be explained by other reasons as well, especially if we look at why solo talk is allowed. One such reason is ‘persistence to completion’. There are several cues that indicate the patient’s persistence to complete narration of her story. She gets her chance when the doctor pauses to take time to ‘hear’ the computer. Solo talk (Schegloff, ibid) may be the strongest possible response to overlap, because interactionally it takes a stance of non-recognition of competing talk. This is illustrated especially well in this context when Dr. Spire activates speakership with the PC[42].

However, after pulling up her electronic records at line 17 and having gotten a chance to read through it, Dr. Spire determines that there is something else worth discussing at this point before addressing her ear problems. He points to the screen in line 35 in Figure 12 as he

[42] I will address the full implications of these moves in detail in sections 5.0 through 6.0

prepares to break the progress of current talk. Dr. Spire initiates his turn in line 36 with the adverbial marker “alright” which is frequently used, as we saw above, to initiate new topics, manage patients’ redirection, and secure their alignment to move the interview forward. In this context, the doctor communicates and acknowledges that he is aware of this problem and explicitly moves the conversation forward to another topic, assuring the patient he will return to the problem. The patient herself moves her gaze to the doctor who has just projected a shift to a new activity, and is now fully engaged with the e-patient as shown in figure 13 above. The topic may be listed on the patient’s electronic face sheet of front page in age related screening section and thus needs to be addressed before scrolling further. It seems as though the physician is concerned that he may not remember to take care of this problem if he does not do so immediately. Perhaps this is because he worries the ear issue will become all-engrossing and take up the entire time, or because he knows something about prior encounters with the patient.

The patient starts attending to the series of questions initiated by the doctor, and provides relevant information as needed about her plans with her birth control, complying with his directives. The doctor gathers the information that the patient has a birth control plan in place, and he updates the computer accordingly. He then states while gazing at the computer, “okay, *well first things first. So, we got that taken care of, we got a plan for that…so we could focus on your ears”*. Here, Dr. Spire provides a summary in what sounds like talk on the computer, but is in reality directed at the patient to justify the detour in line 36. So after the doctor was assured that the patient has a plan, he returns to her original concern, saying that they can now focus on her ears. In this way, Dr. Spire brings the conversation back home to the patient’s ear.

Extract 8:

(Dr. Spire typing up patient's response)

1- Dr. Spire: _ _ _ _ _ _ _ _<<<<<<< ________________________

So:, you ear was hurting you you said on the left side?

2- Pt. Lauren: _______________________________________

On-screen reminders or PC 'mentionables' are satisfied, and the doctor can now focus on the patient's present illness. The screen now allows him to enter the patient's information on her ears. The doctor types, looks back and forth to the patient to acknowledge first that he heard her statement and also to communicate he is trying to type at the same time. In attempt to restrict and redirect the patient to only focus on the questions asked, Dr. Spire modifies the yaw behavior in line 2 in extract 9 with a single hand-clap; a gesture which may serve as place holder to indicate he is considering his next move. The conversation then hits a bottleneck after confusion about the patient's hair-washing and its contribution to her ear problem. During this time, Dr. Spire gazes away from the computer and looks to the patient to clarify the misunderstanding about whether the failure to wash her hair was connected to her ear pain. This prompted the patient again to clarify that she just happened not to wash it, and that her ear pain was unrelated: "That's what I was trying to say="

Extract 9:

1- Pt. Lauren: ____________________________
Tha:t's what I was trying <to say>=

2- Dr. Spire: _
= okay I got you, **u:hmm (clap)** does it hurt to chew?

2a- Pt. :Lauren:___
<no:>
3- Dr. Spire: ttttttttttttt
okay
GAP (.3)
3a- Pt. Lauren: ______
4- Dr. Spire: ttttttttttttt_ _ _ _ _ _ _ _ _ _ _ _ _ _ <<
And have you had fever?
4a- Pt. Lauren:__________________________

This transaction releases the conversation jam, and conversation moves forward again smoothly driven by the doctor's close-ended question as in 2-4a above to move interview forward and control topical development. These interactions show that the computer, just like the patient or the doctor, not only contributes to the topical development, but may also dictate sometimes the order in which issues are addressed. Thus the needs of the e-patient and those of patient in person clash and overlap.

4.2.4 Conclusion

The account above shows competition between doctors, patients and computers over openings and closings. The three partners all participate actively in the progress and development of conversation. “Mentionables,” a traditional issue between human conversationalists in any context, involves the machine partner as well in this interface.

The interactions discussed confirm the summary structures a through c discussed above. After the greeting, the doctor prompts the patient to share his or her Chief Complaint or expand on it, and then proceeds to narrow down the area of patient’s ailments or concerns. The responses to the doctor’s questions legitimize the physician’s gaze back at the computer. The physician updates the medical history and allergies, “reviews” the information, or types prose regarding the patient’s concerns. The physician asks more questions while typing, and the patient answers. The doctor controls the length of the responses so as not to fall behind on typing and to keep things on topic. The doctor breaks his or her relationship with the computer as needed or when side gaze is not enough.

The doctor directs his gaze to the patient to communicate availability for engagement. The gazing generally deviates from the primary orientation of the body toward the computer, thus, communicating temporary availability[43]. The doctors, as we saw, use “completers” and other interjections/space fillers to communicate that they are (or will be) resuming the main activity, frequently placing the patient on hold. Patients may have several opportunities to add to the conversation while the physician is typing. However, this varies greatly between visits.

[43] The doctor’s side gaze marks cooperative stance to help construct activity. The doctor’s primary body orientation towards the computer marks an instrumental stance that such positioning is required to accomplish the activity and grasp it (epistemic stance).

Throughout these observed interactions between the doctor, the patient and the computer, the recorded division of labor in the physician's embodied resources informs us also about various participation frameworks. I introduce the context that might underlie this variation through a discussion of gaze practices and other linguistic resources in chapter 5.0.

5.0 MANAGING THE INTERACTION WITH THE COMPUTER AND THE PATIENT: GAZE PRACTICES AND DOCTORS VERBAL RESOURCES

In Section 5.1 and 5.2, in light of the context analysis above, I summarize gaze practices and linguistic resources that doctors use for adjusting action and managing multiple involvements or intersecting demands. I also discuss the implications of these resources for various participation frameworks. In the chapter that follows this one, I tackle the physical setting and spatial arrangements of participants, and how these affect doctor-patient-computer interaction. I also discuss how these various resources might be shaped by the physical environment in which they occur.

5.1. GAZE PRACTICES AROUND THE PC AND IMPLICATIONS FOR THE DOCTOR-PATIENT INTERACTION

In this section I focus primarily on gaze distribution and its social meaning in interaction. I also discuss the implications of gaze practices for the organization of turn-taking and patient's participation in the conversation.

5.1.1 Organization and distribution of gaze in interaction

Gaze in this study is discussed in terms of specific tasks posed in the construction of the talk. It is also explored in the context of the generic organizations in Table 1. Gaze manifests itself in various ways based on context, physical framing, and talk. Although the gaze framing for each particular encounter varies from one situation to another, the gaze practices are orderly, particularly if looked at within the framework of the generic organizations reviewed above.

Gaze has been studied mainly in terms of two-party gatherings or groups of people around a table, but it has not been fully explored in human-human-computer situations, or in conjunction with the unique spatial arrangements of the exam room. Below I share an example from previously shared extracts to explore briefly the organization and distribution of gaze and its implications in this human-computer interface for the doctor-patient participation framework. This example provides insight into what formed the basis for the gaze practices and idealizations that I share below about doctor-patient participation frameworks. The first example is extract 1a from previously. I will share other extracts as needed to support my observations:

Extract 1a:

1- (Pt gazing at the doctor and narrating what led to his pain)
[[
2- Dr. Spire: ___ >>>.X<<<. X________>>
So that hit your shoulder?
2a- Pt. Kevin: ______________________
3- Pt. Kevin: _________________________________
<Yeah> hit my shoulder and my head (xxx)
3a- Dr. Spire: : _
4- Dr. Spire: _ _ _ttttttttttttt (DGAC)
Okay
4a- Pt. Kevin: (no gaze, patient is looking down)
5- Pt. Kevin: (patient is looking down)
Mostly my shoulder
5a- Dr. Spire: tttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttt

6- Dr. Spire: _
Was that the same shoulder that was already bothering you?=
6a- Pt. Kevin:….____
7- Pt. Kevin: ________________,,,
=hehehehe-**yea(h):ah (xx)** heheheh
7a- Dr. Spire: _ _ _ _ _ _ _ _ _ _ _ _ _
8- Dr. Spire:_ _ _ _ _ ttttttttttttttt
alright
8a- Pt. Kevin: ..___________
hehehe
9- Pt. Kevin: ____
you know (xxx) it's just hard for me to heheheh-laugh-hehehe
[
9a- Dr. Spire: ttt<<< .X__>>>_ _ _
10- Dr. Spire: _ _ _ _
Ri:ght=
10a- Pt. Kevin: ____
=hahah
11- Dr. Spire: __ _ _ _ _ _ _ _ _ tt
<sometimes you might have to laugh or else you might cry>=
11a- Pt: Kevin: ____
= hehehehhe
12- Dr. Spire: _ _ _
>**So:**<=
12a- Pt. Kevin:
13- Pt. Kevin: … _________________,,,
=I have done that one hehe
[
13a- Dr. Spire: _ _ _ _ _ _ _ _ _ _ _ _ <<<X__>>
heh
14- Dr. Spire: _ _ _ _ _ __ _
Alright, **so u:m, s**-this thing hit your shoulder and **now, now** your shoulder is hurting
14a- Pt. Kevin:…. ____
15- Dr. Spire: _ _ _ _ _ _ _ _ _ _ <<(.1)__>>>
you worse, **ehn?**
15a- Pt. Kevin: __________________
16 - Pt. Kevin: _________
(.1) %**yea:h%**
16a- Dr.Spire: _ _ _ _ _ _ _

17- Dr. Spire**: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ ttttttttttt**

okay, u:hhhhhm, okay(.4)

Positioning of Doctor's lower body segments communicates long term prevailing orientation to the PC

As mentioned earlier, the doctor seems to be shifting focus between the computer and the patient. Lines 2, 9a, 13a and 15 also demonstrate how the yaw motion is exercised. Yaw motion is typical of generic organization 5, which exhibits the doctor's stream-lined transitions back and forth between the computer and the patient. In terms of gaze distribution, the transcript clearly shows that the doctor's gaze to the computer exceeds his gaze to the patient and the patient's gaze to the doctor also exceeds the doctor's gaze to the patient: DGAC>DGAP and PGAD>DGAP. This is mainly due to the fact that the physician is primarily facing the computer. The doctor gazes briefly, usually at the end of his turn, as in lines 2, 13a and 15, to confirm availability, and then shifts back his or her gaze to the computer. During most of his other turns, as speaker or hearer, he is continuously interacting with the computer even when asking the patient in line 6 if it was the same shoulder that was bothering him.

The physician as "hearer" (or speaker) looks less at the patient than at the computer as seen in the representative extract above. This is contrary to previous findings (See Goodwin, 1981) on gaze, where it has been shown that hearers look at the interlocutor more than speakers.

Bakx et al. (2003) confirmed the conclusions of this research study, stating clearly that in a situation where a user interacts with a multimodal information system and in the meantime talks to another person, the user typically looks at the system, both when talking to the system (94%) and when talking to the user (57%). I summarize these observations on gaze by comparing and relating them to prior work on gazing between hearers as in Goodwin (1981), Kendon (1967), and Bales (1970), and then noting the striking differences between gazing in dyadic relationships or multiparty computer-free encounters versus the gazing exchanged in the human-computer interface defined above. I also discuss how gaze is negotiated:

In the doctor's yaw behavior in generic organization 5, the doctor's gaze oscillates back and forth between the patient and the computer to attend to the needs of both. This is consistent with Bales' research (1970:67), which notes that a speaker who wishes to address a group as a whole must avoid letting his or her glance "pause on any one person long enough to encourage the belief that he speaks to that particular one." However, my data also show that the physician is able to address the group (both patient and computer) as a whole by allowing his gaze to pause on the computer for a while as in organization 1, even if that encourages the belief that he is only addressing the PC[44].

Gaze distribution over the course of an interaction in generic organization 4 takes more of a dyadic format consistent with gaze practices in Kendon (1967) and Goodwin (1980:31-32). However, gaze practices in this human-computer interface are not always consistent with Kendon and Goodwin's generalizations when the computer is in the picture. For example, Kendon (ibid) and Goodwin (ibid) explain how a speaker looks away at the beginning of his

[44] I will expand on this in my introduction to onscreen commentary below

utterance but gazes steadily toward his addressee as the utterance approaches termination, whereas a hearer at this point looks away from the speaker. Thus, when a turn-transition occurs, the new speaker is gazing away from his recipient, as is expected of a speaker near the beginning of an utterance. While the patient (speaker or hearer) plays out the act precisely as described above, the physician's gaze, on the other hand, is problematic. The physician, as a speaker, follows the rule early on, because at the beginning of his or her turn, the physician is actually looking away from the patient and is facing the computer. and then looks at the patient towards the end to communicate availability or clearance for further interaction, as discussed previously. As a hearer, however, the physician spends less time looking at the patient as mentioned above.

Consistent with Goodwin's findings on the functions of phrasal breaks[45] to secure another party's gaze, doctors do indeed use restarts and pauses to achieve mutual orientation at the beginning of the turn. Examples include when the doctor is done with the computer and turns to the patient to secure a response as in lines 14 and 15 in extract 1a above. However, the physician produces these phrasal breaks not only to secure gaze but also to 'wrestle' with the computer and complete their thinking process. Phrasal breaks enable them time to formulate their ideas, buy more time with the computer, and prepare to turn sideways. The fragmented incoherent part[46] is disposed with as the physician departs from the computer (DGAWC). To secure the physician's gaze, patients will also use a 'summons-answer' pattern to break in the MD-PC 'mutual gaze', or other inviting gestures such as the ones reviewed in section 4.2

Except for the generic organization where the physician is interacting exclusively with the patient or conducting an exam on him or her, the patient as both a hearer and speaker gives

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[45] Examples of phrasal breaks are indicated in bold in line 14. I will expand on these below

[46] I will address these resources in section 5.2

long steady looks to the physician. Extract 1a, above, demonstrates this clearly. This is possible because the physician is looking at the computer and alternating looks between the computer and patient, while the patient has nothing to distract their gaze. This is contrary to Kendon's observation (1967:26-33) which states that the hearers give speakers long looks broken by comparatively brief glances away, whereas speakers alternate looks toward their recipients with looks away of about equal length (Ibid, p.27, 33). The looks of the speaker toward the hearer occur at the end of phrases (Kendon 1967, p.40).

The gaze variation observed above deviates from the norm mainly because the doctor's gaze is shared between the computer and the patient. The degree or length of each gaze is determined by the generic organization in which the doctors find themselves, and how much typing is required. Typing skills may occasionally determine the degree of gazing at the other party, for example during long free-form text blocks, when the physician can type while looking at the patient. But sometimes the software requires the physician to gaze at certain fields that need to be filled in, or at questions on the screen that need to be answered. As such, typing on this software cannot always be compared to typing in a document.

Gaze patterns have implications for the doctor-patient relationship. For example, with regard to the interaction between speaker and hearer within each turn, Goodwin (1981) argues that one way in which a nonspeaking party can indicate whether he or she is acting as a hearer is by gazing at the speaker. As Goodwin suggests; "Gaze is one means available to recipients for displaying to a speaker whether or not they are acting as hearers" (2007: 277). Hearership can of course be demonstrated in other ways. For instance, Dr. Spire and Dr. Ceremuga both gaze at the computer even when they are acting as hearers. However, this is not always an ideal situation, as it makes it difficult for the patient to know if the doctor is truly listening without other cues. In this situation, verbal clues such as “uh-huh”, and physical cues such as nodding may help.

5.1.2 Social meaning of gaze in interaction and its implications for participants’ statuses

Gaze is not simply a tool for negotiating turns, but is also a social act (Goffman 1963:92). Goffman (1963:13) notes that: “The exchange of words and glances between individuals on each other’s presence is a very common social arrangement, yet it is one whose distinctive communication properties are difficult to disentangle.” Perhaps the most logical route to sort out the local social meanings of gaze and to understand its import in the relationships between individuals would be to detail and break down the relationship between participants in the various generic organizations outlined above, using Goffman’s participation framework (1975). Detailing the various relationships between participants will allow assessment of their roles within the group, and thus lead to a greater understanding of the meaning of gaze in these contexts and its implications for participants ‘statuses.

The speaker-hearer relationship can be very broad and might take considerable space to cover. Furthermore, it is not always easy to identify a person’s role within a conversation as the boundaries between hearer and speaker may overlap and is not always a simple dyadic one. Also, the contribution to the conversation in the capacity of speaker or hearer varies drastically. This last reflection makes me shy away from Goffman’s distinction between “Principal, Author, and Animator”. When a speaker contributes to the conversation, all those participants who happen to be within visual and auditory range of this event will participate somehow in it (Goffman, 1981b) and so it becomes difficult to assign definite roles. Instead, I suggest that the participant roles within the human-computer interface are not always agreed upon, as they are constantly being revised and negotiated. For example, when the physician communicates the need for time to look up information on the computer, he or she usually assumes that speaker status will remain with them. But this does not always work out, as patients sometimes self-select themselves as speakers and challenge the doctor's entitlement to the next turn. The doctor's work on the computer can be confusing to the patient and to outside observers or analysts, and some patients may perceive that the turn is "up for grabs" given the pause resulting from the doctor interacting with the computer. Other patients will take the pause as a busy signal.

To further clarify this point, I will examine the patient's various roles in the doctor-patient-computer conversation. Goffman defined participant status, or participant role, as the relation of a member of a participation framework to an utterance (Goffman 1981b). First, however, due to its particular relevance to my research questions, I will focus on one aspect of the hearer-speaker relationship, the non-speaking participant, or "hearer", which will help us understand the patient's status in the relationship when the doctor is focused on the computer or when addressing the group. Goffman (1975:3, 1976) distinguishes between three kinds of non-speaking participants: those who overhear, whether or not their unratified participation is deliberate, and whether or not it has been encouraged; those who are ratified participants but, in the case of interactions with more than two people, are not specifically addressed by the speaker and also called "unaddressed recipients" (Goffman, 1981a); and those ratified participants who are addressed, that is, oriented to by the speaker in a manner to suggest that his or her words are particularly meant for them, and that some answer is therefore anticipated from these hearers more than others.

Based on the above, I briefly review some of the ways in which a patient participates in the conversation between physician and computer, as an addressed participant or an unaddressed participant. I will exploit the generic organizations to give context to my observations. I will also review briefly the staging in which gazing is taking place.

The patient is assumed to be a *ratified participant* even when he or she is not gazed at in any of the generic organizations (1 through 10), since he or she is admitted to the interview and is part of the overall activity.

