

Endangered Literacies? Affordances of Paper- Based Literacy in Medical Practice and Its Persistence in the Transition to Digital Technology

Written Communication
2017, Vol. 34(4) 359–386
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sagepub.com/journalsPermissions.nav
DOI: 10.1177/0741088317723304
journals.sagepub.com/home/wcx



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Abstract

Under the rapid advances of digital technology, traditional paper-based forms of reading and writing are steadily giving way to digital-based literacies, in theory as well as in application. Drawing on a study of literacy in a medical workplace context, this article examines critically the shift toward computer-mediated textual practices. While a considerable body of research has investigated benefits and issues associated with digital literacy tools in medicine, we consider the affordances of paper-based practices. Our analysis of verbal interaction and textual artifacts drawn from a qualitative study of oncology visits indicates that the uses of pen and paper are advantageous for both doctor and patient. Specifically, they allow doctors to process and package information in ways that are favorable to their personal *modus operandi*, and they enable patients to participate in the medical visit and

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take an active role in managing their medical treatment. Understanding the affordances of paper-based literacy provides insights for refining digital tools as well as for motivating the design of possible hybrid forms and digital-analog intersections that can best support medical practices.

Keywords

doctor-patient interaction, paper-based literacy, digital literacy, medical rhetoric, multimodal analysis

This article analyzes changing literacy practices in the context of a medical workplace setting. Under the rapid advances of digital technology, traditional paper-based forms of reading and writing are steadily giving way to digital-based literacies, in theory as well as in application. This process is especially evident in the practice of medicine, with health information technology legislation incentivizing the use of electronic records (Teston, 2012a). Despite institutional pressure toward practicing medicine in a paperless fashion, it has been observed that doctors continue to use analog literacy technologies in medical encounters.¹ This observation is of interest for both theoretical and practical reasons. For literacy scholars, doctors' continued use of analog technologies offers a fruitful context in which to shed further light on the interaction between literacy technologies, individual agency, and broader sociohistorical circumstances. For the practice of medicine, doctors' continued engagement in paper-based forms of reading and writing raises the question of what these literacy acts accomplish, pointing to the distinct possibility that analog technologies contribute to important functions in medical work. Such a finding would suggest caution toward unreflective transition to digital records. Furthermore, an analysis of doctors' continued use of analog technologies, and the functions they are being used to serve, may offer valuable guidance for the refinement of digital tools, and for design of hybrid forms and digital-analog intersections that can best support medical practices.

A central focus in written communication research is the relationship between the tools of literacy (e.g., paper/implement, computer/keyboard) and the practice of literacy. Prominent scholars have cautioned against falling prey to twin myths related to this question—on the one hand, that the tools of literacy are neutral, transparent conduits for the visual appearance of language, and on the other hand, that the tools of literacy themselves inevitably carry significant consequences for participants, independent of how the tools are used (Eco, 2005; Haas, 1996, 1999). A practice-based theoretical approach to literacy (Scribner & Cole, 1981; Street, 1984) eschews these

twin misconceptions while acknowledging the significance of both the tools of literacy themselves—their affordances and limitations—and the forms of activity to which they are inextricably linked (Haas, 1996; Prior & Shipka, 2003).

Drawing on such practice-based theoretical perspectives, we consider the material, sociocultural, and psychological aspects of literacy as deeply entangled in historically situated configurations that merit empirical investigation. This theoretical orientation is reflected in our microanalytic approach, which we use to investigate literacy activities in the spontaneous context of their occurrence, drawing on the conceptual and methodological tools of discourse analysis. By examining the moment-to-moment unfolding of analog literacy activities in medical consultations, we gain insights about what these activities are accomplishing, insights that have implications for both literacy theory and the practice of medicine.

Literacy Technologies in Medical Practice

Scholarship on the role of literacy in medicine has contended that contrary to what is often assumed, literacy artifacts and practices are not neutral adjuncts to the real substance of medical practice—rather, they are constitutive elements of medical practice. Reading and writing have been conspicuous activities in doctor-patient interaction at least since the late 19th century, and before then, starting from antiquity, written case history reports were used for didactic purposes (Gillum, 2013). In the contemporary context of internet health, Segal (2009) argues that patients do not simply engage agentively with Web textuality but are “remade by it” (p. 352)—inhabiting roles and performing actions made available to them within the health-information web’s discursive matrix.

Medical rhetoric scholarship as well as ethnomethodological science and technology studies have illuminated the complex interrelationship between medical documents and doctor’s diagnostic and therapeutic activities (Heath & Luff, 1996; Luff, Heath, & Greatbatch, 1992; Teston, 2009, 2012b). Drawing on Latour’s theorization (notably, Latour, 1986, 1987), Berg places textual practices at the core of medical work: The reality of a disease emerges and gets articulated through a chain of inscriptions, reiterative processes of reading and writing, resulting in “layers of paperwork” (Berg, 1996, p. 511). Thus, textual artifacts are not merely institutional residues, documenting a posteriori what has already happened. For instance, the patient record does far more than merely represent the information gathered during the visit—about the patient’s current condition, his or her medical history, the prognosis, and actions to undertake. Rather, the record plays a central role in shaping

the very events it purports to represent (Berg & Bowker, 1997). Embodying the properties of a Latourian actant, it functions both as “a distributor and collector of work tasks” (Berg, 1996, p. 520).

Similarly, Teston has examined how the Standard of Care document—a key text in oncology, which provides a set of national guidelines for cancer treatment and patient prognosis—“authorizes and organizes medical practice” (Teston, 2009, p. 323), in particular, the multidisciplinary deliberations of a Tumor Board during its weekly meetings. More specifically, Teston shows “the ways that the Standard of Care document rhetorically excludes and includes ways of seeing and doing” (p. 346). In this way the document affords authoritativeness and accountability to the Tumor Board participants while also standardizing their course of treatment action.²

Conceiving of medical texts as “technologically and rhetorically rendered artifacts” (Teston, 2012b, p. 187), fundamentally interwoven with the practice of medicine, complicates the interpretation of the computerization process as transparent shift of media, a mere transference of textual acts from page to screen. Seeing medical record systems as representing “different notions of how work is organized and different modes of configuring patient bodies,” rather than “innocuous storage device” (Berg & Bowker, 1997, p. 532), Berg and Bowker argue that the changes related to the implementation of electronic versions are consequential not solely for the medical institutions (e.g., hospitals, national departments of health, research centers) but also for the health care practitioners and their patients, and these consequences have different significance for different stakeholders. As Teston (2009) has shown, multimodal displays, screen pagination, and hyperlinks implement argumentative pathways that serve medical professionals well in identifying a treatment plan but do not necessarily account for the patient’s experiences.

In medical informatics, the impact of computerized systems and internet technologies has been anticipated as highly advantageous (e.g., Bates, Ebell, Gottlieb, Zapp, & Mullins, 2003; Safran & Goldberg, 2000; Singh, Naik, Rao, & Petersen, 2008). Practicing in a paperless fashion is heralded as a favorable aim, which addresses the shortcomings of paper-based textual practices, promising to reduce drastically the time-consuming nature of handwritten clinical notes and the vulnerability to misunderstanding, inconsistency, and loss of medical documents. Furthermore, scholars who study medical decision making have contended that electronic textual practices in medicine improve shared comanagement of a patient’s care among clinicians, pointing out, however, that on its own the electronic health record is not sufficient to warrant effective communication and fruitful sharing of patient data across health care units (Naik & Singh, 2010). In *The Creative Destruction of Medicine*, prominent American cardiologist and researcher Eric Topol predicted no less than a

technology-propelled revolution, with medical care becoming more democratic and personalized thanks to digital tools (Topol, 2012). Once given access to digitized information about their own bodily functions, medical histories, as well as the world's medical literature, Topol argues, patients will become able to manage their own care, and, importantly, have a say in decisions that are currently reserved for physicians.

Ethnographic, observational, and discourse analytic studies of the actual use of computerized systems in primary care encounters temper the unqualified enthusiasm toward the introduction of digital technology in medical consultations. These studies document the way computational tasks disrupt the doctor's modus operandi during the consultation and disturb the interaction with the patient (see also Gillum, 2013, for a historical perspective, and Teston, 2012a, for a summary of research regarding issues with electronic medical record system design). Greatbatch et al. conducted a longitudinal observational study of the consultations of general practitioners, beginning prior to the introduction of digital technologies and extending to their systematic uptake and concurrent dismissal of paper-based systems (Greatbatch, Heath, Campion, & Luff, 1995; Greatbatch, Luff, Heath, & Campion, 1993). Through a microanalysis of the video-recorded consultations, these researchers demonstrated that the impact of computerization was significant on both the practitioner's and the patient's communicative behavior, with mostly adverse repercussions. Specifically, the computational tasks emerged as more prominent and demanding for the doctor than their paper-and-pen, precomputer analogs. As a result, general practitioners reduced their gaze to the patient and subordinated their talk to their use of the computer, thereby producing (a) extended delays between segments of talk as they awaited for screen changes, (b) abrupt topic shifts in order to elicit information required by the system, and (c) more minimal and undifferentiated responses to the patients' queries. Patients also had to coordinate their talk with the doctor's activity-in-progress to secure his or her attention. This proved to be more challenging given that the computerized system was often visually inaccessible to the patient.

The significant demand computerized systems place upon the doctor, and upon the interaction more broadly, is also discussed in Swinglehurst, Roberts, and Greenhalgh (2011). In their linguistic ethnographic study of general practices, the authors found that doctors often face a "dilemma of attention" between the *here and now* of the immediate interpersonal interaction and the *there and then* of the institutional requirements embedded in the electronic patient record (EPR) system. When an EPR is open on the screen and the doctor is scrolling through its different parts and/or entering information, prompts and alerts might pop up for the doctor to attend to. These

institutional voices inject themselves in the interaction, most of the time undermining the dialogic flow and the coordination of talk between doctor and patient. Furthermore, Swinglehurst and associates point out that “the voices which the EPR admits into the consulting room are forceful, pervasive, difficult to ignore, and they constitute particular ways of accounting for clinical practice, legitimizing particular ideals of what ‘good care’ consists of” (Swinglehurst et al., 2011, p. 25).

In this article, we build on the microanalytic research discussed above. In considering the potential risks in the mandated transition to digital medical records that these studies have revealed, however, we take a different tact: Rather than considering the potential drawbacks of digital literacies in medical encounters, we consider possible affordances in the use of analog technologies. In this way, we hope to contribute to a more complete picture of the ongoing transition toward digital medical records and, more broadly, to the growing presence of digital media in medical workplace practice.

Method

Context

Italy’s health care system is a regionally organized national health service (Servizio Sanitario Nazionale). The ministry of health is the main institution responsible for public health, but the regions are responsible for organizing and delivering health care. This results in variability in regulations and practices by local health authorities.

Our data collection was carried out in the oncology department of two Italian hospitals—a medium-size public hospital and the teaching hospital of the largest Italian university. The study received approval from both the Hospital Ethical Committees. Written informed consents were collected from all participants, including the doctor, the nurse, the patients and all those individuals (e.g., family members or friends) who accompanied her and were expected to enter the consultation room. Names and other references, which might lead to the participant’s identification of personal data, were rendered anonymous.

The medium-size hospital’s oncology department staff comprises a senior oncologist and department head, three more junior oncologists and six nurses. Two senior oncologists and four residents work in the oncology department of the teaching hospital. The hospitals are representative of the Italian public medical infrastructure also insofar as both are in transition from the paper-based to digital information systems. It is thus possible to observe traditional



Figure 1. The oncology visit room: Spatial arrangement and material artifacts.

pen and paper literacy practices alongside a desktop computer on which the electronic clinical record can be accessed and other information can be searched.