As a *ratified participant*, the patient is an *addressed recipient* but the degree to which he or she is addressed varies by generic organization and also speech activity. As an addressed recipient, the hearer is assumedly allowed to participate and take part in the conversation when appropriate (Goodwin, 1981, Goffman, 1981a). However, in this human-computer interface, the patient, even as an addressed hearer, may not always be able to take part in the conversation through an exclusive turn. Rather, the relevant points in the conversation during which they are invited to participate are sometimes shared with the computer as well. This leads me to place the patient in either a "secondary hearer position" or "primary hearer position". The patient acquires primary hearership in generic organization 4 because he or she is being *exclusively* or directly addressed, and a high value placed on the patient by the physician. However, when the doctor turns to the computer to look up or input information, he or she is placing low value on the patient as an addressed hearer and high value on the computer, and the patient becomes a secondary hearer.

The patient is an *unaddressed recipient* when the physician is *exclusively* addressing the computer. However, even though the patient may not be a current addressee, he or she is nonetheless admitted to the interview. Everything that the doctor is doing on the 'e-patient' concerns the same patient in person. In other words, though the doctor is not directly addressing the patient, the doctor expects that the patient is listening to the comments and remains part of the group conversation. The key element in this participation framework is that the doctor does not anticipate an answer from the patient because his/her attention is specifically focused on the computer[47].

Patient status is ambiguous given the *speaker-hearer overlap*. Because there is frequent juggling between patient, computer, and physician as we saw in various extracts above. There is noticeable overlap between speaker and hearer, to the extent that it often becomes difficult to select speakers from hearers[48]. When the doctor oscillates between the computer and the patient in generic organization 5, the hearership values mentioned above start to overlap. In these instances, participants' roles may not be easily discernible due to the ambiguous nature of the interaction as we have seen in the encounter above between Lauren and Dr. Spire.

5.1.3 Implications for organization of turn-taking and doctor-patient participation frameworks

Based on the observations above, the doctor is performing as the main character on multiple "front stages" (Geser, 2002), participating closely in what Goffman (1963) refers to as 'cross talk'; a conversation where "one member of a With momentarily sustains exclusive talk with someone who is not in the With" (p. 25). This resemblance to cross talk is supported by the fact that there is no 'direct' or potential communication between the computer and the patient unless the doctor invites the patient to gaze at the computer, which is rare. There is then reason to

[47] The doctor does not always succeed at keeping the patient outside of the interaction

[48] See Jefferson 1973 for related analysis

postulate that the physician is managing two 'front stages' (MD-PC and MD-Pt) that may be different than those explored in human-human interaction.

Given the disconnect between the computer and the patient mentioned above, these fronts are also 'distant'. The responsibility to manage this three way interaction falls on the physician (computer user) who now has to manage the expectations from both the patient and the computer by either gazing back and forth to communicate attention, or by using other resources to engage the patient (bystander).

Despite the fact that the physician controls the interaction, the exchange of turns and movement of one participant from hearer to speaker is not always smooth. The patient's contributions tend to overlap and are often off topic from the physician's conversation on the computer, because the patient simply does not have access to the computer's 'talk' (i.e. screen). The encounter between Patient Lauren and Dr. Spire recounted above demonstrates this. In these encounters, it is also typically unclear when the physician is actually done conversing with the computer and available for "collaborative action" (Sacks et al. 1974; Schegloff and Sacks, 1973) with the patient.

Doctors and patients use multiple frameworks to manage the conversation and contribute to various participation frameworks based on an understanding of their own and others' involvements in an encounter. In what follows, I present various environments or settings where patients and doctors are interacting at different levels based primarily on how the doctor is interacting with the computer[49]. These examples of participation frameworks that follow are

[49] I am simply reflecting on the generic organizations and conclusions about gaze and participants' roles in order to observe which of these environments would yield more turn exchanges or conversation time between the two partners. 'More conversation time' should not be confused with quality.

simply idealized types of interactions or regularities composited from multiple interview videos and transcripts.

As mentioned above, gaze is an important clue to the environment or generic organization in which the doctor, patient, and computer interact. When the physician is talking, it is not always clear who is being addressed if one is just listening to the transcript of the conversation. Are they addressing themselves? The computer? The patient? The physician's gaze can clarify where such talk may be directed. For example if the physician is talking to the patient, one might expect that the physician would look at the patient. How this actually plays out may be different.

Gaze can be crucial in generic organizations where the doctor is predominantly or exclusively interacting with the computer such as 1, 3 and 8. The doctor-patient frame becomes a side involvement as the computer takes precedence in the doctor's gaze. The patient is a physical bystander witnessing an act happening between the doctor and the computer. However, depending on how the doctor is interacting with the computer, the patient may or may not break into the MD-PC relationship. As mentioned above, based on observations of videos and reading of transcripts, I subdivide the interaction frame with the PC into further categories such as: the physician typing, gazing/reading silently, or engaging in an onscreen commentary with the PC. These subdivisions of the overarching organization when the doctor predominantly or exclusively addresses the PC result in varying degrees as far as patient's contributions to the conversation or the duration of patient on hold are concerned. Within each frame or subdivision a new participation framework emerges which displays the relationship among participants, and which changes and adapts to the other semiotic resources in the interaction.

When the doctor is gazing at the screen, or reading very quietly, some patients -though unaddressed at the time- self-select themselves to speak and expand on the topic at hand. The majority of patients do not ‘interrupt’ unless they are invited. This may be because the doctors’ typing (which creates a lot of noise) seems to impede some patients from talking. Typing which makes a lot of noise then it is more effective in blocking, as the noise resembles the volume level of one individual talking to another. In conversation, a third person must wait unless there is an extraneous circumstance or reason for overlap, and the patient waits for similar clues. Typing, even filled with pauses or gaps, blocks these patients.

Additionally, doctors are occasionally engaged in talk on the screen directed at the patient which does not allow the patient an opportunity to contribute. I expand on this type of interaction with the computer in section 5.2.2. Examples include reading notes out loud, talking to the computer (e.g. “where is this, I thought it should be filed here”), and stalling the patient (e.g. “lemme see:, hold on, u:hmm, I-I’m looking fo:r your prior prescriptions”).

The interaction frame that involves only gazing at the computer partner is very uncommon in machine-free human encounters because one entity does not just gaze at an apparently inanimate object for a long time without other signs of interaction. In multi-human party interaction, talking and gesturing block ratified participants who are not addressed from contributing. In the exam room, the physicians’ interaction with the computer fills this same role, though it may range from silent reading to typing or even verbalizing. And, similarly to human-human interactions, this range allows some people to break in while excluding others, depending on the context or setting.

5.1.4 Conclusion

In this section, I have sorted out the distinctive properties of gaze in various human-computer situations in the exam room. I summarized my observations on gaze and also outlined how patients and physicians negotiate their gaze availability to each other around the computer. I have compared my gaze practices in this human-computer interface to previous work in human-human interaction. I have also discussed the implications of these gaze practices for the doctor-patient participation frameworks. This led me to expand on the various structures in which the doctor activates his or her relationship with the PC through typing, gazing/reading silently, addressing the computer and the implications of these for turn-taking and participation frameworks. These subdivisions of the overarching situation when the doctor predominantly or exclusively addresses the PC result in various participation frameworks between the physician and the patient.

However, the distribution or degree of patient’s opportunities to contribute to the conversation is not only dependent on how the physician is activating the relationship with the computer (gazing, typing or talking to the computer) but also on his or her embodiments and the particular staging where the event is taking place. Below, I expand on this conversation by focusing on the doctor’s verbal resources for managing to survive the competition over his attention by both the computer and the patient before focusing fully on physical formations.

5.2 LINGUISTIC RESOURCES FOR MANAGING THE INTERACTION

This section provides additional linguistic information about how the computer is impacting doctor-patient interaction and particularly the linguistic resources for managing the conversation. In 5.2.1, I summarize briefly the conversational floor holding particles and other linguistic tools for negotiating actions around the doctor's yaw motions and other scenarios where the doctor is managing multiple courses of action. In 5.2.2, I focus on the characteristics of what I describe as doctor's onscreen commentary (OSC) and its primary functions in interaction. In 5.2.3, I frame my analysis around recent research on the impact of driving on language and connect that to my discussion of the impact of doctor's computer excursions on the structure of conversation.

5.2.1 Verbal resources for managing and surviving the competition

In my discussion of the linguistic tools that are used to manage multiple involvements, I will focus as mentioned earlier on turn-taking systems (Sacks et al 1974), turn beginnings (Schegloff, 1987b) and linguistic particles/discourse markers (Schiffrin 1987) which provide various resources for local displays of orientation and task switching (Butterworth, 1972).

5.2.1.1 Turn beginnings, connective devices, overlap management and restarts:

The most logical language material to start with is turn beginnings, which are very significant and strategic aspects of turn design (Schegloff 1987b, Lerner 1996). Turn beginnings project the intended shape and trajectory of the remainder of a turn construction unit, and provide physicians with a manageable tool to direct patients' attention. They also help manage turn-taking between the computer and the patient. Within turn beginnings, discourse markers such as *alright, okay, a:nd, so, uh, uhmm*, are transplanted by the physician to help them connect and redirect action between what was said, what is about to be said, and what is about to be done. For example, in extract 7a, line 17, Dr. Spire prefaces his turn with "alright + a clause consisting of a question" right after he logged in to the computer amidst a latched talk.

Extract 7a:

16- Pt. Lauren: ,,,
=xxx get blood out of there or something, I don't know=
17- Dr. Spire: ___>>>tttttttttttttttttttttttttttttttttttttttttttttttttttttttttttt (**Dr. logs in on computer**)
=**Alright**, are you having any (0.01) any problem with pain or=
17a- Pt. Lauren:____
18- Pt. Lauren: _____
=It was=

In this instance he seems to be trying to control the flow and clear the road for the new 'partner' who has joined the conversation. He is also setting the tone for how things should follow by dictating turn size through closed-ended questions to manage typing, flow, and topical development. "Alright" in this context is slightly dismissive, because the doctor is acknowledging that he heard the patient but is not expanding on it since he seems to be moving talk away and projecting a new course of action.

The adverbial "alright" may occur by itself, at the beginning of a long clause, or may even occur as a complex frame [alright+ another discourse marker] depending on the user's orientation. These particles provide the doctor with an opportunity to shift gears and confirm speakership with the patient or the computer and supply two cues: a lexical one and a prosodic one, because their meaning depends not only on where they are introduced in the talk but also on how they are produced. Additionally, the meaning of these conversational objects depends on other material they co-occur with. For example, the complex frame [alright+So+ main clause] in Dr. Spire's line "**alright**, **so u:m, s**-this thing hit your shoulder and **now, now** your shoulder is hurting you worse, **ehn?**" enables him to sum up and redirect the conversation in a less dismissive way compared to line 17 in extract 7a mentioned above. The stand-alone adverbial markers ('alright' or 'okay' with high intonation) are usually launched to initiate the typing activity, which controls the information intake and allow time for the physician to type the information shared.

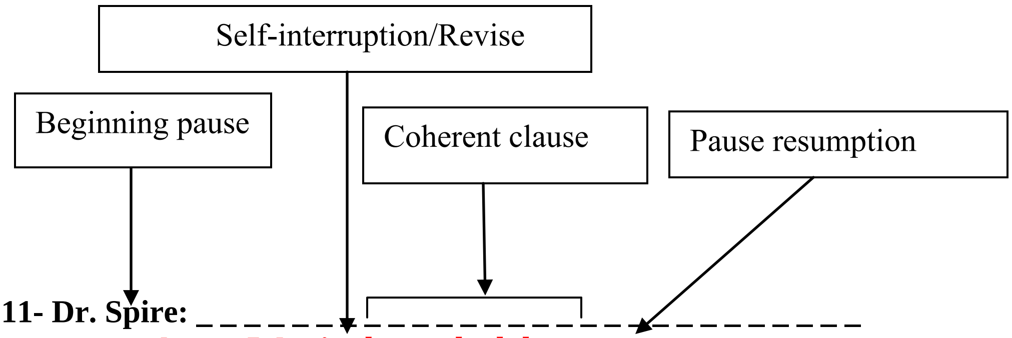
The patient's "Okay" formulations in lower intonation observed throughout all interviews indicate the patient's alignment with the doctor's proposal. The patient's "okay" is a grammatically predictable response (second pair part) to the doctor's "alright" (first pair part). In this regard, the adverbial 'alright' is deployed to secure patient alignment and serves as an interactional vehicle to move the conversation forward (Soudi, 2009b). Ironically, physicians also use the same single low intonation "okay" or a double "okay, okay" as minimal response token or 'continuer' (Schegloff 1982, Jefferson, 1984) which indicates a preparedness to shift from speakership to recipiency as I have shown in extract 7a above. They are apparently giving up competition over speakership with the patient while simultaneously pursuing 'speakership' with the computer (a mixed signal). Another observed token with a similar function is the space filler "uhuh", which occurs simultaneously with interaction between the doctor and computer.

Connective devices (such as "a:nd"), as seen above, convey a stance about what was said, and help shape current stance. They also help the physician bridge conversation between the patient and the computer. When the physician uses the conjunction "a:nd" followed by a gap as in "**aa:nnd**, I think that <should (0.03, mouse joggle) straighten us out for today (.15)", he is

using this connective device as a resource to communicate that the action to follow is part of an activity initiated previously. He is bringing the action home and placing the patient on hold as he restores speakership with the computer to decide what to do next.

One other marker of shifts is “u:hmm/a:hhhm”, which enables the physician to go back to work on the computer. This device occurs either at the beginning of a turn in order to signal the beginning of the action, or at the middle in order to hold the floor. As seen above, other space fillers or turn yielders like “ehn” are compatible with the speaker transferring gaze from the computer to recipient are also very frequently used. Clark and Fox Tree (2002) reported that “um” and “uh” both serve the discourse function of signaling the initiation of a delay in conversation and are often followed by a pause. Restarts in the form of word-doublings, such as “now, now”, are also introduced by Dr. Spire and Dr. Ceremuga after the pause to delay further the launch of the main sequence. “U:m-hmm” introduces not only pauses, but also gaps or increased transition with the computer. Line 11 in extract 6 is repeated below in extract 10 to clarify this process:

Extract 10:



11- Dr. Spire:
U:m-hmm, I don’t –let me look here. Mmm
(.09) (Gap= Dr. gazing at computer)

The gap or time-out with the computer is initiated by the marker ‘u:m-hmm’ and followed by what appears to be a commentary on the computer during which the doctor seems to be addressing both the computer and the patient. The doctor actually asks to be allowed to look at the computer using an ‘online explanation’ sequence, which I expand on below. Prepositional and postpositional fillers help the speaker to play for time (See also Stenström, 1994, p. 81). The play for time is also displayed by the doctor’s phrasal break after the space filler. In general, doctors use these markers to display various orientations and connect the divergent conversations (MD-Pt and MD-PC) together. In this sense, these markers help redirect the conversation, repair it, and save it from disrupted adjacency resulting from the patient being unaware of the turns on the computer, or even the fact that the computer has a turn in the conversation as well. These sequentially-dependent items then function as turn-taking signals to claim space for the computer, and help provide doctors with resources for resolving latched talk and overlap wherever and whenever they happen.

As discussed above, overlaps results from the decreased turn-taking signals, and also from the disconnection between the patients and the computer, which leads some patients to self-select themselves as speakers when the physician is busy with the computer. Overlaps result also from the absence of doctor's gaze when he or she is focused on the computer. Instances of simultaneous talk happen all the time in casual conversation between people, even when a speaker's turn completion is visible to all parties. In this context, the situation is even more difficult because the computer's turn status is only available to the physician, creating an interaction problem. Competition over speakership is an inherently human issue that leads to constant overlap; speakers constantly improvise on how to resolve overlap. Usually, participants take a stance at the overlapping 'beat' (Schegloff, 2000a) or first syllable where talk starts to overlay other talk. Speakers then decide what to do: stop or persist. The challenge in this interface, as mentioned above, is that while the patient's beat and the doctor's beat are available to each other (even in the absence of gaze) the computer's beat or the physician's beat on it are not available to the patient. So, one way of claiming space for the computer is through the space fillers mentioned above.

Given such foreseeable overlap, doctors apply overlap treatment ahead of time by simply being upfront with the patient, as in line 11 in extract 10. Additionally, doctors use other pre-emptive methods such as on-screen commentary, which I discuss below. Schegloff (2000b) refers to the spot in the conversation where overlap is projected as the *pre-onset phase* of overlapping talk; this is where the physician invests linguistic tools to manage their front stages with the patient and the computer.

Schegloff (ibid) also talks about several sorts of behavior that can project an imminent overlap: a repositioning of recipient body, deployment of a gesture such as a lean, or utilizing pre-beginning practices such as audible in-breathing. However, the behavior of a patient embodying a prospective speaker position is not available to the physician because he or she is looking at the computer, and therefore the only tool he or she is left with to treat overlap is onscreen commentary, which I discuss immediately below.

In summary, it is within turn beginnings that physicians insert markers to enable them to manage multiple courses of action. These markers are used to activate the computer in the relationship (MD-PC turn requesting cue) or maintain activity on it (turn maintaining cues). These markers are frequently used to initiate departures from the patient to the computer such as returns from an interruption. Even the "alright" particle produced in "doctor gazing at computer" (DGAC) contexts is mostly designed by the designed to control information intake, manage typing and highlight the no-intrusion to MD-PC boundary. In other DGAC instances, Dr. Spire would use the particles "alright" or "okay" as I showed in extract 1 but would not actually say anything afterwards. By doing so, he is maybe initiating action with the system, filling a pause to stall for time, signal an acknowledgement or claim his or her interactional unit with the computer.

In addition to pauses, the moves from the computer to the patient (also on the computer) are marked by restarts or repeated occurrences of language material as in extract 11 below.

A restart usually consists of an incoherent ungrammatical fragment followed by a coherent grammatical structure (Goodwin 1981). Goodwin (ibid) shows how speakers use restarts primarily to secure the gaze of their recipients, and once this is gained the speaker proceeds to producing a grammatical construction. In this research context, the fragment (incoherent phrase or restart) is dropped when the doctor has finished formulating his analysis on the screen and starts to direct his gaze to the patient away from the computer (DGAWC). While patients use pre-sequencing material to secure doctor's gaze or attention, physicians use restarts to stall for time to formulate an analysis while continuously recruiting the services of patients as hearers. The On-screen commentary which I expand on later has several examples of restarts. I share another example of a restart in extract 11 below:

Extract 11:

9- Dr. Spire: _
aa:nnd, I think that <should (0.03, mouse joggle) straighten us out for today>
(.15) (Gap= Dr. gazing at computer silently & joggling mouse here and there)
(Fig. 8)

Fals | Revise | Restart | Fresh start leading to a coherent sentence

10- Dr. Spire: _
It Looks, like, (0.01) ahh, (0.02) **looks like** we should be, checking your
<<<<<<<<<<<<________________________________
cholesterol also. Have you eaten already today?

In the exchange above, Dr. Spire is on the computer to pre-close the chart and the interview (line 9). Patient Kevin remains on the exam table watching the physician and the computer. Dr. Spire is orienting to a screen prompt, which he proceeds to parse using a restart and a pause. The repetition of the phrase "looks like" followed by a pause helps the physician buy more time to formulate his report. Consistent with Goodwin (ibid), my data show that the restart and/or a pause eventually lead to the occurrence of coherent segments (extract 11). However, my data additionally show that doctors go back to restarts or pauses again even after producing the coherent segment in extract 10 to maintain speakership with the computer. While in Goodwin's study (ibid) speakers do not bring their sentence to completion unless they gain the gaze of a recipient, this study shows that doctors (as speakers) sometimes continue to maintain gaze with the computer even after their turn completion. It is also worth noting in this context that it is the speaker who is negotiating his gaze availability to the recipient, and not a speaker trying to obtain a recipient's gaze as in Goodwin's research study (ibid)). Not sure if he is being gazed at, Dr. Spire is using the restart protocol and pause mainly to sustain his speaking turn, and ensuring that the patient is waiting at the time of final delivery. The pause allows the doctor to "drive" without talking so he can focus better. Martin and Strange (1968, p. 474; cited in Goodwin, 1981, p. 61) argue that "while…hesitations mark speaker uncertainty, they have little utility for the listener". In this context, the phrasal breaks serve both listeners and speakers. They are entered in the conversation to accommodate the doctor's turn on the computer and preserve the patient's status as a hearer, making sure he or she is attending. This action is confirmed by Sacks (1967, cited in Goodwin, 1981) who states that a speaker wants to be heard: Sacks (ibid) notes a difference between a speaker having the floor in the context of hearers paying attention and having the floor when hearers are doing just about anything. The doctor, who is busy with the computer, is making sure the patient is paying attention to them.

5.2.1.2 Patient initiated sequences

Because the physician appears to be often busy with the computer, patients also use various resources for local displays of interactional stance (cooperative, affective and epistemic) to show they are orienting to the doctor's involvement with the computer and that they understand it. Patients deploy various sequences to add new information to the discourse. In the data, there are very few ‘free standing’ types of patient-initiated utterances. Patient-initiated statements usually carry a specific grammar. Similar to the restart-gaze pattern (Goodwin, 1981), patients’ questions are also launched at the beginning as pre-offer, or warning, or even a request to propose a new direction in conversation. For example, patients constantly use the summons-answer sequence (Schegloff 1968, 2002a) to initiate further talk, and secure the gaze and attention of the doctor who appears to be busy with the computer. Responses to summons by the physician may not always lead to an exchange of gaze especially when the physician is too busy with the computer as they sometimes only lead to minimal responses by the physician as shown above. I have demonstrated above how John’s prefatory material in requesting a Viagra® prescription could also be intended to enable opportunity for the physician to turn back from the computer and attend the full act. Doctors use such prefatory material as well as they prepare to shift from an MD-PC frame to an MD-Pt relationship. The pre-sequence material perhaps also helps the patients negotiate the context for introducing new information and minimizes the degree of perceived intrusion.

5.2.1.3 Doctors questions: Managing information flow

Doctors’ questions supply us with information about another resource for managing multiple courses of action and narrowing down the size of ‘mentionables’ (Sacks et al.,1974) to manage typing. Doctors deploy forms structured in a way to warrant new information from the patient by forecasting a new phase of the interview and the close of the on-going sequence (see summaries a-c in 4.1.1)). From the point of view of the structural organization, questions that doctors usually ask and the talk which follows them are bound or packaged together. This strategy enables doctors to control the flow of the conversation and also manage patient redirecting given time constraints of the visit. According to Sacks et al. (ibid), questions and answers are linked in time and structurally organized via a set of conventional rules that provide the resources and constraints upon which subsequent actions are seen as appropriate or not. From a sequential point of view then, questions may be seen as one component of a formatted device for constraining, forcing, or moving the conversation one direction or the other. For example, the patients' multi-component answers in extract 12 are managed in minimal adjacency pairs deployed by Dr. Spire to get medical history and redirect the patient:

Extract 12:

1-Dr. Spire: Um, Who wa:s uh your doctor for your delivery?
2-Pt. Gina: Um, xxx.
3-Dr. Spire: xxxx? He's wonderful. Um, Did you, uh, d-are you uh on some sort of (.1) contraception now?
4-Pt. Gina: Um, no
5-Dr. Spire: Are you (.1) do you wanna be?=
6-Pt. Gina: **=No=**
7-Dr. Spire: =Have you tried it before?=
8-Pt. Gina: =**No**

The doctor's question in line 3 is followed by a series of items that compose a local chain. The chain's completion occurs at the point at which another complete question occurs later in the interview (full question). The reduction of information provided beyond the initial question in the chain (lines 4 through 8) also operates to reduce the amount of information which is relevant for the patient to supply. The question is itself a reduced form because it is affiliated to the chain initial utterance.

The question format in extract 12 maintains the speaker type-turn relationship with the physician as the questioning party and the patient as the answering party. The patient is answering in short forms ("No") in three turns above (lines 4, 6 and 8) to move the talk forward quickly. Most importantly, it also makes typing the records easier. Patient Gina's minimal second pair parts mark her epistemic stance, and also support Sacks' (ibid) claim that turn-order and turn size are locally managed because they display an orientation and sensitivity to the doctor's needs; what Sacks calls "recipient design" (p. 727). This strategy is not unique to computer-mediated medical interviews. For example, it is described in other situations in Heritage and Maynard (2006). However, just because the computer's impact is not addressed in the analyses in Heritage and Maynard (ibid), it does not mean that this does not apply.

This section has looked at the verbal resources utilized by the physicians to manage competition over their attention by the computer and the patient as they conduct the medical interview. It also shows how patients orient to the doctor's struggles by adapting the ways in which they participate in the conversation. This discussion shows very clearly that computer is in fact impacting the conversation between doctors and their patients. In what follows, I focus on the characteristics and functions of the doctors' on-screen commentary.

5.2.2 On-Screen Commentary (OSC)

In this section, I discuss in further detail another kind of verbal resource used frequently by physicians to buy a time-out with the computer and conduct their self-analysis while also sharing on-screen information with the patient. This talk reflects yet another way in which the computer impacts the medical interaction and turn-taking management. I refer to this talk as onscreen commentary (OSC) and I discuss below its functions and summarize its linguistic characteristics. I will also link OSC to generic organizations to provide the context in which these resources are used.

OSC is performed contemporaneously with the doctor's activities on the computer. The physician also takes multiple conversational turns without allowing the patient to speak. In this way it is similar to an extended speech by one character in a theater; typically known as a monologue. OSC is not always "monologic" in structure because the physician appears to address the patient most of the time even though he or she does not allow the patient a formal opportunity to contribute to the conversation. OSC closely resembles interior monologue[50], a technique that enables protagonists to exhibit the thoughts that are passing through their minds for the benefit of the audience (e.g. the patient in this case), and not other characters or co-players (the computer).

Monologues can also be divided along the lines of active and narrative monologues. In an active monologue a character is using his or her speech to achieve a clear goal, whereas in narrative monologues, the character is speaking without a goal in mind. The doctor's commentary, as I show below, is the active type, as it serves many goals. Stream of consciousness novels like James Joyce's *Ulysses* frequently use the interior monologue technique (Stream of consciousness, Encyclopædia Britannica, 2013). Stream of consciousness was also employed in psychological novels during the 20th century and was intended to exhibit

[50] http://www.britannica.com/EBchecked/topic/290310/interior-monologue
Common in fictional literature/drama, interior monologue is a characteristic device of 20th-century psychological novels; it is a self-analysis, imagined dialogue (as in T.S. Eliot's "The Love Song of J. Alfred Prufrock" [1915]) or a first-person expression apparently devoid of the author's selection and control, as in Molly Bloom's monologue concluding James Joyce's *Ulysses* (1922).

characters' natural flow of thinking without relying solely on structured and coherent thought. The concept was first used by William James in the *Principles of Psychology* as a technique to seize, "the flow of myriad impressions — visual, auditory, physical, associative, and subliminal — that impinge on the consciousness of an individual and form part of his awareness along with the trend of his rational thoughts" (Interior monologue, Encyclopædia Britannica, 2013). These snatches of seized "impressions", ungrammatical constructions, incoherent thoughts, words at pre-speech level, and the free association of ideas are reflected in doctors' commentary on computer in the presence of a patient.

In generic organizations 1 and 3, for example, the doctor is observed either reading, typing, skimming the screen, or clicking relevant buttons to navigate other screens. During these actions or operations on the e-patient, Dr. Spire and Dr. Ceremuga also engage in 'one-sided' verbal repartee with the computer as they read through, type, or locate relevant information. They address themselves to the computer as they attempt to enter information into the various formats and occasionally grow visibly frustrated with the computer. At times, the doctor appears to be buying a "time out" from the patient to focus on the computer's needs. While one might think that their involvement with the computer would be a perfect time for patients to interject additional questions, this is not always the case. The doctors' focus on their interaction with the computer leaves little room for patients to add to the conversation. In observed interviews, many patients sit quietly, rarely commencing further conversation, simply waiting for the doctor to initiate talk again or prompt them to speak. Thus, the patients, reluctant to interrupt the doctor, do not seize the conversational floor. This leads to the patients' concerns being sequentially and indefinitely put on hold.

In extract 13 for example, Dr. Spire discusses how he has not been able to pinpoint exactly what is bothering the patient. Dr. Spire initially recommends blood work, but the patient shares she has already had this workup. So Dr. Spire proceeds to the computer to verify this information; reading silently, mumbling, and sometimes talking clearly. The patient seems to be 'invited' to join the act of looking in line 1. A few seconds later, the patient leaves the exam table on her own to go sit on the chair. This action is unusual for a patient; in most other interviews, the patient remains on the exam table until told they can leave as illustrated before:

Extract 13:

1- Dr. Spire: Let's look!
1a- Pt Carly: ________________ moves to chair ,,,,

Figure 14. Post exam. Pt Carly and Dr. Spire

[GAP (.30): Dr. Spire examines information on PC silently and jiggles the mouse. Pt. Carly looks back and forth between the door and computer station]

2- Dr. Spire: : _ _ _ _ _ _ _ _ _ _ _ _ _ _ _(DGAC)

<t-looks like the la:st time

2a- Pt. Carly: -- __

3- Dr. Spire: _

We checked this stuff (.1) was back in November (.1) and it was normal>

GAP (.8) (DGAC)

3a- Pt. Carly: ____(PGAD)

4- Dr. Spire: _(mouse jiggle)

So: (.4) I think I would START with (.2) -uh repeating some of those tests

4a- Pt. Carly: ____

5- Dr. Spire: _

to see if we can get any clues about why (.1) you're having this discomfort=

5a- Pt. Carly:____

6- Dr. Spire: _

=Did ↑the urologist check your urine (.1) recently?

6a- Pt. Carly: ________________________________

7- Pt. Carly: _________

(.1) U:h, yeah

7a- Dr. Spire: : _ _ _ _ _ _ _

During the onscreen commentary, doctors typically describe what they see on the screen as seen in lines 2 and 3, express their thoughts and feelings about what they see loudly, and detail what they want to do, what they are doing, or what they are trying to complete on screen. They read through electronic compositions from previous visits in an attempt to locate relevant information and formulate diagnostic ideas, occasionally speaking clearly for the benefit of the audience. In the above extract, Patient Carly waits 'outside' of the physician-computer dyad for the doctor to complete his performance. As mentioned above, the doctor then holds the next turn, and Carly misses any opportunity to contribute to the conversation.

5.2.2.1 Linguistic characteristics and Functions of OSC

As a form of conversation, OSC is performed with the computer, but it also makes information available about the doctor's thoughts available to the patient: the speech event is a projection about the electronic patient. Lines 2 and 3 in extract 14 below are spoken with lower volume than the surrounding speech and indicate that the computer and physician are much closer physically to each other than the patient. Additionally, it may serve as a discourse strategy to communicate full engagement with the computer, preempt intrusive talk, and ask for privacy until further notice. From a patient's perspective, OSC sometimes appears as "off the cuff" — a sudden and unplanned delivery that makes little sense, while from the physician's perspective, it may be coherent because gaps are filled by the information on-screen. Furthermore, because OSC is unrehearsed and unplanned, it often is unstructured, and even more slackly arranged than other spoken discourse of a conversation. OSC, as a kind of stream-of-consciousness narrative, is characterized by extensive phrasal breaks, pauses and subject-less clauses. Due to the randomness of its construction, OSC sometimes sounds like a one sided conversation whose first or second pair parts are missing: One person, the 'doctor', reads aloud part of a text message from a second person (the 'computer'), as a third person, the 'patient', stands by and listens. For example, Dr. Spire's line 1 in Extract 14 below denotes a closing environment; however his subsequent line 2 conflicts with the environment indicated in line 1 because in his OSC he introduces a new topic. This initiation of the closing with the patient in line 1 is also what justifies the increased transition space used to close the conversation with the e-patient as well:

Extract 14:

1- Dr. Spire: _

aa:nnd, I think that <should (0.03, mouse jiggle) straighten us out for today>

(.15) (Gap= Dr. gazing at computer silently & jiggling mouse here and there) (Fig. 13)

2- Dr. Spire :_ _ _ _ _ — _ **(Fig. 15**)

It Looks, like, (0.01) ahh, (0.02) **looks like** we should be , checking your

<<<<<<<<<<<<________________________________

cholesterol also. Have you eaten already today?

Figure 15. Dr. Spire and Kevin post-physical exam. Dr. Spire is examining the patient

Line 2 is a sudden response to a computer's prompt. The first turn construction units in line 1, which are characterized by a restart ("looks like, looks like") and also a revision moment ("ahh" followed by a brief silence), do not seem to be overtly addressed to the patient nor directly acknowledged by the patient, because he lacks access to what the physician is seeing. The physician takes time to examine the computer and share what he sees. He holds his turn on the computer via repetition, restarts, and a pause, if necessary, before sharing his final delivery, which is more coherent. The first TCUs are also delivered without gaze at the patient. However, when Dr. Spire decides to address the patient, he actually looks back to the patient to ask him a question as in the end of line 2 in extract 14.

Another related example comes from the encounter previously discussed between Dr. Spire and Patient John when John put in a request for a Viagra® prescription in a closing:

Extract 15:

1- Dr. Spire: _
Um-hmm (.2) I don't –let me look here. Mmm
(.10) (Gap= Dr. gazing at computer) ---> INCREASED TRANSITION SPACE

Figure 16. Dr. Spire preparing a response for Pt John

1a- Pt. John: ____
2- Dr. Spire: _ <<_
//D-Did we: (0.03) **I see coronary artery disease on your list.**
2a- Pt. John: __________ ,,,,… _______________________________
//(xxxxx)
3- Dr. Spire: _____________________________________
Did you have a (.2) What did you have, a stress test?=
3a- Pt. John: _____________________________________
4 -Pt. John: _________________________________
=Yes
4a- Dr. Spire: ___
[Dr. Spire continues to look at the computer to examine medication interaction]

In lines 1 and 2, Dr. Spire is engaging again in another "side-play" with the computer (Goffman 1981) following a question from the patient. The progress comes back to the patient via what Morgan (1996) described as "pointed indirectness" in her study of African American Women's discourse: A speaker allegedly appears to direct comments to one person ('Mock receiver'), but the actual intended hearer is someone else. To the casual observer, the order of Dr. Spire's turn might seem random to the external observer. The physician starts his turn with a space-filling comment in line 1 to allow for his excursion on the computer, holding a turn but not saying anything. Realizing perhaps that his sudden intermission to examine the e-patient might take longer than initially expected, he follows up with a TCU in the same turn, this time explicitly explaining what he is doing. In this case, the physician is apparently directing his/her comments toward the computer, but the intended hearer is the patient, as he is explaining what is going on. This is very similar to an 'online explanation' (Billings and Stoekle, 1989; Zoppi, 1997, Swartz, 1998, cited in Heritage and Stivers 1999), when a physician informs a patient about the next steps in the exam: physicians usually announce what they are about to check ("I am going to check your ears"). Patients rarely resist or block these procedures, since such maneuvers are expected when coming to the doctor. For example, line 2 is initiated with both a phrasal break and an overlap by Dr. Spire. John is responsible for abandoning his turn, and Dr. Spire takes advantage of this. Line 2 indicates an explicit shift of gears. While initially it appears that Dr. Spire is going to ask a question, he shifts instead to a statement about what he sees on the computer. Dr. Spire decides to openly report what he is seeing as he continues to examine the e-patient. This also resembles 'online commentary,'[51] (Heritage and Stivers, 1999) as the doctor is narrating or commenting on what he is seeing to the patient.

[51] I expand on online commentary below.

The randomness of the OSC and its disrupted chronology lead to the production of incoherent fragments. But this spontaneity enables the doctor to lead the interview and control the topical development. It simultaneously demonstrates the doctor's flexibility and willingness to accommodate the computer. It is also this occasional lack of coherence and gear shifting that makes multiple involvements possible. The physician redirects the patient much more easily than he or she can redirect the computer, partly due to the fact that the computer's screen and flow of information presented through EpicCare can be difficult to override[52].

The doctor's engagement in such a commentary is indeed common practice in other stages of the interview. As discussed above, Heritage and Stivers (1999: 1501) made reference to doctor's *online commentary* in an acute medical visit which "describes or evaluates what the physician is seeing, feeling or hearing during the physical examination of the patient." Online commentary (OC) occurs when the physicians examine patients (generic organization 6). Heritage and Stivers (1999) explain that this online commentary affords the patient access into the physician's reasoning (in statements about what the physician observes and feels, etc). In terms of content, they (ibid) also explain that online comments are:

> …quite distinct from the concluding diagnosis or evaluation of the patient's health status….online commentary differs from diagnosis in that it does not contain inferential reasoning in the form of conclusions about the patient's medical condition. Rather, online commentary simply formulates the sensory evidence that is available to the physician in the course of the medical examination. (p. 1502)

[52] The system sometimes requires things to be entered according to previously automated structures. A red or yellow bar would appear if a wrong test that is not supported by the diagnostic codes is entered. For example the physician can't order a pregnancy test without documentation of a suspected pregnancy. Also you can't order a colonoscopy without diagnosis screening for malignancy.

OSC as described above has the same exact function. The physician gathers information about what they are seeing on the e-patient. The patient (unaddressed participant) is not expected to attend to such talk because what the physician is seeing is not within the patient's visual range, and the patient is not therefore expected nor empowered to participate in it simply because they lack the necessary resources. The extracts below illustrate the physical context for OC and OSC, and how none of the areas the doctors are 'examining' are available to the physician. The extracts illustrate encounters between Dr. Spire and Pt Gina (Figures 17, 18) and Dr. Ceremuga and Pt. Nicole (Figures 19,20):

Figure 17. Exam on patient in person (6)

Figure 18. Exam on e-patient (1)

Figure 19. Exam on e-patient (3)

Figure 20. Exam on patient in person (7)

If and when patients do participate during an OSC, their contribution is very limited to minimal responses, such as “okay” or other back-channeling material. The characteristic features of how OC is designed are based on the types of comments that the physician makes — in other words, what he or she observes and feels (assurances, assertions, evidential formulations, reports of observed signs) (see Heritage & Stivers, ibid). These are similar to OSC, which makes OSC and OC almost the same in terms of structure and function. Additionally, OSC may allow physicians to introduce serious matters mainly because OSC is performed on histories and past procedures, contrary to OC, which occurs on the actual patient.