Figure 1 is a snapshot from one of the video-recorded visits drawn from our data corpus. Highly salient in the picture is the range and quantity of literacy artifacts on the desk and the relatively close proximity between doctor, patient, other copresent participants. This spatial configuration of participants and artifacts has interactional implications: It makes possible reciprocal monitoring of acts of reading and writing, convergence of attentional focus on texts, and easy access to and exchange of documents.

Data Corpus

Our data corpus consists of 56 video-recorded cancer consultation visits, 31 collected in the medium-size hospital and 25 in the teaching hospital. These are all *first visits*, that is, the first time the patient meets the oncologist to discuss the diagnosis and therapeutic prospects. Most patients in these visits are women (81%) and have breast cancer (77%). Their average age is 55. The patients are usually (66%) accompanied to the visit by a family member or close friend (Fatigante, Zucchermaglio, & Alby, 2015).

Table 1. Semiotic Dimensions of Literacy.

Dimension	Observed characteristics
Textual matrix	Composing, copying, selecting
Communicative mode	Silent, aloud
Type of sign	Words, numbers, scribbles, diagrams, pictures

In the medium-size hospital, the first visit is always carried out by the senior oncologist (more than 35 years of experience) and has an average duration of 23 minutes. In the teaching hospital, the first visit is divided in two parts. A first part, referred to as *filter visit*, is led by the resident and devoted to constructing the patient anamnesis and completing the medical record. The second part—led by a senior oncologist, with the resident still present—focuses on diagnostic and therapeutic decisions. These two-part visits are 42 minutes long on average.

Prior work in this research context has documented the structural organization of first visits (Fatigante, Alby, Zucchermaglio, & Baruzzo, 2016). The first visit comprises six phases: (a) opening (greetings and small talk), (b) anamnesis (personal data, medical history, current health status), (c) cancer's diagnostic assessment (staging), (d) treatment recommendations, (e) outline of future actions (e.g., next appointments, exams), (f) closing (greetings).

Throughout the visit, and in each of the 56 visits that composed our data corpus, several literacy practices take place. In what follows, we describe how these acts of reading and writing were treated, conceptually and analytically.

Analytic Procedure

We have singled out all acts of reading and writing carried out by the participants in the context of the medical encounter. Each video-recorded visit was examined independently by two of us, and we obtained full agreement in identifying therein acts of reading and writing.

The identified literacy acts have then been described in terms of a triad of analytic dimensions, which stipulate inherent semiotic properties of literacy practices (Table 1). While these dimensions were derived from theory—notably formulations on the nature of signs (e.g., Bezemer & Kress, 2008; Eco, 1984) and on the modes of access to and rendering of texts (e.g., Chartier, 1992; Scollon, 1998)—their observed characteristics were discerned from the specific context of use, that is, oncology visits.

Textual Matrix. Texts come into being and/or become relevant in the medical encounter through a wide range of operations that include copying from one document into another, writing down what just conveyed or is about to be conveyed orally, marking and annotating documents, and drawing. As such, texts emerge as always situated into a semiotic matrix in which acts of reading and writing function as sutures between texts in the very moment they create and enact texts.

Communicative Mode. Acts of reading and writing can be carried out silently or engage the voice. Reading or composing aloud renders the literacy practice more easily monitorable by copresent participants and usually displays an orientation toward making it the focus of interaction.

Type of Sign. A wide range of signs can be encoded and/or decoded through literacy acts—from words to numbers, diagrams, pictures, and scribbles as well. Different kinds of signs have distinct semiotic affordances, which are brought to bear in the literacy activities in medical settings.

This triad of analytic dimensions allowed us to capture the semiotic texture of literacy acts in oncology encounters, unearthing the range of multimodal resources deployed by participants and their interconnectedness. In addition, we have considered how the literacy practices in our corpus are distributed in the course of the oncology visit. In situating literacy practices in the temporal unfolding of the visit, we have examined how acts of reading and writing mediate different purposeful trajectories of action, such as completing an anamnesis or formulating a treatment recommendation.

Taking into account the temporal location of each occurrence of literate acts together with the combination of their observed dimensional characteristics, we have characterized functionally the literacy practices in our data corpus. Repeated cycles of collective discussion among the authors and independent coding resulted in discerning six specific functions that literacy acts help to accomplish in the oncology visit. We present these functions in the following section.

Results

We present our results in two subsections. First, we describe the functions that paper-based literacy practices serve in oncology visits. Second, we present illustrative examples from an in-depth analysis of a subset of our data. The examples presented are representative of the practices in the collection but were selected as particularly clear illustrations of the focal phenomena, although they are not qualitatively different from other instances in the collection.

Literacy Practices in the Medical Encounter

We have identified six distinct but not mutually exclusive functions that paper-based literacy practices contribute to oncology visits. In what follows we describe them, in their dimensional characteristic manifestation as well as their temporal location (i.e., when during the visit they predominantly occur).

Management of Interaction. Acts of reading and writing are functional to the management of ongoing doctor-patient interaction, supporting the transition between different phases of the visit and patient's participation into the exchange (Mondada, 2006; Robinson & Stivers, 2001). For instance, the composing aloud of a list of future actions for the patient to undertake generally serves as closing device that brings the visit to an end. As interaction management devices, acts of reading and writing appear across the duration of the visit, engage primarily alphabetic and numerical signs, and are produced either aloud or silently.

Inscription and Archiving of Medical Data. Throughout the course of the oncological visit, doctors write information onto the patient's clinical record, at times transcribing therein data contained in other documents (e.g., the histological exam, blood tests, etc.), at times writing down information provided orally by the patient. These inscriptions are done silently or aloud. As discussed above in this article, the practice of completing the clinical record has been widely studied both before and after the inception of computer usage for archiving data (e.g., Berg, 2001; Berg & Bowker, 1997; Bleich & Slack, 2010; Heath, 1982; Nielsen, 2014).