As mentioned above, this commentary enables the doctor to make his or her ideas explicit. This technique is particularly relevant here because the doctor has access to the computer screen and other information influencing his or her self-analysis, whereas the patient does not. Thus, sharing these things out loud in OSC serves the same traditional function as a monologue in fictional drama: externalizing thoughts so that the audience can witness experiences that would otherwise be mostly internal. The patient, thanks to OSC, is apprised of the doctor’s thoughts while watching the act and also understands the nature of the hold in direct action. The voicing of thoughts is intended for and incorporates the patient even when the doctor is not gazing at him or her. Thus, in these situations, the physician’s address is an interior monologue that becomes active. The patient in this case is treated as an audience; a ratified hearer, but not an invited player in the act. While the physician speaks, the patient is expected to allow the physician the time to complete his or her performance until further notice. The patient’s invitation back to the conversation is usually indicated by a change in pronoun, a sideways gaze or a direct question in louder volume than its previous preceding talk, as shared above in extracts 13, 14, and 15.

The commentary is also used to indirectly attend to the patient's requests about any radiology or blood work and other expectations as in extract 16 below, where Dr. Ceremuga is meeting Pt. Nicole to discuss her lower back and other issues:

Extract 16:

1-Dr. Ceremuga: _
<alright > so: up↑at the blood work (.12) the rhematoid factor was completely normal
[
1a-Pt. Nicole: . .X________________________________

Total GAP time (.21)

When Dr. Ceremuga says in line 1 above "…the rhematoid factor was completely normal," this could be a clear indication that she won't order new labs even if that is what the patient had intended or anticipated. This is another example of 'pointed indirectness' (Morgan, ibid) where the computer is serving as a mock recipient to report results to the patient as well to save time.

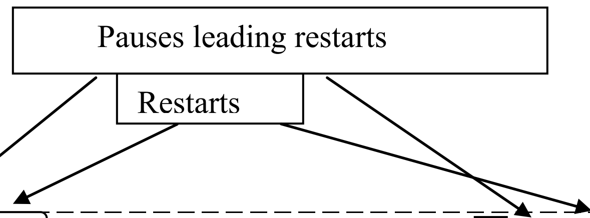
OSC, just like OC, serves to validate and project (Maynard, 1996) the physician's upcoming diagnostic evaluation and occasionally to lower the patient's expectations. This is similar to Dr. Spire's mention in line 2 in extract 15 about his seeing of "coronary disease." His verbal presentation of what he sees serves him to invite the patient to approach Viagra® prescription with caution. The physicians' OSC shapes the patient's upcoming prospects and relates final available information and medical decisions without engagement in direct conversation about it, which saves time[53] and face. In this respect, the physician is acting as an animator 'sounding box' and the party responsible 'principal' for what is said is the 'e-patient'. Because these commentaries are short and delivered on the side, they also are similar to 'asides,' as in drama[54]. One other possible function of the doctor's onscreen commentary can also be borrowed from and is equal to the original role of monologues in the Ancient Roman theater: to indicate the passage of significant amounts of time especially those that would be tedious or even impossible to actually play out in real time. This type is referred to as a 'linking monologue.'

The turn below in extract 17 occurs following a misunderstanding about a previous prescription for the patient's physical therapy: Right after his acknowledgment in line 1 in extract 17, Dr. Spire claims space for a 22 second excursion on the computer using the 'online explanation' sequence described above. The acknowledgment is followed by a 'dispreferred marker' to the flow and also that Dr. Spire is now consulting his thoughts ('thinking out loud', Labov and Fanshel 1977:189) and he is asking to be allowed to 'deliberate'. Muller (2005) also showed that 'well' can be used to show that speaker is searching for content and planning what to say. This is also confirmed by the repetition and pauses that follow the marker and also the

[53] Dr. South-Paul reports using a similar strategy as "pointed indirectness" to save time in a situation where she asked a medical student to follow her back to the exam room so she could address ("teach" him) in front of the patient since the talk is relevant for the patient) (personal communication, April 5, 2013

fact that he is actually scanning the screen for content. The patient is placed on hold and the hold is not released until the doctor directs a new question to the patient.

Extract 17:



1- Dr. Spire: _
<Okay>, well, let me .2 , let me look over your (.1) records here so (.4) <so you saw me back in February> (.15) (reading and jiggling mouse)= DGAC total time (.22)

These devices enable the doctor's redirecting, funneling, topic closings and movement of conversation forward while allowing constant transitions along MD-Pt and MD-PC frames. They also exclude the patient and enable increased transition space with the computer to pursue the computer's dramatic needs while still informing the patient in order to save time by minimizing exchanges.

5.2.2.2 The fourth wall

OSC, as I will show in my analysis of F-formations, introduces a "fourth wall[55]" into the interaction, which, in drama, refers to a boundary or imaginary fence between actor and audience. "The fourth wall" in this context separates the physician and computer (players) from the patient (audience). During OSC, information made available to the patient as needed, and

[55] "The **fourth wall** is the imaginary "wall" at the front of the stage in a traditional three-walled box set in a proscenium theatre, through which the audience sees the action in the world of the play. The idea of the fourth wall was made explicit by philosopher and critic Denis Diderot and spread in nineteenth-century theatre with the advent of theatrical realism." (Bell, Elizabeth S. (2008). *Theories of Performance*. Los Angeles: Sage. p. 203.)

there is generally no need to break in the stream of consciousness and excursions on the computer. However, that is not to say that this fourth wall is never broken. As Bell (2008) explains:

> If frames are generated through conventions of theatre, art, media, and film, then these same frames can be broken. In the theatre, when performers "break frame," they break the imaginary fourth wall — purposefully in direct address to the audience, and oftentimes accidentally, when things go wrong onstage. (p. 38)

In terms of this study, the fourth wall is constructed between the doctor and the computer and reinforced by OSC. However, an established moment of mutual gaze between doctor and patient or a doctor's OSC followed by a direct question to the patient usually breaks the fourth wall, from both the doctor's and the patient's perspective. Also, the fourth wall is usually broken when the patient injects intrusive talk into the MD-PC domain. This occurs, for example in extract 18/Figure 21 below, where the patient breaks into the MD-PC conversation in line 1 and the doctor gazes away from the computer to participate in collaborative action with Pt. Kevin.

Extract 18:

1- Pt Kevin**:** ______________________
I was on the phone like this
[
1a- Dr. Spire: tttttttttttttttttttt<<<.X__ (Dr. Spire typing pt's prior response)
uhuh

Figure 21. Fourth wall broken

It is interesting to note that just as the arrangement of different sets in the theatre shifts the audience's perception of the fourth wall, the boundaries of the "stage" in a clinical setting vary between the rooms of this study; the physical layout of the room can affect how or when the fourth wall is broken by either the doctor or the patient.

5.2.3 Typing-speech interaction: Driving and talking

In this section, I will detail how two motor functions, typing and driving, negatively affect speech interaction, with implications for the efficiency of our linguistic resources in simultaneously managing the activities of speech and typing. By reviewing analogous studies that explain how driving impairs speech — namely, cell phone conversations between the driver and an outsider — I describe how a physician's spoken interaction with a patient might also be impaired. To elaborate, 'typing' here refers to the doctor's ballistic moves on the keyboard, scrolling, and other activities on the computer. 'Speech' refers to the doctor's engagement with the patient.

In section 2.5, I underlined, based on existing research on typing, that keyboarding is not as simple as may seem, and that low typing skills can impact text quality. Typing a text is the result of several operations that have considerable motor and cognitive overlap in time (Gentner, 1988). In fact, because there is a continuum between the motor and cognitive requirements of typing, it is a form of speech in itself, and — as both a motor skill and a form of speech — typing is perhaps a much more complicated motor activity than driving a vehicle. Regardless, the language of drivers might actually be similar to that of doctors falling behind on typing or reading on-screen information and also attempting to converse with the patient. I should note, that while the reverse comparison could also be made, studying the effect of conversation on driving ability and the effect of speech on typing ability, this was not the purpose of this research. — I am not concerned with medical records themselves on the computer at this point in my research to analyze the quality of text production.

There is anecdotal and experimental evidence indicating that expertise in typing is associated with the ability to perform concurrent activities successfully (Gentner, 1988; Pashler, 1993). The medical interview can be quite complicated, and evidence from prior research shows that it is asymmetrical because it is delivered though a set of organizational behaviors. It involves competition between the doctor and patient agendas, as well as the restrictions imposed by the structural units of the medical interview itself.

I mentioned above that the language of drivers or substantial multi-tasking is similar to that of doctors falling behind on typing, reading on screen information, and conversing with the patient. I have shared how physicians use multiple verbal and non-verbal resources to manage the conversation in this human-computer interface. In this section I simply interpret these findings in light of research done on driving and talking on a cell phone. This real life comparison will shed additional light on the challenges of medical interviewing using a computer. We know from extensive research that talking on a cell phone and driving has been equated to that of drinking and driving (Strayer et al., 2006; cited in Becic et al 2010). And research has also proven that conversation on a cell phone impairs our driving ability (Briem & Hedman, 1995, also cited in Becic 2010). Ironically, however, the extensive research conducted on how a cell phone impairs our ability to drive is of limited use to this study at the time. Instead I will focus, as mentioned in my review, on the more recent research that addresses the effect of driving on speech production, comprehension and meaning (Becic et al 2010). To apply this analogy to my research context, driving is comparable to the doctor using the software and navigating using a keyboard and mouse to select appropriate fields and scroll up and down though text. Talking on a cell phone is comparable to talking to the patient since the patient is not within the physician’s visual range in addition to the fact that the computer fields are not available to the patient. The conversation with the patient might also be compared to a driver chatting with a passenger, as in Figures 22 and 23. The physician almost needs a rear view mirror to exchange gaze in Figure 23.

Figure 22. Pt. Tina and Dr. Ceremuga (2)
Driver-front seat passenger arrangement

Figure 23. Pt. Gina and Dr. Spire (8/9)
Driver-back seat passenger arrangement

The study by Becic et al. (2010) assesses the effects of driving on speech production comprehension and meaning using a story-retelling task during which participants heard and retold short narratives, each of which described a single event. The results of Becic (2010) are fascinating. Not only does the study demonstrate that driving impacts speech production and comprehension, but also shows that it affects the encoding of the products of comprehension into memory. Drivers were less accurate in their retellings when experiencing a more demanding driving situation — such as maintaining high speeds and shifting lanes on a highway — which provides further evidence of prioritization and a tangible cost to linguistic processing. Similarly, driving through an intersection or a busy, urban environment requires additional attention, and linguistic performance suffers to the extent that the driver calls on those resources. In hypothesizing when conversation would most be harmed during routine driving, or during less predictable, higher variability driving, it would seem logical that routine driving would have less impact. However, as Becic et al. (2010) describe, there are more pronounced detrimental effects to conversation during routine driving than during less predictable driving routes. "Language use…is degraded by even the most routine driving" (Becic et al. 2010, p. 20), suggesting that linguistic performance suffered in both types of driving. The doctor-patient-computer interfaces relevant to Becic's findings here are generic organizations (1, 3, 5), when the physician is focused more on the computer or both at the same time. The busiest intersection, so to speak, is the doctor's yawing moments or generic organization 5 which require considerable redirecting, floor holding markers, and thought processing and occasionally even a physician's clap to balance speech and typing. That is, consider again the encounter between Lauren and Dr. Spire, when the conversation hit a bottleneck after confusion about the patient's hair washing and its contribution to her ear problem. During this time Dr. Spire had to gaze away from the computer (pause on the driving), and look to the patient to clarify the misunderstanding about whether the failure to wash her hair was connected to her ear pain. Additionally, these situations requiring intense engagement with both the physician and patient show high occurrences of phrasal breaks, repetitions and space fillers as the physician struggles to balance everything. They are also characterized by extensive overlap as seen in extract 7. Both patient and doctor are going beyond their transition relevance points, which show the difficulty underlying operating on two front stages, as explained previously. These types of situations can be equated to managing a fluctuating environment, such as driving an automobile through several consecutive intersections; they certainly pose a challenge and limit linguistic performance (Becic et all 2010, p. 18), but are still navigable without a severe effect on the conversation.

However, physicians also draw boundaries to protect their interaction with the computer from the patient's intrusions, just as drivers use meaningless fillers or 'continuers' like "yeah" and "uh huh" and "right" in a conversation over the phone as they navigate a tricky intersection. In generic organization 1, which involves the physician addressing the computer exclusively, the physician's on-screen commentary tends to cause the conversation with the patient to suffer. Conversations in these situations have longer dead zones, as we saw above in extracts 15, 16 and 17. OSC embodies the most uneven distribution of speech and reading on the computer, when the doctor in his or her actions and speech all but forbids the patient to talk. Based on personal experience, the comparable driving situation to OSC is when the driver actually begins to describe traffic situations over the phone, as a way to urge the person on the other end not to interrupt the process. This might be similar to how physicians simply narrate their actions or read from the computer screen loudly to allow focus and block the patient.

According to Becic's (2010) results, 'steady driving' (i.e steady speed and lane-keeping) while talking came at the expense of accuracy in the language tasks performed. These results further confirm performance on multiple involvements and the fact that we cannot pay the same level of attention to all of the tasks at hand. The miscommunication I referenced above between Dr. Spire and patient Lauren in extract 7, 8 and 9 where the physician missed details about hair washing and antibiotics exemplify this. Thus, ‘steady typing’ (i.e. high quality, involved responses) seems to negatively affect, or even eliminates conversation with the patient. The following extract between Dr. Ceremuga and Pt. Nicole illustrates another example of increased transition spaces with the computer. This is just one example out of many other ones that illustrate how typing on the computer results in dead zones in the conversation. Doctors in this study generally do not type and talk. This was also confirmed by the doctors’ responses to the questionnaire.

Extract 19:

1-Dr. Ceremuga: _ _ _ _ _ _ _ _ _
anything new?
1a- Pt. Nicole: _______________
2- Pt. Nicole: ____,,,,   …__,,,
no:pe, nothing new
2a- Dr. Ceremuga: (writing on paper chart)
3- Dr. Ceremuga: (paper chart)tttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttttt
Okay

GAP (.54)

As a form of corroboration of this statement, Becic et al. (ibid) note that the prioritization of driving over conversation was also seen in the influence of route difficulty; when a route required more resources to maintain speed and keep in a lane, the accuracy of a subject’s retellings were less accurate than on a less demanding part of the road (Becic et al 2010, p. 18).

In short, steady typing over a longer period of time is more demanding on the physician's attention and maybe more detrimental to the physician-patient conversation than engagements that involve minimal required responses on the computer as in organizations 2 and 4. In generic organizations such as 1 and 3, physicians must focus on the computer and keep the patient at arm's length, whereas in 2 or 4, the physicians can flow between the computer and the patient more easily because the main focus remains the patient.

In terms of my research, how do we determine when a physician is steadily engaged with, or even completely preoccupied by, his or her work on the computer? For the purpose of this study, I use the examination of pauses. Addressing the computer through gazing at the screen in-between small bursts of typing is pretty common throughout variations of generic organization 1. The pauses noticed throughout my data are consistent with Olive and Kellogg's (2002; cited in Alves et al., 2008, p.3) observations, which have shown that "adults routinely engage in parallel processing during motor execution. However, as every writer has experienced, motor execution does not always proceed continuously within a writing session. According to Schilperoord (2001; cited in Alves et al., 2008, p.3) "writers can pause for cognitive (e.g., cognitive overload), sociopsychological (e.g., writing apprehension), and physical reasons (e.g., fatigue)". The typing dynamics in my encounters are, though marked by pauses, different. Doctors pause longer to communicate availability, address concerns with patients in person, and to process information. Pauses are also used to read notes from previous visits. During a pause when the physician is reading, they need more time with the computer, so they may activate OSC to keep patient out. OSC also seems to help the doctor and the patient too process the information. Additionally, pauses cue the pursuit of high-level writing processes that for some reason could not be carried out at the same time as talking.

The most influential theory in writing research is that pauses are due to the competition for limited capacity (Just & Carpenter, 1992). Another valid consideration is that typing and high-level processes compete for a common processing component (Pashler, 1994). A third possibility is that pauses result from cross-talk between products and processing of ongoing activities (Navon & Miller, 1987). Findings from real-time studies (Foulin, 1995; Schilperoord, 1996; Stromqvist et al, 2006) have linked pauses to planning and to revising. This is very similar to the revise points and restarts I parsed above in extracts 11 and 17 which reveal how the physician is plotting next steps, and also his or her involvement in "cross-talk" in the Goffman sense.

5.2.4 Conclusion

In this section, I discussed various linguistic resources that doctors use to adjust action and manage multiple involvements with the patient and the computer. I examined how the usage of verbal resources is shaped by the dynamics described above. The doctors' grammar is instrumental in aiding them in the management of information flow and text input. I have focused mainly on examining how doctors use turn beginnings, restarts and other discourse markers to manage interactions with both the patient and the computer. Examination of the structure of doctors' questions, gap fillers and other markers, for example, may supply us with yet additional clues about how such resources are activated to manage multiple courses of action and narrow down the size of 'mentionables' to manage typing and control topical development.

I have also detailed the structure of onscreen commentary (OSC), its characteristics and the many functions it serves. OSC helps the physician protect the MD-PC domain from outside interruptions. It lowers patients' expectations because it serves to validate and project physicians' upcoming diagnostic decisions. In this case, it saves both face and time. It saves face because the physician is acting as 'sounding box' reading information off the screen. The party responsible 'principal' for what is heard is the computer not the physician. The physician is relating the information indirectly. OSC also save times because information is being made available to the patient without going in direct conversation with the patient.

The conclusions from this section about how patients negotiate entry into the MD-PC domain also confirm the findings in section 5.1.3: OSC leaves the patient out. Typing on the computer also results in increased dead conversations zones between the patient and the physician. Based on transcripts, some patients do not talk to physicians when the physician is talking to the computer or typing loudly on the keyboard. Other patients will take advantage of the physician simply gazing at the computer and speak to supply additional information or simply share jokes by describing their ailments in funny ways, indicating their ability to shift frames and "key" information (Goffman 1974). Other patients seem to remain quietly waiting for the doctor to finish working on the computer.

The above comparison between doctor-patient-computer interaction and driving and talking on a cell phone shows the difficulties physicians face in managing the "three-way calling" between patients and computers and themselves. It also underscores the doctor's inability to type and engage the patient in conversation. In the chapter that follows this one, I tackle the physical setting and spatial arrangements of participants and how these affect doctor-patient-computer interaction and their verbal resources as well.