Reasoning. Reading and writing mediate and support doctors' diagnostic reasoning and the process of therapeutic decision making. As support to reasoning, acts of reading and writing occur primarily during the staging phase of the visit, are predominantly carried out silently by the doctor, and engage different kinds of signs (Fraenkel, 1992).

Socialization. Literacy practices also scaffold doctors' expounding to patients. Acts of reading and writing make salient information germane to understanding the oncological procedures at stake and promote a patient's participation in delineating the specificities of her clinical case and projecting future actions (Lave & Wenger, 1991). Especially present in the anamnesis and staging phases of the visit, these acts of reading and writing are always produced aloud, include coping as well as composing, and engage different kinds of signs.

Persuasion. Scholarship in medical rhetoric has demonstrated that communication in health care is fundamentally rhetorical (Segal, 2005, 2009). Seen as an ethical pursuit in guided decision making, persuasion is deeply embedded in medical encounters, including but not exclusively encounters where highly consequential topics, such as end-of-life and enrollment in clinical trials, are discussed (Barton, 2011; Barton & Eggly, 2009). In explaining the nature of the tumor and orienting the patient toward the preferable therapeutic option, doctors make use of graphs, charts, drawings and other written materials, which they often produce themselves as they construct verbally their persuasive argument. The functional distinction between socialization and persuasion is not clear-cut but worth making: Literacy practices mobilized to persuade the patient support the doctor formulation of treatment recommendations and respond to a patient's intervention that puts pressure on the doctor's epistemic authority, either by expressing puzzlement about the treatment recommendation or by requesting possible alternative treatment routes.

Outlining Future Actions. Literacy practices are key to mapping out the actions following the visit that the patient will need to undertake (e.g., tests, other medical appointments, medication intake). These practices typically involve the production of official documents, such as prescriptions and exam orders. The doctor's textual composing is often done aloud or read to the patient once written down. It takes place in the last phase of the visit, just before the closing remarks.

In summary, we found a range of complex functions—cognitive, institutional, and interactive—that acts of analog literacy help to accomplish. Our analysis also brought to light the heterogeneity of semiotic representations (writing, graphs, images, etc.) engaged in the oncology visit and the rich variety of forms through which texts come into being in or traverse the medical consultation. These findings provide a more nuanced picture of how analog textual practices contribute to the constitution of the medical encounter.

Literacy Practices Fostering Patient Participation

Having identified various functions served by paper-based literacy practices in our data set, we gave further attention to the last three functions discussed above—socialization, persuasion, and outlining future actions. Albeit in this study we have not carried out quantitative analyses—a limitation discussed later in the paper—the main reason informing our selection of these functions for further analysis is that they manifest and support an orientation toward an active role of the patient into the oncology visit and the management of his or her clinical case. This orientation is central to present-day efforts to improve

medicine as institution and experience. Indeed research has shown that health literacy and knowledgeable involvement in illness management augment patients' resilience and the quality of their health outcomes (Coulter & Ellins, 2007; Reyna, Nelson, Han, & Pignone, 2015). In what follows, we illustrate how in mediating these functions, analog literacy acts afford for an active role of patients in the medical encounter.

Socialization. In the visit, oncologists produce and engage a wide range of texts in order to familiarize patients with their domain of professional action. Test results are read aloud and explained, drawings are produced to outline surgical procedures, quantifications (e.g., percentages of risk factors) are written down, all while being interpreted and discussed with the patient.

The following example is extracted from a visit in the medium-size hospital, specifically during the cancer's diagnostic assessment phase. The patient, a woman who was diagnosed with breast cancer and underwent surgery, is accompanied to the visit by her daughter.³

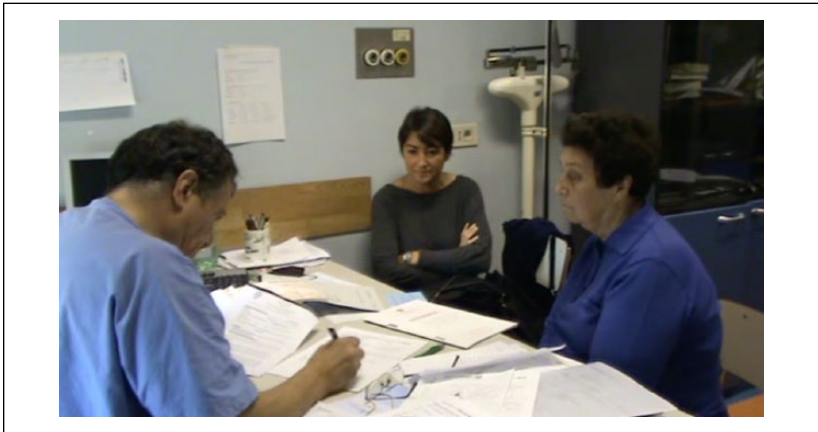


Figure 2. Patient and her daughter following the oncologist's literacy practices.

We shall see the oncologist shifting from silently examining the histological analysis, which the patient brought to the visit, to copying data from such document into the clinical record (see Figure 2). Not only is the data copying produced aloud—the doctor also makes the data intelligible to the patient by commenting on each bit of information he writes in the medical record.

Example 1. (Participants: Patient; patient’s daughter; oncologist).⁴

1	Oncologist:	here it is what I was looking for. /c-a- ((spelled)) infiltrating (0.8) ductal/ which, well, it’s what (0.5) eighty percent of breast cancers are.	CA INFILTRATING DUCTAL ∅
2	Daughter:	mhm.	
3	Oncologist:	hh. /diameter of centimeters/ (4.0) /t-p-l-k- one point eight/ so it’s p-t- one c- (2.0) /sentinel node negative/ and this is good. (1.5) then /estrogens (2.0) plus one hundred percent/ and this is good. (0.5) hh. /progestins plus seventy percent/ and this is good. (0.4) hh. /chi sixtyseven (0.3) plus twenty percent/ and this is so-so (0.6) /er two negative/ and this is good hhh. so (1.4) it’s not-	CM 1.8 (PTIC) NSENT - ER+100% PG+70% KI76 +20% HER2 -
4	Daughter:	it’s ok.	
5	Oncologist:	what	
6	Daughter:	it’s ok	
7	Oncologist:	(0.4) yes we can say that.	