6.0 PARTICIPANTS EMBODIMENTS AROUND THE COMPUTER AND THEIR IMPLICATIONS FOR PARTICIPATION FRAMEWORKS

In this chapter, I attend to my last research question about participants' physical arrangements in the physical space and their implications for participation frameworks. As mentioned previously, postures matter not only for understanding the relevance and orientation of participants' embodiments around the computer and around each other, but also for how their relationships, interactions are negotiated through gaze, gesture, and other verbal resources. I will show that the physical space negotiated around the computer affects the turn-taking system and the participation framework.

6.1 F-FORMATION IN THE HUMAN-COMPUTER INTERFACE

I rely on Kendon's (1990) F-formation system theory in order to survey and analyze the possible configurations revolving around and resulting from the doctor's need to use the computer. This section expands on my previous discussions of the implications of gaze practices and verbal resources for various kinds of involvements and coalitions between the patient and the physician. It also sheds light on their physical context. As mentioned previously, F-formation postulates that different spatial adjustments indicate how the gathered individuals communicate while additionally regulating their relationship. Quoting Kendon (ibid):

> "An F-formation arises whenever two or more people sustain a spatial and orientational relationship in which the space between them is one to which they have equal, direct, and exclusive access. Such a pattern can be seen in the circle of the free-standing conversational group…the participants stand so that they all face inwards to a small space which they cooperate together to sustain and which is not easily accessible to others who maybe in the vicinity" (p.209)

Based on figure[56] 24 below, Kendon (ibid: 233) proposes that there are three kinds of physical spaces in the F-formation domain: o-space, p-space, and r-space.

Figure 24. Functional spaces of F-formation system: o-space, p-space, r-space.

O-space to refer to this joint transactional space, or the space created between the members over which they have 'equal, direct, and exclusive access'. The p-space is the area where the participants' physical bodies are located. Lastly, r-space is just outside of the gathering, encircling the p-space and that's where those outside the shared transactional space wait for entry into the group. (see Cheflen, 1976, 1977 for more on this).

[56] The original picture does not carry a title

This theory is useful for this analysis because doctors and patients assume a variety of formations, all of which change the level and form of interaction, activity type and degree of involvement. F-formation is also the perfect guideline to describe the placement of bodies-in-space when doing video or image analysis and also to inference practical hitches or pluses of particular arrangements in sequentially relevant points of the interaction. Spatial analysis through basic triangular structures and key concepts derived from literature and theater, all provide practical perspectives to help further the exploration of how the physician and patient navigate their space and forge the connection between the human-computer interface and the F-formation frame. The same concepts also make the application of Kendon's F-formation to the human-computer interface much easier, because F-formation theory was developed mainly through the exploration of standing people in casual encounters.

Application of F-formation will allow definition of the boundaries between the doctor's domain with the computer and the domain that encompasses the doctor-patient relationship. This insight will also provide a visual representation of the observations noted above.

6.1.1 Spatial and orientational organizations between participants

Because the doctor must work on the computer while interviewing the patient, the participants in the exam room arrange themselves in various triangular patterns. These patterns sustain a spatial and orientational relationship, or 'focused encounter[s]' (Goffman 1961, 1983) that are lodged in the exam room. These encounters are embedded in gatherings between physicians and their patients who, in turn, are also embedded in a social occasion defined as a medical interview. The interaction is managed by the doctor who creates an F-formation with each of his participants.

While the patient in this context is part of the exchange system, the developments and underpinnings of the theory did not account for arrangements in generic organizations 1, 3, 8, and 9, where the physician is facing the computer. F-formation was also originally applied to standing participants in casual social settings. Standing up makes face-to-face interaction more manageable and negotiable for all parties because they are at least able to move around to maintain a spatial and orientational relationship towards each other. Because the partners in this human-computer interface context are seated, it is consequently difficult to maintain a face-to-face interaction between the patient and the doctor when the latter turns to the computer for an extended period of time. For this reason, it becomes difficult to define exactly the patient's participation frame by applying Kendon's F-formation literally. The patient's status remains ambiguous, because he or she is positioned outside of the main MD-PC domain. However, the resources are available and the scope is appropriate to apply F-formation theory to the context of doctor-computer-patient interaction. In what follows, I expand Kendon's original F-formation frame to account for the patient's spot in the conversation precisely in the generic organizations mentioned above and based off that explore the impact this has on turn-taking and doctor-patient relationship.

As mentioned previously, after the greetings, the three participants cooperate to maintain a working consensus establishing that the doctor will need to interview the patient using a computer. His or her focus on the computer or on the patient varies based on task at hand and medical interview requirements. Their cooperation and negotiation of space, posture, or orientation, however, are very limited and pre-determined because they are seated and the furniture arrangement is predominantly fixed. In this observation, the physicians both sat on a chair with wheels which allowed for yaw movements and other space movements such as rolling towards the patient to conduct exams by the computer station. However, his arrangement is less flexible and less convenient than if he or she is standing up. That is, at a party, for example, people tend to stand up or negotiate changing seating to engage with people around them[57]. Even when standing up, the degree of flexibility of course varies based on traffic in the room, distribution of furniture, and willingness and friendliness of social circles to let others join. It also depends on what activity is going on and the background assumptions about the gathering. If we consider physicians to be the 'leaders' of the doctor-patient-computer triad, then perhaps that authoritative disparity should mirror other encounters when the 'leader' remains standing and facing the audience. For instance, in classrooms, religious institutions, and formal meetings or talks, people generally sit facing the teacher, religious leader, or speaker.

In this context, the patients are seated on stationary chairs. In each exam room, the desktop table is also already arranged for the physicians, and so their choices are constrained. The physicians' chairs allow 360 degree rotation, but the computer is fixed to the wall. Thus the only postural changes initiated by physicians to change orientation tend to involve only their torso and head. The direction of their legs is mostly permanent. Patients sometimes cross their legs or extend them but they do not change their direction or orientation. The patient is generally constrained to his or her domain, though he or she sometimes leans forward towards the doctor's desk if invited to look at an image on screen as in Figure 25 below:

[57] See Kendon (ibid) for more on changes in arrangements when participants are standing up.

Figure 25. Dr. Ceremuga directing patient's gaze to the screen
Pt. Tina leaning forward towards the MD-PC domain to gaze

The space between the doctors and the desktop (MD-PC domain) will be referred to as the doctor's and computer's 'transactional segment.' This space mostly encompasses the physician typing on the keyboard and gazing at the screen, and it is therefore a protected 'region' or interactional territory (Kendon 1973, See also Scheflen 1974). Intrusions are not allowed, and the view should never be blocked or interrupted. The red, square, dashed line in image 1 in Figure 26 defines approximately the boundaries of such operational space: the PC-MD domain of interaction, their localized activity. The boundary is transparent particularly when the doctor is gazing at the computer, like a door left ajar, representing the doctor's constant, though not always welcome, accessibility to the patient. At other times, the boundary is opaque, especially when the physician is typing or engaging in OSC as in image 2 in Figure 26. Dashes represent the transparent boundary that allows for fleeting looks here and there to engage the patient.

The PC and the physician are spreading themselves into this area, thereby creating a joint transactional space. The patient is visibly removed from it, as he or she has no physical presence in the space. Therefore the patient does not have equal access to and jurisdiction over this space with the physician. Any ability the patient has to interrupt this arrangement is only temporary and must be justified.

Having expanded on the spatial and orientational organization of the doctor-computer-patient relationship, I will now proceed to apply F-formation to activities from the data to determine mainly the patient's placement in the F-formation frames in the generic organizations in Table 1 and the implications this placement has on turn-taking and participation frameworks.

Let's consider the following video extracts[58]:

[58] see more generic organizations in Collage 4 in 4.1.1

Figure 26. Dr. Spire with Pt Na'avi and Pt. Carly exclusively focused on PC (1**)**

Figure 27. Dr. Ceremuga switching tasks from paper chart to exclusive focus on PC (1)

Figure 28. Dr. Spire predominantly focused on PC (3)

Figure 29. Dr. Ceremuga predominantly focused on Pt Tina (2)

Figure 30. Dr. Spire and Kevin post-physical exam. Dr. Spire leans towards screen to examine the e-patient (8, 9)

In generic organization 1 (Figures 26 &27) the patient's membership to the party raises questions because the physician is facing the computer exclusively. In generic organizations 2 and 3 (Figures 28 &29) the physician is either predominantly focused on the patient or on the computer but remains facing both permanently with their lower segments facing halfway between the computer and the patient which creates an o-space or joint transactional space combining all three. In generic organization 4, the doctor is exclusively focused on the patient, which means there are no questions about the patient's involvement. This situation actually raises more questions on the computer membership to the group than on the patient's. In generic organization 5, yaw motion causes F-formations (MD-PC, MD-Pt) to overlap, and thus the boundary is hard to draw. This situation is also characterized by latched talk and latched formations. Generic organizations 6 and 7 are excluded because they encompass the doctor examining the patient. Generic organizations 8 and 9 as in Figure 30 are extreme situations because the patient is even removed from the scene that I am trying to capture in this particular analysis. These organizations take place after the exam and the physicians remain fully focused to transcribe their observations and write-up the visit summary. Humphreys' (2003) study on cell phone users demonstrated that by speaking softly, as Dr. Spire and Dr. Ceremuga sometimes do, or turning their backs to those around them as in Figure 30, leaning forward, or speaking with their head downward, cell phone users communicate a requirement of privacy so that other people would not break into their territory. However, unlike generic organization 8, the physicians in generic organization 9 occasionally enter an F-formation with the patient leaving the computer out by turning away from it to face the patient in order to summarize the visit for them. Generic organization 10 shows the physical parting of the doctor and the patient.

Having established that the patient does not have equal jurisdiction over the space between the doctor and the computer as in generic organization 1, one wonders if there is a space over which the doctor and patient share jurisdiction when they talk or an interface point at which they can establish interaction without being totally excluded due to the computer's presence. Since the patient, a ratified participant in the interview in general, is not directly part of the same o-space that unites the physician and the computer in the generic organizations described above, there is a possibility for the physician to claim two o-spaces (two joint transactional spaces): one shared between the computer and doctor, and one shared between the doctor and the patient. However such a claim falls outside the definition of F-formation because that might also imply existence of two separate conversations. This also raises questions about how the doctor can possibly maintain equal membership to two separate conversations during the entire duration of the interview and particularly when the patient is outside of the doctor's visual range as I explain below. This may be an unprecedented or unique occurrence in human interaction, but it may also indicate the impossibility of designing a universal notation capable of accounting for interactional or participation spaces[59]. This latter assumption has more validity because the MD-PC and MD-Pt are not considered separate conversations but rather are part of one medical interview which is continuously available to both the computer and the patient.

To resolve this problem and incorporate the patient into the F-formation, I will refer to the MD-PC domain as a solid F-formation (solid o-space) and the MD-Pt as fluid F-formation (fluid or flexible o-space). Both o-spaces still fall under one o-space or F-formation. The MD-PC arrangement (solid o-space) is sustained continuously or solidly than the MD-Pt (fluid o-space), primarily due to the physical set-up of the room and the doctor's need to transcribe the visit. However, if we were to address the computer's participation status in the generic organizations where the physician is exclusively or predominantly focused on the patient, we might alternate the above concepts[60].

The existence of a fluid F-formation is contingent on the availability of a solid o-space. Equally, without the availability of a fluid F-formation / o-space, we could have been content with Kendon's original terminology of F-formation / o-space. But we cannot be satisfied, because the physician breaks away from the patient to focus completely on the computer. The physician also breaks away from the computer temporarily breaking the fourth wall. The MD-Pt organization must be fluid, temporary, fleeting, flexible, and negotiable to allow for accurate

[59] Personal communication with Dr. Scott Kiesling

[60] The computer system is also naturally rigid as explained previously. Additionally, entering an F-formation with the patient eventually takes time from the MD-Pt relationship because it just results in more data needing to be inputted. Both doctors faced the computer when typing, presumably because the software uses visual alerts.

completion of computer fields and to accommodate the predetermined, long-term MD-PC arrangement and the rigidity of the software system. Figure 21 is repeated below in Figure 31 to provide a sample of an MD-Pt fluid arrangement:

Figure 31. MD-Pt fluid F-formation

In human interaction in general it's very difficult to picture two people sustaining a long conversation in person unless they operate around an established o-space or do some main activity along the lines of a counter position. Multiple o-spaces are usually seen in parties and other gatherings of groups. Understanding the patient-doctor space as a second, fluid o-space, allows us to understand how the patient fits into the encounter as a ratified participant. Framing one o-space as solid and other as fluid in a given the physical arrangement allows us to refer to the interaction as one whole interaction, but also as one interaction whose activity systems, types of participation, frequency of its members' turns, or its size changes, without a change in the participants themselves. The two o-spaces (fluid and solid) together create one exchange system (f-formation) in which the Doctor-Patient-Computer dialogue is embedded. With this in mind, when the physician turns away from the computer, the F-formation exchange system changes its *participants* in that particular interaction frame but remains the same in the general system of the medical interview.

Kendon's chapter also provides a key piece of information that supports this understanding of the spatial divisions and my claim of introducing this 'fluid o-space' in this interface. The exact boundaries or area of o-space (joint transactional space) are also unclear, so we can't really be sure if we should exclude the patient from the MD-Pt o-space at all times. However, Kendon (1990) explains:

> …[if] p rotates his head so that a line projected from the midline of his face forms an angle of more than thirty degrees from the midline of his lower body, p may be said to be facing out of his transactional segment. (p. 212)

When the doctor rotates his head sideways away from the computer screen to gaze at the patient as I demonstrate below, he is definitely forming an angle more than thirty degrees. Commonly, patients form an angle with the doctor that is around 90 degrees. The angle is expanded to about 180 degrees when the patient sits on the exam table almost directly behind the physician as seen in generic organizations 8 and 9. Additionally the doctor rarely sustains episodes of gazing out of the transactional space. This also lends further support to proposing a fluid o-space that appears and disappears as needed as in Figure 32:

Figure 32. Dr. Spire sideway gaze from computer to the patient forms angle of 108^0

Whenever the participants find themselves needing more than nodding, quick acknowledgements, or yaw motion, the participants bring their bodies into a regular F-formation as in generic organization 4. This supports Kendon's (1990) contention that, "Where a conversation is begun between adjacent participants whose individual transactional segments are oriented in quite different directions…. as the conversation continues, the F-formation becomes established" (p. 212). In other words, a fluid o-space allows only a fluid transaction or exchange. Therefore if physicians want to engage extensively with the patient, they abandon the solid F-formation with the computer which naturally converts the MD-Pt fluid arrangement into a solid one and cancels out the PC-MD arrangement; the duration of this adjustment depends on the matter at hand as we saw in 4.2.2.

This section covered how the spatial arrangements of patients and doctors have implications for various kinds of involvements and coalitions between the patient and the physician. It has also delineated the physical context for the verbal resources discussed above. This, along with gazing practices, further demonstrates how physical arrangements resulting from the computer's presence in the interaction exert more control over the participants' resources for interaction.

6.1.2 The waiting room in the exam room and implications for patient's participation

The exclusive transactional space between the doctor and the patient in generic organization 1 raises several questions about the patient's status and his or her membership in such a transactional space and even their ability to participate in the conversation. I will demonstrate in the light of the above analysis that the patient's space in 1 or 8 functions, depending on duration of MD-PC interaction, functions similarly to a reception area or waiting room; there the patient expects to be seen momentarily following the doctor's excursions on the computer.

Willingly or not, physicians draw many types of fences around the boundary of the domain they share with the computer, just as people at parties draw an invisible boundary around their group. At a social gathering where individuals are standing up, the new individual approaching two people knows well not to invade their circle randomly. The new individual must invest in selecting a good time to join, or wait for pause before crossing the r-space line unless there is an 'extraneous' circumstance or reason for overlap. Usually the new individual must be acknowledged before they are fully admitted. It becomes a collaborative effort between all parties. The patient's entry into the closed circle of the physician and computer follows a similar structure. Kendon (ibid: 234) argues that the r-space is "postulated in the light of a number of observations on the relationship between F-formation systems and the behavior of others in their immediate vicinity." The 'huddle' boundary of this space serves as a shield or fence to protect and save the interaction between the doctor and the computer from outside invasions in the exam room. This spot functions in exactly the same manner as an actual waiting room in service areas, where people await their turn to be served and I argue, as mentioned above, that the patient's spot is located in the r-space as in Figure 33. The patient is waiting 'outside' to be invited:

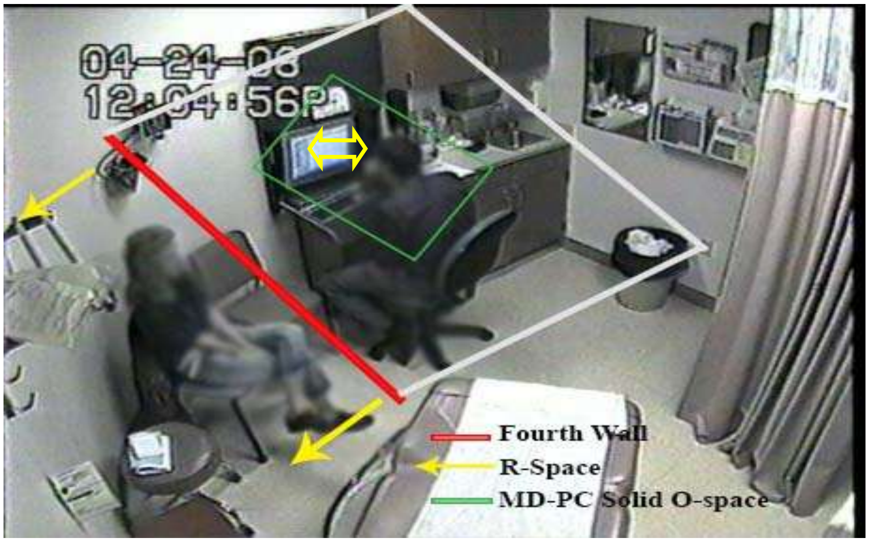


Figure 33. Pt. Carly (external subject) waiting for a signal from Dr. Spire

In this r-space or 'waiting room,' the patient is placed on hold repeatedly through various linguistic resources described above. The patients must 'knock on the door' before entry to the o-space. Patient's strategies or efforts to negotiate entry into this protected space maybe compared to the image that Kendon draws of outsiders who stop right 'outside' the gathering (in r-space) when they approach other people who are standing in a circle and engaged in a conversation. Usually one member of the o-space will acknowledge the outsider through a greeting and, at the same time, make space for the outsider to merge in 'spatial-orientation move' (Kendon, 1973, 1990). This move is similar to the physician gazing away from the computer to give clearance to the patient and communicate availability for engagement as seen above in Figure 31.

It is crucial to note that the new member carefully selects the appropriate time to approach the group, such as a silent moment or a laughing point, but hardly ever when the members are focused and immersed, listening to another member of their group. The patients here negotiate their entry to the MD-PC circle in similar ways, selecting a time when the doctor is not making as much noise typing and is not engaged in a loud self-analysis or on-screen commentary with the computer.