After having obtained from the patient the histological analysis, the oncologist indicates that the exam is a key source of information and invites the patient and her daughter to wait quietly for a moment so that he can read the document. After 2 minutes of silent perusal (Example 1 starts at this point in time), the oncologist draws patient’s and daughter’s attention toward the histological exam, pointing to the document while uttering “here it is. That’s what I was looking for” (line 1). Once patient and daughter shift attention toward the document, the oncologist begins to copy data from the exam into the clinical record. The histological exam and the clinical record are placed next to each other on the desk, between the oncologist and the patient and daughter (see Figure 2). It is noteworthy that the oncologist’s copying activity is selective: Only the information relevant to cancer staging is written onto the clinical record (see Figure 3). Furthermore, a number of modifications to the information-as-written are made in that the oncologist deploys abbreviations and symbols (see Figure 4).

The information being copied is simultaneously verbalized. The oncologist activity thus becomes accessible to the copresent parties both visually and

Diagnosi istopatologica			
Carcinoma duttale infiltrante (e-caderina +). La neoplasia è scarsamente differenziata e presenta grading istologico 3. (B5).			
<u>Reattività con sieri</u>			
1 Mammella sinistra			
<u>Anticorpo</u>	<u>Clone</u>	<u>Risultato</u>	<u>%</u>
Ki-67	ROCHE 30-9		70
C-erb-B2 **	4B5 Roche	++	50
Recettori - Progesterone	1E2 Roche	++	40
Recettori - Estrogeno	SP1 ROCHE	+++	80
Note: ** per il c-erb-B2 è stato richiesto esame FISH			

Figure 3. Histological exam (detail).

EI: Ca duttale infiltrante ϕ cu 1,8 (PTac)
 Ncut (-)
 ER +100% PG +70% KI67 +20%
 Her-2 (-)

Figure 4. Clinical record (detail).

aurally. Reading and writing mediate the sharing of relevant information. In addition, after each segment of information is copied aloud on the clinical record, the oncologist provides an assessment of the datum. By deploying ordinary evaluative terms, notably “good” and “so-so,” the oncologist renders intelligible to patient and daughter information that otherwise would likely remain opaque to them. While the histological exam is customarily brought to the visit by the patient (and this was the case also in the current visit), its informational content is difficult to decipher without highly specialized medical knowledge.

In summary, the oncologist’s study of the histological exam, functional to cancer staging, is turned into a socialization activity through acts of reading and writing. The placement of the documents in the middle of the desk and the lay assessments punctuating the copying aloud demonstrate the oncologist orientation toward the coparticipants. Patient and daughter are recruited into the meaning-making activity. The participants’ alignment is manifest through gaze, alternating between the documents and the oncologist throughout the sequence. The daughter also offers a display of understanding, an appropriate move in a socialization sequence, in line 4 (then repeated in line 6), which is in turn validated by the oncologist (line 7). Thus, the ability to physically manipulate the

documents, which paper affords, creates an anchor for intersubjectivity and enhances opportunities for sense making and successful communication. This ultimately contributes to an active involvement of the patient in her medical care.

Persuasion. We observed the oncologist engage in complex acts of inscription in order to persuade the patient to consent to the therapeutic proposal. Such persuasive explanations were triggered by the patient's expressions of apprehension and hesitation. The oncologist's epistemic authority (Heritage & Raymond, 2005) is challenged, and so he mobilizes this authority in producing a persuasive argument.

We illustrate with an example extracted from a visit in the teaching hospital, more precisely from the second part of the visit, immediately following the filter phase. Both the senior oncologist and the resident are present. The senior oncologist has formulated the treatment recommendation, which requires the patient to take tamoxifen, to prevent cancer recurrence, local or in the contra-lateral breast. As we shall see, however, the patient wonders what would happen if she stopped taking the medication after a year. The oncologist asks the resident for paper and pen and then addresses the patient query through talk and the composition of a complex text, which includes numbers, other symbols, and emphasis markers, such as underlining and circling (see Figure 5).

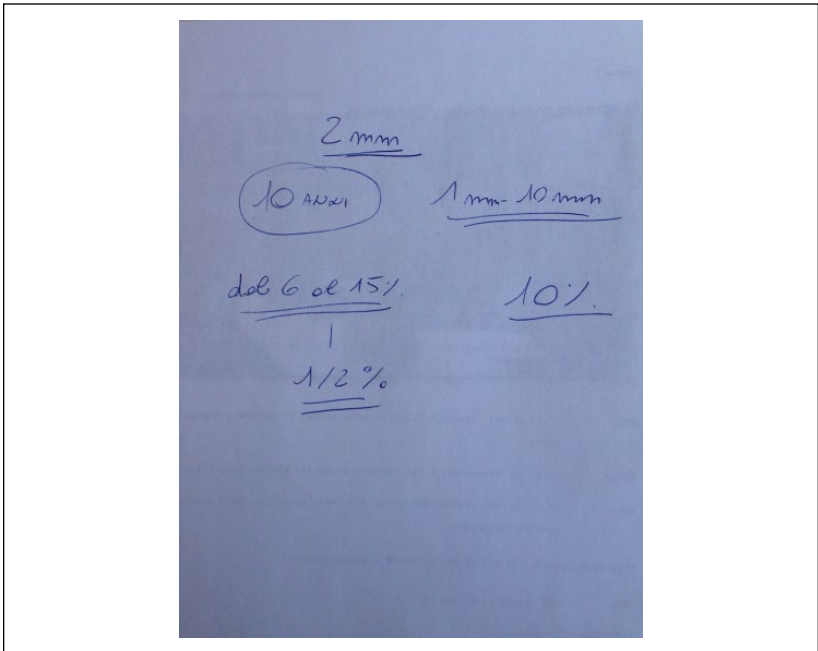


Figure 5. The oncologist's sketch.

Example 2. (Participants: Patient; resident; oncologist).

1	Patient:	so, what happens if for instance I stop it after a year. I realize of the first side effects.	
2	Oncologist:	hh. so. Well, I mean, please wait, let's take a piece of paper and a pen. And let's write everything down.	
3	Resident:	yes.	
4	Oncologist:	otherwise here we then really-	
5	(2.0)	((resident places a piece of paper on the desk in front of the oncologist))	
6	Oncologist:	look madam ((moves the computer keyboard on a side and places the paper at the center of the table))	
		you had a surgery for a cancer that in the worse case was two millimeters	2MM
7	Patient:	yes yes.	
8	Oncologist:	so it is a two-millimeter hormone responsive cancer.	_____
		so look madam (0.8) the risk that it can reappear in ten years, (0.8) we do not have an exact calculation for two millimeters we have a calculation on cancers which span between one millimeter and ten millimeters.	10 YEARS ○ 1MM – 10MM
9	(1.0)	((oncologist looks at patient))	_____
10	Patient:	((nods))	
11	Oncologist:	and this risk varies depending on the literature between six (0.6) and (0.4) fifteen percent.	6 TO 15%
	(1.0)	((oncologist looks at patient))	_____
12	Oncologist:	consider that a woman who has never experienced breast cancer has a ten percent risk to develop it in her lifespan.	10%
13	Patient:	((nods))	
14	Oncologist:	so it is just a little higher (1.0) ((points on page)) see that's just a little higher	
15	Patient:	yes yes sure	
16	Oncologist:	so the advantage of the little pill is that it lowers this risk significantly.	
17	Patient:	sure	
18	Oncologist:	but since the risk is low it lowers it of one two percent. (1.5) ok?	1/2%
19	Patient:	((nods))	



Figure 6. Patient following attentively the oncologist's explanation.

As the oncologist gears up to provide an explanation to the patient, he asks for the necessary materials to produce inscriptions. Although the oncologist leaves his sentence incomplete (lines 2 and 4), the subordinating conjunction of the adverbial clause of condition, “otherwise,” signals the import of what is stated in the main clause (“let’s take paper and pen and write everything down”), projecting undesirable consequences if those conditions cannot be secured.

The oncologist moves the computer keyboard to gain space at the center of the desk, where he positions the paper. The patient leans toward the table and orients her gaze onto the paper (see Figure 6). Then the explanation and inscription are produced hand-in-hand, mutually elaborating and complementing each other. The oncologist deploys summoning terms (i.e., “look” in lines 6 and 8; “see” in line 14) to guide the patient’s attention toward the graphic signs he is producing. He also underlines and circles numbers he has written to highlight their relevance in articulating the explanation (see Figure 5).

The persuasive argument that the oncologist articulates draws on data that oncologists themselves consider in determining the appropriate treatment: The size of the tumor, its specific properties (e.g., whether is hormone responsive or not), the patient’s cancer history. These factors are then considered in terms of risk percentages for cancer recurrence. Reasoning around the interrelationship between percentages is undoubtedly a complex process, and writing down percentages and other numerical values facilitates computation and comparison. In fact, we would argue that the oncologist’s complex argumentation would probably be both arduous to articulate and difficult to

understand without the support of writing. Through the interweaving of talk and inscription, the oncologist's reasoning unfolds to the ears and under the eyes of the patient and entices her to accept the treatment recommendation. The marked orientation toward persuasion is evident also in the oncologist's recourse to the scholarly authority of published work and statistics. The information that the doctor puts on paper represents knowledge that transcends his own. The oncology research community is invoked to provide further authoritativeness to his argumentation.

Throughout the unfolding of the oncologist's persuasive discourse the patient displays understanding. She does so in a way that indicates progressively increasing assurance—evidence, we would argue, of the oncologist's persuasiveness. At the beginning the patient produces only head nods (lines 10, 13, 19) and minimal assent tokens (i.e., “yes” in line 7); toward the end of the explanation she deploys the epistemic marker “sure,” prefaced by reduplicated assent tokens or accompanied by head nods (in lines 15 and 17, respectively).

Writing on paper is an effective tool through which the oncologist exercises his epistemic authority. At the same time, this literacy act also accommodates the patient's specific concerns, thereby providing opportunity for her agency in the management of her medical care.

The relevance for the patient of the oncologist's written document extends beyond the support it provides in the here and now of the treatment recommendation discussion: At the end of the visit the patient asks the doctor if she can take with her the paper on which he wrote (see Breuch Kastman, Bakke, Thomas-Pollei, Mackey, & Weinert, 2016, on the advantages of sharing written physician notes with the patient and family members). In leaving the oncologist's room with the patient, the paper turns into a memory device and an *immutable mobile* (à la Latour [1986]), which will carry the doctor's authorship and knowledge in other contexts, removed from the spatiotemporal setting of the visit.

Outlining Future Actions. The oncology visit is indeed situated in a complex course of medical actions, which spans across time and space, and includes numerous events before and after the visit, such as surgery, radiological, histological, and blood exams, treatments, and posttreatment evaluations. The oncology visit generally closes with a discussion of future actions to undertake. Literacy practices are central to this phase due to the considerable amount of paperwork that each medical activity requires, as well as to the complex set of instructions that the patient has to follow. Given the transcontextual orientation of the inscription produced in this phase, the textual composing is usually vocalized.