In this study, further physical evidence for the patient's placement in the r-space comes from two incidences when patients used their cell phones while the physician was engaged on the computer. Usually two people in a conversation do not use cell phones while speaking with one another. They may text-message briefly, but those who intend to do it extensively will generally secure permission for it ahead of time. In one of these exceptional instances, the physician oriented to the patient who was on the cell phone, and the patient apologized by saying he needed to wake up his girlfriend. Clearly the patient felt like there was enough of a buffer, a dead zone in the conversation and enough space between himself and the doctor, that he felt enabled to make a phone call without being rude. The doctor's re-orientation toward him confirms this, as it elicited an apology and explanation.

It is also possible that the two patients using a cell phone may just be orienting to the doctors' need for privacy with the computer and wanting to help build a "private area" (MD-PC solid o-space) by engaging in self-distracting activities. This is a similar behavior to what Humphreys (ibid) observed in his field study of cell phone users and their physical partners. The physical partners, recognizing the callers' need for privacy, engage in self-distracting activities such as reading the menu to also avoid any tendency to intrude.

Cell phone use was noticed mainly when the patient sits in a spot that is more out of range of the physician. In situations where the patient remains in the physician's line of sight, they are less likely to obviously disengage. They do not use their phones, but rather wait to be recognized again. In contrast, the patients who are farther from the doctor's main gaze or sitting behind the physician are more likely to conduct an alternative conversation with a phone or engage in other activities.

In the converse scenario, when the physician focuses on the patient for an extended period of time, computers fall asleep, essentially severing themselves from the conversation. In 4, for example, the physician is focused on the patient, and the computer becomes excluded. The screen fades off as the computer hibernates, and consequentially requires the physician to jiggle the mouse to wake up the computer, thereby restoring the computer's status in the relationship. Such moments also require the physician to figure out where he or she left the conversation by dragging again the arrow to the field where action was happening.

It is important to note that the doctor-patient interaction is perhaps less interruptible than the doctor-computer interaction because it is more protected. The computer disengages itself from the situation because it hibernates. The doctor does not need resources like OSC to block the computer from participating. However, the computer can also interrupt via pop-up reminders while it remains active. The physician is conditioned to 'listen' to these interruptions and signals despite the computer's indifference to what is going on in the rest of the exam room. The computer intrudes even at the most sensitive times. Patients, on the other hand, conditioned by society to respect physicians, are sensitive to the physician's interactions with the computer, and hesitate to interrupt these.

I also believe the computer is similar to a magazine or book in a waiting room, in that it isolates the person interacting with it from others. As Goffman has noted, reading material in public places serve to offer to actors a "minimal involvement" whenever the individual "feels he ought to have an involvement but does not." [4:51-52]. In a waiting area, nurses enter to call patients for appointments, but it is extremely rare for a client to enter this area without being formally allowed access. Typically, the most they may do is go to a reception window to inquire about the hold time. Patients watching their doctors use the computer are in a similar position, waiting to be invited into the special domain.

6.1.3 Conclusion

In this section, I have demonstrated how the location and shape of the F-formation changes as it acclimatizes itself to variations in participation frameworks to continuously satisfy computer and patient needs. Changes in f-formation arrangements take place as doctors and patients move the conversation through the structural units of the medical interview. Major shifts in conversation are marked by shifts in the postural arrangement[61] of the participants as described in generic organizations 1-10. This understanding led me to postulate the two kinds of o-spaces I outlined: fluid o-space and solid o-space. I have also shown how the behavior of both the patient and the physician reflect their cooperation and commitment to the working relationship.

I have also argued how the patient's participation status can be equated to that of an outsider in some generic organizations where the physician is exclusively focused on the computer. The physician continues to monitor r-space to see the patient who may be trying to

[61] For a similar analysis in a different context see also Scheflen, 1973; Blom and Gumperz, 1972

join. Kendon (ibid: 230) explains "how both current members [of an ongoing F-formation system] and outsiders cooperate in maintaining the integrity of the system's boundary. An outsider only becomes a member of an existing system through cooperative action between himself and members of the existing system." Because the role of an individual in a group is related to his position in the arrangement, as illustrated also in Kendon (1973), patients must constantly negotiate access to the MD-PC domain. These negotiations regulate the kind of relationship that may or may not be developed between the doctor and the patient.

6.2 HOME POSITION IN THE HUMAN-COMPUTER INTERFACE: ORGANIZATION DEVICE FOR DOCTORS' MOVES

To describe the doctor's dominant orientation to the computer in the exam room, I have described above how doctors engage in yawing movements, which involve rapid oscillation away from the computer to the patient and then back to the computer. This head-based gaze behavior is seen throughout the interview and further illustrates how bodily moves during interaction are patterned to organize conversation and accomplish actions around the computer.

The physician's departing gaze moves from the computer's area and lands back on the take-off position — akin to the flight of a boomerang. As mentioned above, the physician looks away temporarily from the computer to glance at the patient and gravitates back to the computer. This behavior is obvious in generic organization 5. I have outlined above the many sociolinguistic functions that motivate performance of oscillation or turning sideways to the patient. Sacks & Schegloff (2002: 137) refer to this kind of action in another context as establishing a ‘home position.’ Focused mainly on hand gestures, they observed that:

> “A very large number of moves and sequences of moves in interaction end where they begin. That is, the end in the same place and regularly in the same position, which we are calling ‘home position’. The moves depart from home and return to home.” (p.137)

In this context, however, I extend the application of this concept to gaze and additional secondary and temporal gestures to further illustrate the impact of the computer on doctor-patient interaction. I have noted above that when the gaze returns to its rest position, the participants (physician) recover their postural stability. This research observation further supports this characterization of the home-position, while expanding its application. While it may be applicable to several spatial arrangements, I will focus here mainly on side head-based turns, which are driven by gaze and occasionally supplemented by hand motions.

In terms of hand gestures, a common one involves gesturing or pointing with the dominant hand. The right hand is moved outward off the keyboard where it sits, to point off in the air. As soon as it reaches its maximal extension, it begins its return to the home position. This movement is performed when the doctor, either as a speaker or hearer, turns sideways to either communicate availability, to indicate that they are addressing the patient, or to act as a ratified participant. Gestures, as Goodwin (2000:1519) explains, “can carry propositional information and function as individual actions, or as components of multimodal actions”. Unlike talk, gestures can't be heard. Physicians usually gaze to perhaps make sure the gesture is perceived by the patient. Figure 34 below illustrates an example of a home position movement:

Figure 34. Yaw motion: Dr. Spire gazes away from the computer to the patient and gazes back at the computer

Movement in Figure 34 is summarized as follows:

<u>(e) Main gaze departures and arrivals</u>

Home position #1 (MD-PC Mutual Gaze) -------> Gesture #1 (MD-Pt MG) ---------> Home position (MD-PC MG)

These series of movements depart from home, to which they return to complete the action. Dr. Spire begins by facing the computer with both his upper and lower segments. The departing move above is a physical movement to the side. His hands remain on the keyboard, likely in anticipation of further typing. At other times, he moves his hand while turning his head, resulting in a paired set of home position movements. A similar linguistic 'movement' prompts this physical move: The physician asks a question. As part of this address, he looks to the patient towards the end of the turn to secure a reply. The physician exchanges a brief mutual gaze with the patient, then looks back to the computer to input the reply. Goodwin (1981) described that speakers look at their hearers towards the end of their turn, while hearers look away in anticipation of taking the speaking floor. In these instances, the physician, taking over the hearer role, looks away to the computer to record the patient's reply. In addition to the fact that doctors are facing the computer almost entirely and need to maintain postural stability, completed actions also need to be transcribed on the computer. This physical behavior in interaction is also sequentially organized (Sacks et al, 1974), and part of its sequential organization is that it is partially ordered in relation to the talk. Yaw motion, and the doctor's question/patient's reply are both informed by sequential organization. A patient's reply is issued with the expectation that the doctor will gaze at them briefly, afterwards returning to the computer.

6.2.1 Gaze, gesture and other bodily movements

Yaw motions in generic organization 5 which demands quick transitions between the patient and the computer require the physician's hands to remain on keyboard to input information quickly. But with home position movements, gaze and hands can sometimes both depart from the rest position at the same time, or one can move without the other. There is plenty of visual evidence of them returning at the same time to their respective home positions. There is also evidence of one returning first, in particular, the hand. Yet evidence of gaze landing back in its home position while leaving the hand stranded is lacking, indicating that this may not occur. It seems that people tend to face their audience when gesturing at/for them; under normal circumstances, we generally gaze and point in the same direction. This supplementary hand gesture can also be summarized along the same grammar above:

<u>(f) Supplemental hand departures and arrivals</u>:

Home position #1 (hand on keyboard/mouse) -------> Gesture #1 (pointing off in air) ------> Home position (MD-PC, key board/mouse)

Another interesting gesture seen in the videos is a clap as in Figure 35:

Figure 35. Hands move away from keyboard (orange arrows) to perform a clap and return to keyboard

The clap might represent, as mentioned above, a climax point of wrestling with the computer. Dr. Spire claps at the middle of typing in one of the videos, possibly to refocus attention or take a breather. In this case, the clap refocuses attention on the conversation at hand, and recovers the conversation from overlap. By departing further away from the keyboard, the physician might lose focus or clear landing on key stokes, but in certain circumstances this does not seem to matter. The gaze to the patient is absent during this gesture because it is focused on the computer. Keeping the hands closer to the keyboard and gaze towards the screen are arguably similar to the kind of yaw motion that doctors perform between the computer and a point between the computer and patient, so as not to lose sight of the labor on the screen.

The commute back from the patient to the computer is a straight one, but the drive away from the computer has stops along the way, as sometimes the physician gazes half way before gazing all the way to the patient. The journey of gazing away from the computer might be reduced to manage typing. In these instances, the yawing movement takes place between the computer and a mid-point between the patient and the computer as mentioned above.

These moves in various lengths and durations show that the human body is “a dynamic, temporally unfolding field that displays a reflexive stance toward other co-participants, the current talk, and the actions in progress” (Goodwin, 1981, p.31). Making use of the “home position” in this particluar analysis has implications for understanding and organizing the turn taking system in this interface, by showing that the phsyician has to make choices. This has implications for task, orientation, and patient expectations. It also lends further supports to the concept that the patient is on hold.

6.2.2 Hierarchical & structural relationships & implications for turn-taking

In what follows, I would like to further discuss the structural and hierarchical relations between the physician, the computer and the patient. As mentioned above, the physician has exclusive jurisdiction and command over the computer and leads the medical interview. The physician exhaustively dominates all the members in the exam room. Given also the solid o-space created between the computer and the physician, the physician controls access to the computer. In short, the physician controls the interaction.

However, the computer in some situations indirectly controls the interview, thereby putting the patient in an accessory position. This entire situation resembles the triadic interaction when two people are conversing and one then begins a cell phone conversation with a third party to make arrangements for all three. In this cell-phone interaction, the caller functions as the physician — having access to both the person standing next to the caller and the person on the other end of the phone, thus controlling the entire interaction.

The cell phone comparison also brings to mind a common problem in the computer science field: the sleeping barber problem (Dijkstra, 1968). This metaphorical scenario expands on the patient's ostracism and emphasizes the importance of clear lines of communication combined with effective management of time, space and resources. The sleeping barber problem essentially comes about when two people (barber/customer, or physician/patient in this case) are blind to one another. Essentially, a barber finishes with one customer, and thinking there is no one waiting, he sits down to sleep in his chair. Yet, unbeknownst to him, a customer has arrived. Seeing the barber occupied with another customer, the second customer sat down in the waiting area. Thus, the barber sleeps and the customer waits, when in fact both are available for an interaction. In a way, this is very similar to the conversation described above about cross-talk via cell phone, because the person with least access to and control over the conversation (the customer/patient) becomes an adjunct to the interaction between the other two participants, and in turn, the most harmed. The patient's contribution to the conversation is limited because he does not have access to conversation on the other line.

The barber problem has relevance to turn-taking management as well, given that the problems occur because the actions by both parties take an unknown amount of time. Similarly, in the cell phone problem, when the caller (the physician) is on the phone and remains quiet for an extended period of time, the person next to the caller (the patient) is not sure whether or not there is a lull in the conversation that they can interrupt comfortably, or if the speaker on the other end of the phone is occupying the caller's attention with a monologue. The person next to the caller is also not aware of the other person's turns/contributions to the conversation and therefore lacks access to updated information. If they chose to contribute, they run the risk that their thoughts are no longer useful. This mimics the situation during which a patient is excluded from the dialogue between physician and computer. Since the patient does not have access to the screen, the patient cannot tell if he/she is able to interject or not.

6.2.3 Conclusion

In this section, I have focused mainly on the physician 'body torque' or divergent orientations towards the computer and the patient. I have concluded that the computer remains the physician's long-term direction or home position. The physician turns away from the computer to the patient to communicate availability for collaborative action but his or her torqued position, being an unstable position, projects an imminent return to full postural alignment with the direction in which his or her lower body segments are facing. I have also shown how the torqued posture indicates a ranking in interaction involvements and prioritization of engagement options. Given the disconnect existing between the patient and the computer, the physician controls the three-way interaction because he or she has access to both.

Ultimately, however, both the patient and doctor need to collaborate together to satisy the machine's needs. The doctor's gestures help to manage the patient's replies for ease of transciption. 'Alignment' (Goffman 1981) is negotiated not only through participants' utterances but also through their bodies (Goodwin 2000). The body, as Goodwin (2000) puts it "functions in yet another way when prosody and intonation are used to display alignment and stance (Couper-Kuhlen and Selting, 1996; M.H. Goodwin, 1998)" (p.31). A physician's temporal sideway gaze towards the patient is a visible display marking the physician's cooperative stance to help construct the activity in progress. Their almost 'permanent' orientation towards the computer marks an epistemic stance and understanding that such body positioning is required to grasp the situation and also an instrumental one to indicate that this is necessary to accomplish the activity in progress.

In the general summary and conclusion I will synthesize all of the various lenses through which we have viewed the physician-patient-computer encounter.

7.0 SUMMARY AND CONCLUSION

In this chapter, I provide a summary and conclusion. I also highlight the broader impact of this research, take-home points, and share observations on alternative systems and recommendations for future research.

7.1 SUMMARY AND DISCUSSION

The aim of this dissertation has been to examine the dynamics and challenges of medical interviewing using a computer in a primary care context. It has highlighted the dynamic roles of the computer, the patient and the physician in the development of the interview. It has also focused attention on how physicians manage interaction with both the computer and the patient using various verbal resources and embodiments.

Broadly speaking, I have reviewed how a physician in active interaction with the computer or the patient turns his or her head away from one while sustaining involvement with the other. Physicians accomplish this through both gaze and verbal resources, or by remaining physically oriented to the secondary involvement. In the instances examined here, the doctor keeps his or her lower body in line with the computer in order to communicate full engagement with it, and uses his or her head, torso, and arms to engage simultaneously, but temporarily, with the patient, who is positioned outside of the main domain. The working consensus negotiated between patients and doctors leads to various environments that result, in turn, in various participation frameworks.

The computer, just like the physician or patient, participates actively in the medical interview. It occupies a turn in the conversation and shapes the design of the interview, as its onscreen prompts dictate forthcoming courses of action. This speaks to the dynamic role of the computer in the interview's topical development. It also speaks to the dictatorial nature of the computer in guiding the interview. Though the computer is supposed to be a tool, it can be seen controlling the flow of interview in a tangible way.

Interactional asymmetry, or power differentials in interactions, is intensified by this addition of the computer. In addition to shaping the topical development of the conversation, the computer also decides the order in which 'mentionables' are advanced at the opening stage. Sometimes a patient's presentation of his/her chief complaint is placed on hold at the beginning in response to computer's prompts. Thus the needs of the e-patient and those of patient in person overlap and even clash at times. Computer turns are valued and also pursued forcibly by the doctor. Attempts to co-ordinate with the computer's needs come at the expense of conversational coherence.

Overall, in the opening, the doctor prompts the patient to share his or her chief complaint or expand on it, and proceeds to elaborate on the patient's concerns. Patients' answers are recorded on the computer, which legitimizes the doctor's gaze back at the screen. The physician records the patient's response to update the screen. The doctor controls the length of the responses so as not to fall behind on typing and to keep things on topic. The doctor follows the order of screen items and sometimes postpones patients' concerns until later in the visit if they do not cohere with screen information.

Regarding closings, I have shown that it is essential before closing a conversation to establish if all potential 'mentionables' have been covered. When the patient's needs are not satisfied, they may bring up a new concern in a closing environment. Yet this includes not only the patient's and doctor's concerns, but also the computer's issues. The computer prompts the doctor to direct the patient's attention to various topics. This diversion in the interview direction shows clearly that the computer participates actively in the development and progression of talk. The computer also adds many dimensions to face threats involved in closing conversations. The burden rests on the physician to satisfy both the computer and the patient. Thus the doctor deploys various strategies to manage talk with the patient and the computer. Although onscreen prompts must be dealt with immediately, it remains unknown if all computer needs are satisfied during the encounter, as certain problems may not arise until the physician "closes" the encounter.

The responsibility to coordinate this three-way interaction mostly falls on the physician (computer user) who has to manage the expectations from both the patient and the computer by either gazing back and forth to communicate availability and attention or by using other linguistic resources to engage the patient (bystander) who might be feeling socially ostracized when the doctor is interacting with the computer. The situation becomes difficult for the patient because while he is a participant and invited player in doctor-patient-computer conversation, he or she does not have access to computer's turns. All in all, the actors must collaborate visibly in the joint accomplishment of the activities in progress to mark their cooperative, moral and epistemic stances as well as role performance (See Goodwin 2007, Goffman, 1961a, 1961b).

Depending on the generic organizations (1-10) that I have delineated, physicians use a variety of verbal and non-verbal resources to manage actions. The physicians use these verbal resources to manage the competition over their attention by the patient, computer, and their own thoughts. I divided these into the following types: minimal responses, discourse markers, restarts, and onscreen commentary, which each have a different role.

Physicians use low intonation "okay" and similar minimal 'response tokens' (Schegloff 1982a, Jefferson, 1984) to indicate a preparedness to shift from speaking to listening. However, doctors' minimal response tokens in situations where the PC is activated function as a tradeoff: though they allow the patient to take the floor, doctors frequently turn their attention to the computer. In these instances, doctors are acting as insincere passive recipients. The "continuer" itself superficially proposes that they are fully allowing the patient to complete their turn but they are simultaneously using the time to address the computer.

Connective devices (such as a:nd) help the physician bridge conversation between the patient and the computer. They help doctors bring the action home and place the patient on hold as they restore conversation with the computer. Other connective markers such as "u:hmm/a:hhhm" enable the physician to go back to talk on the computer and introduce increased transitions or gaps to allow for extended excursions on the computer. Restarts are also introduced after the pause to delay further the launch of the main sequence when the physician is just not ready to engage the patient. The play for time is also displayed in other phrasal breaks placed after the space fillers. When more time with the computer is needed, the doctor becomes more upfront with the patient: They actually ask to be allowed to look at the screen using an "online explanation" sequence such as "lemme see here" through which the doctor communicates what he or she is about to do. During these times, the doctor typically describes what they see on the screen through what I have categorized as onscreen commentary (OSC).