To illustrate we present an example from a visit in the medium-size hospital. The oncologist is reordering the numerous documents spread over his desk, an activity that also functions as preclosing sequence (Schegloff, 2007):

Example 3. (Participants: Patient; patient’s daughter; senior oncologist; junior oncologist).

-
- | | | | |
|----|---------------|--|---|
| 1 | S Oncologist: | I give this back to you ((handing the histological exam to the patient)) | |
| 2 | Patient: | thank you. | |
| 3 | S Oncologist: | and now you’ll go to my illustrious head nurse, who, thirty seconds after you’ll leave her, will come here to tell me blah blah blah | ULTRA HEPA ()
X-RAY THORAX ()
BONE SCINTI ()
ECHO ()
BLOOD TEST () |
| 4 | Daughter: | mh. ((nodding)) | |
| 5 | J Oncologist: | ((laughs)) | |
| 6 | S Oncologist: | you’ll give her this ((handing the clinical record to the patient’s daughter)) | |
| 7 | Daughter: | so this, I have to- | |
| 8 | S Oncologist: | you give it to the head nurse | |
| 9 | (1.5) | | |
| 10 | Daughter: | this one only? (0.4) I have to give to the head nurse? | |
| 11 | Oncologist: | ((nods)) | |
| 12 | Daughter: | okay | |
| 13 | Oncologist: | okay? | |
| 14 | Patient: | ((nods)) | |
-

The oncologist returns to the patient the documents that she brought to the visit and he examined for diagnostic purposes. He then writes in the clinical record referrals for exams, which the patient will have to carry out in the upcoming weeks in other hospital units. The inscriptions are rather cryptic, including abbreviations and visual symbols signs (below the “deve” [to do] line) (see Figure 7); and they are not read aloud to the patient. While writing these referrals, the oncologist instructs the patient to bring the clinical record to the head nurse.

Although the oncologist’s inscriptions are unintelligible to the patient and are designed for other recipients, who will be able to decipher them and act accordingly, the patient becomes the carrier of a document, the clinical record, which will in turn carry the oncologist’s instructions to other medical professionals. The written document has thus encoded a transcontextual trajectory, a

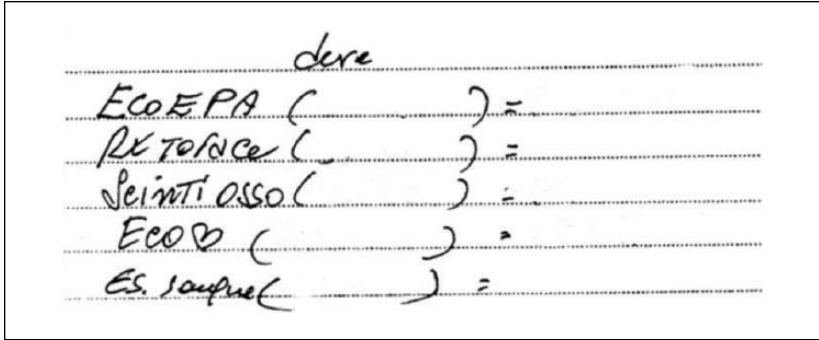


Figure 7. Medical record (detail).

course of actions that stretches into the future and traverses medical settings and domains of specialization. As such, the oncologist's inscriptions serve to coordinate the work of other professionals, but it only does so through the patient's actions, who will travel side by side with the clinical record. The patient carries the record at the same time as it guides the patient through medical contexts.

Figure 7 also shows that the doctor has created blank spaces, in between parentheses, for other medical professionals to write in. The clinical record is projected to become a coauthored, multivoiced document, one capable of speaking to its intended recipients, who will in turn write into it, without need of further verbal mediation. While the capacity of the clinical record to perform such complex instructional and coordinating function is a given for the oncologist and the head nurse (as projected by the doctor in line 3), the patient's daughter, who is with his father at the visit, shows surprise: "that only?" she asks the oncologist, revealing an expectation for more documents or instruction to be necessary for the complex set of actions previously outlined by the oncologist.

Undoubtedly, the clinical record is a remarkably complex and yet concise literacy artifact, capable of performing multiple functions. In addition to the clinical record's legal value, in Example 3 we have seen it support the transition toward the end of the visit and the set of actions to be implemented after the visit. While carrying also information about the past, including the visit just about to end, the clinical record projects itself and the patient into the future, where the document will come to orchestrate the action of other medical professionals, inside and outside the hospital, and serve for them archival and planning functions. Furthermore, because the clinical record is

inscribed on paper (or, we might say, is itself the inscription), the record is physically portable, and it gives the patient a critical role in ferrying the important document along its path to other medical professionals and future courses of action.

Discussion

This article closely examined rapidly changing literacy practices in medical visits. In so doing, our work has engaged theoretical questions about the tools of literacy. By investigating reading and writing as they spontaneously occur in social and institutional context, and by deploying close analysis of talk-in-interaction, we were able not only to attest to the persistence of analog literacy practices but also to identify their specific affordances, which, based on the findings presented, we believe are important to preserve in the transition to digital medical records.

Through a wide range of manifestations, paper-based literacy practices are constitutive of the oncology visit: Texts are read, copied, or composed anew, and made accessible for scrutiny among participants through spatial arrangements and the means of spoken utterances. Our multidimensional analytic framework has enabled us to discern a variety of functions that analog literacy practices support in the medical encounter. Serving the cognitive as well as the interactional, literacy acts mediate the unfolding of the visit and circulation of information.

In this article we have focused in particular on those practices that are oriented toward engaging the patient as active participant in the medical encounter and her treatment process. The symbiotic relationship between speech and inscriptions here is particularly salient: Spoken utterances rely indexically on texts, and texts are made relevant and legible through spoken utterances. This way, these communicative modes mutually amplify their semiotic potential, undoubtedly a favorable asset for navigating the complexity of oncology practice.

We have shown that acts of reading and writing offer a window into the oncologist's reasoning process as well as opportunity for better understanding the informational content of clinical exams and other medical documents. Given the level of complexity and technicality of the information relevant to the medical encounter, inscriptions also play a central role in scaffolding explanation as the doctor unpacks it (see Example 2). In fact, these literacy practices simultaneously support the doctor's analysis of the patient conditions toward the formulation of treatment recommendations. Handwriting and drawing carried out in the course of the visit emerged as especially suitable to information processing and sharing: The sensorimotor and artifactual

features of these practices entail a pace and spatial configuration that facilitated the doctor's expounding and commentary as well as patient's apprehending and querying.

As protagonists in the oncology visit, textual artifacts operate as *boundary objects* (Star & Griesemer, 1989): They come into being and then circulate across medical contexts as authoritative repositories of information, both enacting and reporting the practice of medicine. Many documents considered in the visit traveled to the oncologist office from other medical units. Through those textual artifacts, other medical professionals participated to the oncology visit and via acts of reading (and sometimes copying) were given voice. Documents that were generated during the oncology visit were polyvocal and intertextual from the get-go, incorporating data from other documents, information authored by the patient, and semiotic materials articulated by the oncologist. Sometimes these documents also included visible markers of their future fruition, for example, the oncologist created boxes that would later be filled with data pertaining subsequent medical interventions, or included communications to other medical professionals for whom the document will become relevant next. Laminated with multiple authorities, spanning medical contexts and time, textual artifacts are agentic participants in the medical practice, Latourian *actants* (Latour, 1987) which orchestrate and regulate the action of other participants, including those who generated those very documents.

An interesting aspect of the circulation of textual artifacts in our study, it was the patient who brought to the visit most of the medical documentation the oncologist needed to formulate diagnosis and treatment recommendation. An anachronistic and necessarily risky practice, having the patient be the carrier of documents pertaining to her clinical case required her active participation—from identifying the appropriate documents requested one-by-one by the oncologist to reporting commentaries made by the medical professionals who handed her those documents, and from examining independently the textual artifacts before the visit to organizing them according to her classificatory principles.

The findings of our study could be enhanced in significant ways: By complementing our qualitative analysis with quantitative measures, notably frequency and distribution of the different functions our qualitative analysis identified, we could achieve a better sense of how paper-based literacy assists the work of oncologists and mediates the interaction with patients. A systematic comparison of analog and digital literacy acts in health care settings where they coexist could provide a more nuanced understanding of each medium's affordances and limitations in medical context as well as how multimedia practices come to be configured therein. By expanding the

ethnographic scope of our work, notably via surveys and interviews, we could garner information about doctors' and patients' experience with literacy artifacts and practices in their engagements with medical work. These stakeholders' accounts could offer further insights on the different factors that play a role in the persistence and transformation of literacy practices in health care contexts.

Conclusion

In societies increasingly driven by digital technology, traditional forms of reading and writing persist, which rely on paper and ink/graphite inscription tools. Our study has demonstrated that analog literacies continue to play a central role within a specialized context, that of oncology, which is under significant pressure toward paperless, digital informational management. This finding supports Haas's theorization on the relationship of old and new technologies (Haas, 1999), which posits that rather than replacing traditional technologies, the new ones exist side by side the older, with the more advanced not necessarily representing the most powerful technologies deployed in work sites. Undoubtedly, digital technology can enhance both the archiving of clinical data and the development of medical knowledge. Digital literacy practices in medicine can contribute to a more effective, more widely distributed, and more integrated practice of health care. Our study, however, has shown that analog literacy is still of significant value for both doctors and patients.

When languages have a rapidly diminishing number of speakers, we refer to them as *endangered languages*. They are under the threat of extinction, and so programs are put in place to safeguard their survival (e.g., UNESCO, 2003), as the extinction of each language entails the irrecoverable loss of unique cultural and historical knowledge (e.g., Fishman, 1991). As a way to close our article, we raise the question of whether literacy practices that are under the pressure of being discontinued should be given the same status as endangered languages. In other words, should we talk about *endangered literacies*? We deem this question worth posing not only for medical practice but also for other contexts in which literacy acts play a central mediational role.

Understanding the affordances of paper-based literacy is more than nostalgia or apocalyptic apprehension. It invites caution toward unreflective adoption of digital technologies, and it motivates more intentional design of semiotic resources that preserve the affordances of analog technologies while incorporating the benefits of digital tools. For literacy scholars, such an

understanding articulates further the materiality of written communication, illuminating how literacy is rooted in the very dimension it transcends.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Notes

1. In 2013 the percentage of physicians using an electronic health record system was 48% in the United States (Hsiao & Hing, 2014) and 32% in Italy in 2012 (Osservatorio ICT in Sanità, 2012).
2. See also Teston (2012b) for an analysis of how medical images, as technological and rhetorical artifacts, contribute to cancer-care deliberation and action, via the rendering visible and present specific characteristics of the disease.
3. It is not atypical in the Italian oncology encounter that the patient is accompanied by a relative or close friend. In 34 of the 56 visits in our data corpus, the patient came with a companion, who participated to the interaction to varying degrees but never remained withdrawn or silent during the visit (see Fatigante, Zucchermaglio, & Alby, 2015, for a focused analysis of the participation of the patient's companion to the oncological visit).
4. The following notations have been used for transcribing speech and inscriptions in the data examples:
 - // Signs (words, numbers, and symbols) that are read aloud
 - SIGN Signs (words, numbers, and symbols) that are written
 - Signs (words, numbers, and symbols) that are underlined
 - Signs (words, numbers, and symbols) that are circled
 - (1.2) Numbers in parentheses indicate silence in tenths of a second.
 - hhh Letter "h" indicates hearable aspiration.
 - A hyphen after a word or a part of a word indicates a cutoff or self-interruption.
 - (()) Double parentheses enclose descriptions of conduct.

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