Patients' questions sometimes lead the doctor to engage in "side-play" with the computer, and then comment to the computer for the benefit of the patient, as I described earlier. This "pointed indirectness" saves the doctor both time and face. In this sense, OSC helps shape patients expectations and the doctor does not need to engage in direct action with the patient. The end of the doctor's verbal performance is often marked by an increase in volume, and is usually followed by a direct question to the patient supplemented by a side gaze for "clearance". The randomness of the OSC leads to the production of incoherent fragments. But this spontaneity enables the doctor to manage the interview and also demonstrates the doctor's flexibility and willingness to accommodate the computer. It is also this occasional lack of coherence and gear shifting that actually make multiple involvements possible.

OSC on some occasions may help physicians draw imaginary fences to protect their interaction with the computer. I have described how OSC serves as a "fourth wall". In terms of this study, the fourth wall may be constructed between the doctor and the patient, and is reinforced by OSC, typing and other embodiments. Because the physician continues to monitor r-space to see the patient (a ratified participant) who may be trying to join, this fourth wall might be broken. Patients also occasionally "break" the fourth wall; this non-cooperation reveals how embodied participation frameworks are accomplishments and formations for the organization action that must be actively negotiated and sustained through the ongoing cooperation of participants.

In general, patients may have several opportunities to add to the conversation while the physician is interacting with the computer. However, whether they take advantage of this varies greatly between visits, depending on how the doctor relates with the computer and the patient's personality. I have demonstrated that patients are less likely to contribute to the conversation when the physician is typing or engaging in an onscreen commentary with the computer. Typing and addressing the patient rarely occur simultaneously.

The division of labor in the physician's embodied resources such as talk, gesture, gaze and body torque illustrates interpersonal involvement, engagement/disengagement, organization of conversation, and participants' stances to ongoing action. The patient acquires primary hearership when he or she is being *exclusively* or directly addressed as in generic organization 4. However, when the doctor turns to the computer to look-up or input information, he or she is placing low value on the patient and a high value on the computer as in generic organizations 1 and 3. In this last case, the patient's participation status might be downgraded to *unaddressed recipient* or secondary hearership.

The physical contexts in which action is taking place are connected to what resources are in use. For example, the doctor's primary body orientation towards the computer marks an instrumental stance that such positioning is required to accomplish the activity and grasp it. The role of an individual in a group is related to his position in the arrangement, as illustrated also in Kendon (1973). For example, in situations when the physician is typing or engaging in an OSC, he or she creates temporary territory (f-formation) with the computer with an outside space for the patient. As such, patients must constantly negotiate access to the MD-PC domain.

In most generic organizations, the doctor, computer, and patient maintain a triangular arrangement or configuration. Being a triangle's vertex means also that the physician is entitled to more turns and more speaking time than either the computer or the patient. It also means that there are expectations placed on the doctor by both the computer and the patient, and he or she must balance their needs. As a result, the doctor enters various formations with the patient and the computer to manage his or her multiple involvements. This system is sustained through cooperative maneuvering of both the patient and the physician. As Kendon states (1990):

> The arrangement maintained, thus, can be regarded as a behavioral manifestation of the 'working consensus' (Goffman 1957, 1961, 1963) by which behavior in focused encounters is governed. So long as a given 'working consensus' prevails to which all of the participants are jointly committed, we may expect that they will compensate for one another's positional deviations... (p. 220)

The physician does not always get to focus fully on the computer because they might have to focus on the patient in unpredictable ways. The physician's struggle is supported by the doctors' answers to the post-study questionnaire, in which Dr. Ceremuga and Dr. Spire both stated that they sacrificed the use of the computer in favor of focusing on the patient when needed. This dichotomy, or forced choice, indicates that the computer's role as a tool often fails. Additionally, this occasional need to abandon the computer shows that there are still challenges ahead for UPMC's vision to conduct paper-free visits. Future research may be helpful in fine-tuning the use of technology in the doctor-patient interaction. In what follows I describe broader impacts of this research, limitations and recommendations.

7.2 BROADER IMPACT, LIMITATIONS & IMPLICATIONS FOR FURTHER STUDY

The description of the dynamics of the medical interview enabled through a computer elucidates the impact of using computers in general practice. This study has described the challenges and dynamics associated with interviewing the patient while using the computer. Conclusions drawn here might provide a framework for improving the use of computers in the medical interview.

Methodologically, this study contributes to the growing corpus of qualitative research that uses audio-visual capabilities as an analytic resource to explore and spell out multi-modally the sociolinguistic practices and interactional organizations on which medical doctors rely on to accomplish their daily activities using various forms of technology. This study underscores the importance of video use in analyzing human conversation. With video technology I was able to describe the detailed production of the activities of the participants. This report, based on video-based research, also underlies the importance of the spatio-orientational arrangements and participants' rapport to these ongoing physical structures. Moreover, research about technology usage and its impact on human-human interaction is also lacking. As mentioned earlier, the classic Human-Computer Interaction (HCI) view focuses on single users interacting with a system and does not account for "co-presence" (Goffman, 1963) around technology.

I have also shown how one must be careful about global associations of type or content of talk with specific positions in the conversation. The functions and characteristics of OSC, for example, show that it is similar to OC, which raises many questions. In other words, perhaps contrary to Heritage and Stivers' conclusion (1999, p. 1502-1503) stating that OC occurs only during the physical exam (or generic organization 6), online commentary may occur both during the physical examination of the patient and between successive elements in an examination. Here I have shown evidence of it occurring in generic organizations such as 1, 2, 3 and 8, where others have not previously described it. In general, while some forms of talk are frequently seen in certain positions, such forms are not exclusive to these positions. Additionally, adjustments made to Kendon's F-formation to analyze the transactional space between the doctor, the patient and the computer indicate the impossibility of designing a universal notation capable of accounting for all interactional or participation spaces.

This study itself is limited by the fact that doctors and patients were not asked to complete a simple questionnaire about their encounters immediately after their interviews. Doctors could have been invited to make reference to encounters with significant difficulties, which would allow closer analysis of these videos, as well as direct comparisons to patient reflections. Patients could have been asked about their perception of the computer and whether it affected their relationship with the doctor, or desire to bring up concerns immediately after the encounter.

This study was also limited by the inability to see what was happening on the computer screens. Though I could sometimes tell that the physician was speaking about something on the computer, there were times when I did not know what was going on. If I had been able to see the screen, I could have compared what the physicians were doing to the activities in the room. Because I could not see the screen, I cannot always know for sure whether topic changes were physician or computer driven.

In future research, it would be helpful to capture on-screen conversation. This could help connect the conversation between doctor and patient with the computer. Additionally it would help define exactly what the physician was gazing at or doing during times of silence or indistinguishable monologue. I was able to understand the computer's turn only if it was read out loud by the physician directly or through OSC. I know based on the conversation when an arrangement has been made to take care of some of the patient's "mentionables" in later visits, but I do not know for sure if all PC "mentionables" are satisfied during the visit itself. In order to fully appreciate and accurately assess the effect that the computer has on the dynamics of medical interviewing, this information must be collected.

It is very clear that research needs to be done to optimize the accommodation of the computer in the exam room. Doctors receive trainings in using the software independent of real patient context. Training doctors to adopt patient-friendly styles of computer use will likely lead to improved doctor-patient interaction.

The breadth of this research prompts many other considerations. For instance, the Becic study on cellphones and driving (2010) also compared young and adult drivers. Similarly, there might be value in future research to compare typing and talking by young residents who are increasingly raised with computers and mobile devices at home and in school to that of faculty who may struggle to adapt to such changes. Becic only focused on the impact of driving on conversation, and not vice-versa, but in this context we could also look at the effect of conversation on typing, since the notes on the computer become permanent records and are frequently used to inform treatment and guide future interviews. It would be useful to look at the interplay between talking and typing to better understand how we exploit verbal and attentional resources to multitasking, and how this ultimately plays into patient satisfaction, doctor comfort, and health outcomes.

In the long run, physicians are constantly shifting their focus between the patient in person and the e-patient. Therefore, they may not be fully capturing the visit in real time. If this means they are putting in extra time to complete charting, are EHRs fulfilling their potential? In this research we are concerned with the reciprocal impact of typing and talking in search of a socio-linguistically intelligent interface that balances conversation with the patient in person and the patient on the computer. How can we embrace and protect both — in other words, foster meaningful use of the computer and meaningful conversation with the patient? This research contributes to this end.

Thus, we cannot marginalize the needs, expectations and analytic work of doctors and patients as we continue to design EHR platforms. We should also not forget that EHR activity is expected to take place while doctors are concurrently engaged in interaction with ailing patients. EHR is designed to enhance their accountability, success, and the ease of the visit, not to interrupt and distract them from the patient. Additionally with payment increasingly tied to documentation quality, we must be sure that this need to obsessively document every encounter in detail does not distract from the real job of healing the patient. The responsiveness to these issues will eventually decide the fate and quality of EHRs.

The Clinical Data Repository's (CDR) Clinical Decision Support and Clinical Documentation Application was designed to function as an "unbiased" and "nonaligned" system, envisioned as a routinized procedure for any physician walking into an exam room. My research, however, has shown that a physician can't predict ahead of time how much data, if any, he or she will enter in light of active participation of both patients and computers in the interview. The process of recording varies from one person or context to another and may not always be neutral. Keyboarding also varies between physicians. Dr. McCague shares, for example, that she types as much as possible during the interview, but then edits later. “Later” could be after the visit, at the end of the day, or even some days later for some physicians, depending on patient flow. To make EHRs very successful as a project, it is going to be very important to take this into account.

It is almost impossible to routinize the entering of electronic health records mainly because it is generally difficult to standardize or singularize human conversation according to a-priori or predefined expectations. Though the medical interview serves as a methodological or guiding framework for the medical interview, there is no guarantee that a patient or doctor will not deviate from the basic order, meaning the EHR has to be flexible enough to accommodate such changes.

7.3 OBSERVATIONS ON ALTERNATIVE SYSTEMS, AND RECOMMENDATIONS

This study illustrates that the current use of computers in the exam room is problematic. As EHRs have developed, physicians and others have recognized the burdens placed on providers and patients, and have developed alternative ways of accessing the system. Below I review some alternatives currently available in the market and possible applications of my analysis.

In the spring of 2012, I observed and experienced an interesting solution called “The Scribe System”, one example of an adaptation to improve ease of use for physicians. The Scribe System is a system that uses a proxy connected to the physician by Bluetooth to enter the visit data. Instead of typing, the physician dictates his or her observations and thoughts to this listener, who is located in another room in the facility. The physician later reviews and signs the note electronically. Similar versions of this place the scribe in the room with the patient and physician. All versions allow the doctor free hands to examine the patient while providing for the concurrent capture of the physician's thought process.

Based off feedback from its users, such a system seems to be an improvement over a traditional electronic model. According to these users, the scribe system is preferable to interacting with a computer or dictating notes at a later time. Having a head-set on, the physician had access constantly to the remote scribe and was in fact able to add notes right away even when walking in the hallway between patient's rooms or on his lunch break in the office. A physician there explained how the scribe system has made his interactions with patients much easier and even increased the number of patients he sees per day.

The scribe system itself is not free of challenges, and sociolinguistic research needs to be done to optimize its use. For example, when the physician is talking on his or her headset to the scribe while facing the patient, the addressed recipient may be unclear. Additionally, it may not always be clear what the scribe should or should not type; certain things the doctor says may be part of online commentary, and not for the official record. Also, as the doctors thought process evolves during the visit, certain thoughts recorded originally may no longer reflect reality. Furthermore, only observations that can be easily stated in front of the patient can be transcribed. The use of medical jargon, appropriate in notes which will be read by another medical colleague, may make the patient uncomfortable, confused, or lead to time-consuming requests for clarification. Lastly, this system introduces the potential for transcription errors as in the child's game "telephone".

One major difference here is that the screen that the remote scribe makes available for the physician is also viewable by the patient. It's not yet clear if this acceptable or desirable. Some of the documentation requirements perceived as necessary to defend physicians legally may be awkward if viewed simultaneously by patients, and the problems described above with jargon might only be amplified. Usually, patients must go through various steps to gain access to their records and so viewing them simultaneously might pose issues, especially as these are subject to revision and change before the chart is finally closed. The laws, however, might vary from one place to the other.

In the end, both the scribe system and the more common use of computerized records put patients on hold. However, putting the patient on hold to type while facing the screen might seem a more awkward and complex involvement than putting the patient on hold to dictate a note to a remote scribe. On the other hand, talking on a blue tooth device might seem rude to the patient, who also might be unwilling to share confidences when they realize someone else will hear. Thus, sociolinguistic research comparing both systems is needed. Patients' feedback on a remote scribe viz-a-viz patients' feedback on the computer will be an important deciding factor as well.

There may also be different modifications to the basic system to improve the sociolinguistic interaction. Some physicians may have touch-typing skills which allow them to face away from the computer while typing. They then could create an o-space that truly involves all three participants at all times: the physician, computer, and patient. Yet this depends on the complexity of the software checklists and forms, as physicians cannot navigate certain functions of the software without looking.

Another solution would be the use of a notebook computer, touch screen, or recessed computer located between the physician and patient. In this case, the computer or device would become the center of the o-space or transactional domain. In some cases, it would give the patient access to the conversation and enable them to take turns that are relevant, available, and less interruptive to the process. This would also enable the physician to avoid collisions between typing, thinking, and a patient's interjections — especially those most violent collisions that the physician must recover by audibly or even physically steering the conversation back on track. A dual-accessible interface could help protect the computer domain in the sense of transparency; the conversation would not be blocked by the computer, but instead, the patient would be encouraged to participate in the conversation with the computer, too.

This potential solution presents its own set of potential issues. The physical barrier of the screen might impact the relationship between physician and patient. Additionally, typing accurately and swiftly on a touch screen is very difficult without looking continuously at the screen. Furthermore, as touched upon above in the discussion of the Scribe system, allowing the patient to view their chart as it is created could lead to problems: They may type things the patient feels are derogatory or untrue, or they may type something the patient does not understand, leading the patient to ask for clarification. Additionally, orders or comments such as "drug seeker, do not give narcotics" could be misunderstood and/or lead to an immediate breakdown in the patient-physician relationship.

Since typing seems to be a major problem as I have described earlier, another solution would be the electronic stylus pen technology which would allow the doctor to use a digital pen that translates written notes into digital format. Physicians may resist using the computer to type patient data because the process is awkward, time consuming, and does not give them a chance to focus on the patient. Additionally, because physicians are also trained during medical school to take clinical notes using a pen and paper which are both handy and allow for easy communication with others, the suggested digital pen will create a comfortable and happy medium for everyone.

Training is also imperative as healthcare works to accommodate technology in the patient context. One example of such an application of findings from this research would be to raise physicians' awareness as to the meaning or interactional effect of their verbal resources, embodiments, and physical arrangements on their relationship with their patients.

Research on language, indexicality, and identity (Johnstone and Kiesling, 2008) has shown for example, that people are in fact capable of using speech and other linguistic practices without awareness of the meanings they communicate to others. For example, Johnstone and Kiesling (ibid) show very clearly that it is possible to have co-occurrence of a linguistic item within an identifiable group without indexical meaning. They show that in fact the people who use a particular feature of Pittsburgh speech (/aw/-monophthongization) do not necessarily understand that feature as indexing a Pittsburgh identity; rather, other aspects of social discourse must take up this possibility and "point out" to speakers in different ways that the form is local to Pittsburgh. Similarly, we could point out to physicians what OSC or torqued body positioning around the computer would mean from the patient's perspective, and how these might affect the organization of turn-taking and participation framework. Following the methodological scheme in Johnstone and Kiesling (ibid), this research and the trainings that I intend to generate from it should create that social discourse to raise doctors (and patients) consciousness to various indexicalities inherent in doctor-patient-computer interaction.

Furthermore, because there are many competing software tools available for electronic health records, a new resident or physician changing practices may not be familiar with the software in use at their new job. Additionally, some practices change software providers when they find their current one to be unsatisfactory. Even when physicians are familiar with the software program, each hospital may have its own special additions. Thus, trainings for new physicians are standard. Yet these trainings do not mimic the actual patient encounter. Physicians may be taught how to edit the medication list or start a progress note. They are taught how to navigate the chart in a basic fashion. Yet this is not enough. Physicians must be trained to use the software so that it seamlessly integrates into their practice. Trainings should focus on real life situations to increase physicians' facility with the computer. For example, online video chats or programs could be used to mimic the often rambling nature of an encounter. In-person training could train certain physicians to become teachers of others at the hospital or practice, showing them how to advantageously navigate the system and make the computer a partner.

This study opens up exciting areas for the future training of physicians, and it will advance the design of medical applications for doctors. Findings from this research can be used to support the meaningful use of health information technology and improve health and healthcare delivery. My insights into the problems with current software could lead to changes that would improve market saturation for one company in relation to another. The computer certainly has many advantages, but our main goal should not be solely to create fancy computer applications or a paperless, automated, or electronic office, but rather a global village where technology and human aspects are converging to create an interconnected worldwide society.

APPENDIX A

BINNEY'S STATEMENT

"To Err is human… to Really Mess Things up Takes a Computer"

"Um, hold on a second… I'm just typing all that stuff you just told me." Daily, it seems, I hear words like this put my patients on hold while I try to use the technology that is supposedly making my life easier. The problems are threefold: 1) having to do with the inability of the technology to keep up with what is going on in the room 2) software problems such as ordering tests, which have the potential for improvement over time 3) physical, secondary to the placement of the computer, myself, and my patients. Overall, and unexpectedly, I often find the computer in my exam room creates frustration and anxiety for me rather than becoming the helpful partner I would expect.

Yet I am hardly computer illiterate. I am one of the computer generation: I have used a computer for word processing since middle school, and email has been part of my daily life since college or even high-school. I have taken touch-typing classes and can troubleshoot my own problems on my computer. I use many functions on my computer outside of the office suite and the internet, and though I'm not quite the computer geek, I think of myself as relatively technologically savvy.

Yet I still cannot get over the feeling sometimes that I'd rather just have a pen and paper with me in the room. Throughout my academic life, I have taken notes in class on paper – all my skills for writing at high speeds have been shorthand learned with a pencil in my hand – never a keyboard and a screen. As a medical student I was required to hand-write my histories and physicals, and always took shorthand notes on paper before writing anything that become an inpatient or outpatient note. With a screen in front of me I can't use an arrow, a diagram, or standard shorthand. With a pencil I can make notes in the margin for thoughts of questions to follow up on later, write important thoughts and numbers down in my own cryptic shorthand and still connect them into a coherent presentation later. With the computer I lose all this, as I invariably fall behind and the cursor jumps somewhere else on the screen and I have to find the mouse or use some special function to navigate to family history instead of simply continuing to write.

Additionally there are my numerous typos to throw into the mix. Things I would never spell wrong when writing by hand morph magically into incomprehensible mushes of letters that have trainwrecked on the page. To make matters worse, the computer, in a misguided attempt to help, suddenly underlines these abhorrent words in red, capturing my eye, and dragging my attention from my patient and the narrative I am trying to keep up with. That errant e - I cannot leave it alone; nor those reversed letters, nor that sad word that forces me to read the entire sentence over to figure out what it was suppose to be. And the farther behind I get, the more errors in typing I make. If the room happens to be cold – forget it. The jitters start in my shoulders and shiver down my arms so that my fingers dance all over the keys, making a potpourri of my finely crafted lettering.

In the midst of all this, it's a wonder if I *don't* miss a key part of my patients' discourse. Sometimes I have to backtrack and reclarify details I've missed while wrestling with the red underline, getting odd looks from my patients who are certain that they just mentioned this. Lately, I've more often resorted to simply listening and writing down a bare bones sketch before I leave the room, planning to fill it out later. This of course interferes with the efficacy of my visit and means I am typing notes after clinic has ended for the day; thwarting the whole point of the computer to begin with.

A second challenge for me, and anyone who has switched systems in the electronic health record is figuring out how to get the unfamiliar software to do what you want. Often the visit has ended but I spend another 10 minutes or more trying to enter prescriptions and orders only to be plagued by "that diagnosis does not allow that order" and other such appalling messages. I have literally spent minutes trying vainly to find a *diagnosis* to let me order a pregnancy test before someone shared that it was "pregnancy, unconfirmed" – I only learned that later of course; in desperation, I put "nausea".

So called "smart forms", another blessing of the computer system, though designed to make my life easier, often keep my attention riveted on the computer screen. I may have my own pattern for talking to a patient about their history, but if I don't keep track of the computer form, I might miss some crucial component which I won't be able to fill in exactly according to the computer's needs. Navigating through them, while supposedly easy, takes my focus off the patient and off transcribing their story and puts it onto placing the correct answers into the form.

Working with the software may improve with time (I hope), but sometimes the sheer lack of common sense in the software we use makes me wish I could just write those orders instead.

Lastly, there is the third, physical component. While I am aware that studies have shown that patients don't mind the computer's creation of an odd trio from what used to be a comfortable, cozy duet, I can't imagine that this is always true. I almost always have to turn my back to the patient to use the computer, and I end up swinging back and forth throughout the interview, trying to keep an eye on my patients and an eye on my computer screen. The placement of the computer, this monolith that has become central to the interview, varies from room to room. In some rooms it is at a back corner, some in the middle of the room at a high desk I have to stand to reach. But always, always, the "examining table" is behind me. The only way I can see my patient, this person I'm trying to connect to, to forge a bond with, is on the rare occasion when a chair fits next to the computer table, and even then, only in my peripheral vision, and somehow this strikes me as not quite right. Inevitably there is a loss there. I only skim the surface of my patients' complaints because my real interaction is with the computer, and their interaction is with – nothing. When, on the other hand, I give up, and I put aside the computer, and turn to talk to my patients without anything between us, I feel the connection deepens. It is those times that I learn about my patients truly.

Of course, I then have no record of our interview.

For all this, I wouldn't want to give up the computer – in some ways, especially when it comes to finding information, the computerized medical record makes my life much easier. Looking for past information about a patient is a million times easier in the computer – I can find the relevant visits by date and specialty and I can read it – no handwriting to decipher. Also, I love having computerized lab values and vital signs that I can import into my note instead of hand copying them. Additionally, computerized medication lists are much easier to work with.

Occasionally though, I miss being able to work with just a pen in my hand. I wonder if tablet computers (though an expensive option) might not be a great solution. They allow the physician to sit facing the patient and to write with a pen. You can draw, color, doodle… yet with handwriting software the things written during the interview can still be imported into a word document that is in typescript and thus readable. It would be the best of both worlds: I would have access to records, vitals, and labs, but still would be able to use my arrows and diagrams and squiqqles, and most importantly, to be able to face my patients with nothing coming between us.

APPENDIX B

MONIQUE'S STATEMENT

Reflections on computers in the patient exam rooms.

Recently computers were installed in the patient exam rooms in our pediatric outpatient clinic. The computers sit on the physician's desk. I have walked into the exam room multiple times to find toddlers banging on the keys and even parents hitting buttons. I once interrupted a teenager playing a video game online. A computer in the exam room is too much temptation for children and teens. In order to access patient information, a log-in and password is required, so I doubt that clients would be able to tap into medical records; but one only has to hit the universally recognized 'Internet Explorer' icon on the desktop to access and surf the web while waiting for the doctor.

I do find it difficult to enter data into the computer during a patient encounter. I find it impossible to look at both the patient and the computer screen while taking a history. I fear if I turn my back to the client (or even turn sideways, losing eye contact) that I will be perceived as disengaged from the patient. I find that if I take a notepad with me into the exam room that I can jot down notes while still maintaining an acceptable stance (facing the patient or parent). It also seems easier to maintain eye contact jotting notes on a pad, glancing down at my pad briefly while the patient is speaking. Of course, after the encounter I must transfer these handwritten notes into the computer.

There are advantages to having a computer in the exam room. We can quickly review the patient's medical record, rooming form (vital signs, growth parameters for that day), immunization records, medications, and allergy history. We now enter all of our prescriptions into the computer. This will likely reduce medical errors because it eliminates illegible handwriting on prescriptions, and it automatically calculates safe dosage ranges for pediatric patients. In our office we are able to access and print handouts for parents on various pediatric topics, and this helps with pediatric anticipatory guidance. I have easy access to current evidence-based medical information from journals, and I have access to references like the Pediatric Red Book (infectious disease reference) and DermAtlas (dermatology images). I do find other uses for the computer. Once I helped a teenager look up information on colleges, and we printed out a few college applications to review.

I am certain I will have more to write when we move to the new hospital and we are officially “paperless.”

APPENDIX C

DOCTORS QUESTIONNAIRE

Physician-Patient-Computer Interaction: Doctors' reflections

Questionnaire: Feedback form on the presence of the computer in the exam room

What is the purpose of this questionnaire?

I appreciate your time providing us with feedback on the computer's presence during your consultation today with your patient. A self-addressed stamped envelope is enclosed for your convenience. If you prefer you can also e-mail the answers to the questions below: soudia@pitt.edu or call my phone: 412-716-3414 to dictate your answers. Please contact me also if you have any questions or concerns. Completion of this questionnaire is optional. Your feedback will help augment our understanding of doctor patient computer communication and the challenges underlining human computer interaction in the doctor's office. Incorporating your opinions in our study will also give us a clear picture of what has been sacrificed and gained by inviting the computer in the exam room.

1- What is your overall impression about the computer's presence in the room? Compare this to any prior experience using a pen a paper (Computer free encounters)
2- Do you feel that you are interacting with your patient equally well when you are using the computer?
3- Do you find it easy to talk to your patient while you are using the computer?
4- Do you find it easy to talk to your patient while you are typing?
5- How do you feel the computer has changed your office visit with your patient?
6- Has the computer changed the way you interact with your patient? Please explain if you can!
7- Would you allow your patient to see or use the computer? In what way?
8- Does the noise of typing bother you? Do you think it bothers the patient?
9- Do you think your patients know what you use the computer for?
10- Are there any other advantages and disadvantages you would like to add please?
11- Do you talk to the computer sometimes? Did any of your patients ever think you were talking to them when you are simply addressing the computer (monologue)?
12- How does the computer affect the structure of your medical interview?
13- Please feel free to share any other concerns or stories about your interaction with the computer and patient.

APPENDIX D

Physician-Patient-Computer Interaction: Patients' reflections

Questionnaire (Video No.): Feedback form on the presence of the computer in the exam room

What is the purpose of this questionnaire?

Completion of this questionnaire is optional. I appreciate your time providing us with feedback on the computer's presence during your consultation today with your doctor. You answers to the questions below will help us understand the advantages and disadvantages of the doctor's use of a computer while interviewing patients. Your feedback will also help improve our understanding of doctor patient computer communication and the challenges underlining the doctor's use of a computer to interview patients. Incorporating your opinions in our study will give us a clear picture of what has been sacrificed and gained by inviting the computer in the exam room. A self-addressed stamped envelope is enclosed for your convenience. If you prefer you can also e-mail the answers to the questions below to: soudia@pitt.edu or call my cell phone: 412-716-3414 to dictate your responses. Please contact me also if you have any questions or concerns about this questionnaire. You may choose to answer all the questions or just some of them. Your answers to these questions will be strictly confidential.

14- What is your overall impression about the computer's presence in the exam room? Please compare this to any other experiences you had when your doctor simply used a pen and a paper?
15- Do you feel that the doctor is interacting with you equally well when he/she is using the computer?
16- Do you find it easy to talk when the doctor is using the computer or typing?
17- Do you still feel connected to your doctor when he/she is using the computer?
18- How do you feel the computer has changed your office visit with your physician in terms of your doctor's ability to look up test results or other visits while you are there?
19- Has the computer changed the way you interact with your doctor? Please explain if you can.
20- Does your doctor allow you to see or use the computer? Would you like to do so?
21- Do you have a computer at home? Do you use one regularly for work or school? What things do you use computers for?
22- What do you imagine doctors use the computer for?
23- Please feel free to share any other concerns or stories about your interaction with the doctor and computer in today's visit.

APPENDIX E

Table 2. Participants (Fictitious names only), Spring/Early Summer of 2008

<Field notes and master list are locked>

Pts (Fictious)	MD (Fictious)	Video	Room	Date
Lauren	Dr. Spire	1	9	4/22/2008
Kevin	Dr. Spire	2	11	4/22/2008
Lori	Dr. Spire	3	9	4/22/2008
Lisa	Dr. Ceremuga	4	18	4/23/2008
Mary	Dr. Ceremuga	5	9	4/23/2008
Gina	Dr. Spire	6	11	4/24/2008
Richard	Dr. Spire	7	11	4/24/2008
Carly	Dr. Spire	8	11	4/24/2008
Tina	Dr. Ceremuga	9	9	5/6/2008
Nicole	Dr. Ceremuga	10	11	5/6/2008
Madeline	Dr. Ceremuga	11	9	5/6/2008
Tanner	Dr. Ceremuga	12	9	5/6/2008
John	Dr. Spire	13	11	5/8/2008
Nia	Dr. Spire	14	11	5/8/2008

Table 3. Participants (Fictitious names only), Spring of 2010

<Field notes/master list are locked>

Pts (Fictious)	MD (Fictious)	Video	Rm	Date
Bob	Dr. Ceremuga	15	9	2/17/2010
Carrie	Dr. Ceremuga	16	9	2/22/2010
Jamie	Dr. Ceremuga	17	11	2/22/2010
Stephanie	Dr. Ceremuga	18	11	2/22/2010
Drew	Dr. Ceremuga	19	9	2/22/2010
Tanner 2	Dr. Ceremuga	20	18	2/22/2010
Margaret	Dr. Ceremuga	21	11	2/24/2010
Linda	Dr. Ceremuga	22	x	3/22/2010
Laura	Dr. Ceremuga	23	x	3/23/2010
Stella	Dr. Ceremuga	24	11	3/29/2010
Dominic	Dr. Ceremuga	25	11	3/29/2010
Anne	Dr. Ceremuga	26	9	3/29/2010
Penelope	Dr. Ceremuga	27	9	4/6/2010
Tom	Dr. Spire	28	9	2/18/2010
Robert	Dr. Spire	29	11	2/23/2010
Na'vi	Dr. Spire	30	9	2/23/2010
Ryan	Dr. Spire	31	11	2/23/2010
Cathy	Dr. Spire	32	9	3/2/2010
Jessica	Dr. Spire	33	9	3/2/2010
Kevin 2	Dr. Spire	34	11	3/23/2010
Corey	Dr. Spire	35	11	3/23/2010
Amy	Dr. Spire	36	18	3/23/2010
Nate	Dr. Spire	37	11	4/13/2010
Stewart	Dr. Spire	38	9	4/13/2010
Steve	Dr. Spire	39	11	4/13/2010

APPENDIX F

Flyer for recruiting research participants (patients)

Research Study on Doctor Patient Computer Interaction

Principal Investigator: Abdesalam Soudi, PhD Student, Specialization in Sociolinguistics, University of Pittsburgh.

We are asking patients to allow us to videotape their meeting with the doctor today so that we can learn about doctor patient computer communication. We are also asking patients to complete a questionnaire after their visit. The questionnaire can be completed anytime. A self-addressed stamped envelope will be provided for your convenience.

A compensation of $35.00 gift certificate will be given to patients who agree to participate in this study. Please ask the receptionist to meet the researcher for more information.

Thank you

APPENDIX G

Transcription guide

A) Transcribing speech: common CA transcription conventions (based off Jefferson, 1984; Sacks et al, 1974).

= (equal) Latched talk. It indicates lack of a temporal gap between two speakers.

Capital letters: Stress

Silences of short duration are frequently denoted in tenths of a second

(xxx) Unclear or unintelligible speech. Questionable words appear between parentheses.

(..) Ellipsis

// Simultaneous speech.

< > Spoken more slowly than the surrounding discourse

> < Spoken more loudly than the surrounding discourse

: Lengthened vowel.

: The colon indicates a lengthened syllable. Each additional colon represents a lengthening of one beat

%words%: Creaky voice

Upward and downward Arrows: Descr↑iption↓: an upward arrow denotes marked rising shift in intonation, while a downward arrow denotes a marked falling shift in intonation

B) Gaze: I used Goodwin's style (Goodwin, 1981: viii) for recording gaze:

The gaze of the speaker is marked above the utterance; that of the recipient is marked below it.

```
              12                                           16
              ↓                                            ↓
SPEAKER:  ______________________________________________, , , , ,
          Brian you're gonna ha v- You kids'll have to go down closer
                                  [
HEARER:                       .  X________________________________
              ↑               ↑  ↑
              13              14 15
```

12- A line indicates that the party so marked is gazing toward the other.
13- The absence of a line shows that that party is not gazing toward the other.
14- A dot or series of dots marks the movement that brings gaze to another
15- A capital X connected to a specific point in the talk with a bracket shows the place where gaze reaches the other.
16- Commas mark a movement withdrawing gaze

C) Speech-gaze typing interaction (current work)

It was necessary to design a new system for capturing computer involvement in the action for this context (Speech-typing and gaze between doctor, patient and computer). Below are additional symbols and abbreviations for transcribing both gaze and speech around the computer. These symbols describe the doctor pivoting back & forth between the computer and the patient. These abbreviations will be helpful to indicate the direction of gaze and its withdrawal. Also it will save space when describing gaze actions or providing templates/structures/summaries within the analysis.

a- Mutual Gaze (MG): Doctor and patient gazing at each other (head-based gaze).

b- Patient Gazing at Doctor (PGAD) – the patient is looking at the doctor

c- Doctor Gazing at patient (DGAP) – the doctor is looking at the patient.

d- Doctor Gazing halfway between patient and computer (DG ½ way b/w Pt-PC):

Doctor is looking somewhere between the patient and the computer. Symbolized by

%%%%%%%%%%%%%%%%%%

e- Doctor Gazing at computer (DGAC): the doctor is looking at the computer, symbolized as

– – – – – – – – – – – – – – – – – – – –

f- Patient Gazing at Computer (PGAC): the patient is looking at the computer, trying to see what is on the screen, symbolized by ;;;;;;;;;;;;;;;;;;;;;;;;;;;

g- Doctor's yaw motion – the doctor is oscillating from patient and computer is symbolized as: >>>. <<< (gazing from the patient to the computer, and then back to the patient) or <<<.>>>, (gazing from the computer to the patient and back). The period in-between represents the moment the doctor hits the mid-point of the yaw motion and then begins his journey back to his starting point. It is seen more frequently as <<<.>>>. **Yaw motion** is not to be confused with commas which mark withdrawing gaze in general or dots which mark the movement that brings the gaze to another place. **Yaw** motion describes situations where the doctor switches gaze back and forth quickly between patient and computer or vice versa.

h- Doctor gazes away from patient to look at computer (DGAWP): the Doctor moves his/her gaze away from the patient to the computer symbolized by

>>>>>>>> (greater than symbol)

i- Doctor gazing away from computer to look at patient (DGAWC): The doctor moves his/her gaze away from computer to the patient symbolized by <<<<<<<< (lesser than)

j- Typing on pc: the doctor is typing, usually simultaneously gazing at the computer, symbolized by ttttttttttttttt

k- Commentary in the transcript: takes several forms, but are verbal descriptions of actions noted in the transcript. For example:

((Coughs)) – describes a cough during that time in the video

l- → A horizontal arrow or **bolded words** in transcript draws attention to a particular phenomenon the analyst wishes to discuss.

m- A description between brackets will also be added where necessary to indicate the direction or person to whom gazing is going to or leaving when necessary

n- Images are used for additional gestures or other key gaze practices. Refer to my methods for why I use sequences of images or single images to represent visual conduct: Gaze and other embodiments are best transcribed by inserting an arrow into frame-grabs.

o- OSC= **On Screen Commentary**. This means that the physician is describing what they are seeing on the computer or reading electronic notes. Even when the physician is directing talk at the patient he or she is not allowing the patient room to contribute. Turn color takes a red theme.

p- Goodwin (ibid) mainly focused on hearers' behavior and also shared examples of one speaker producing a turn and underlining the hearers gaze towards it. In my transcriptions, I attempt to account for both speakers and hearers. The line number will refer to the turn taken by the speaker. As above, the movements or gaze of the speaker will be located above the text. The movements or gaze of the hearer (patient or doctor) will be represented below the text of the speech the same number labeled with an (a). This will account in each turn of the conversation of what each person is doing as his or her speaking roles change. The example below from the data shows how this process works:

1- Dr. Spire: : _ _ _ _ _ _ _ _ _ _ _ _ _ _ _(DGAC)

<t-looks like the la:st time

1a- Pt. Carly: .. __

2- Dr. Spire: _

We checked this stuff (.1) was back in November (.1) and it was normal>

GAP (.8) (DGAC)

2a- Pt. Carly: ____(PGAD)

3- Dr. Spire: _(mouse jiggle)

So: (.4) I think I would START with (.2) -uh repeating some of those tests

3a- Pt. Carly: ____

4- Dr. Spire: _

to see if we can get any clues about why (.1) you're having this discomfort=

4a- Pt. Carly:____

5- Dr. Spire: _

=Did ↑the urologist check your urine (.1) recently?

5a- Pt. Carly: ____

6- Pt. Carly: _____________

(.1) U:h, yeah

6a- Dr. Spire: : _ _ _ _ _ _ _

k. GAP versus Pause: Following Jaffe and Feldstein (1970, Cited in Goodwin, 1981: 18) I treat the "silence" as a gap or a between turn silence when it's not occurring after a question (meaning it does not belong to next speaker, the answerer). This decision may not be generalizable to all points of the conversation in this human-computer interface as I explain below. I also treat "silence" as a pause and transcribe it within the turn itself if it occurs within the participant's act.

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