

**Practitioners' Noticing and Know-How in Multi-Activity Practice of Patient Care And
Teaching and Learning**

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We have no known conflict of interest to disclose.

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Abstract

Developing a sound ability of noticing is a crucial competency for both teachers and medical professionals in the respective professional and disciplinary communities. In this article, we investigate noticing in practice—how members of a professional community in the high-tech modern medicine specialty of Advanced Heart Failure use this ability towards developing and sustaining what it means to be a competent practitioner and what counts as a relevant practice of noticing in their moment-to-moment training. A multimodal analysis of videotaped practice is conducted on professionals' interactions who are simultaneously engaged in multiple activities: *patient care* and *teaching and learning* in graduate medical education. Toward this end, we expand the concept of noticing to 1) include a relational aspect, attending to and caring for the Other (students, patients); and 2) shift the analytic focus from an observer's interpretation of a scene to a concerted production of the scenic features to make sense of *noticing in practice*.

Keywords: Learning in Practice, Noticing, multimodal video analysis, microethnography, Skilled performance in professional contexts, Relational Ontology

Practitioners' Noticing and Know-How In Multi-Activity Practice of Patient Care and Teaching and Learning

There is consensus in considering noticing, the capacity of teachers to attune to certain aspects of practice to enhance meaningful learning possibilities for students, as a crucial competency for teachers (e.g., van Es, Cashen, Barnhart, & Auger, 2017). In this article, we show that noticing is also crucial for medical professionals practicing in teaching hospitals. As diverse as the institutional contexts are, both teachers and medical professionals in the respective professional communities and disciplines encounter a “varied and amorphous set of phenomena that are constantly in motion” (Sherin, Jacobs, & Philipp, 2011, p. 4). For the teachers, these are encountered in the interactional spaces of the classroom and, for the medical professionals in teaching hospitals, these are encountered in patient care and teaching in practice. To expand our understanding of practitioners' noticing, we add two new dimensions: (1) we consider noticing a relational ability because both teachers and medical professionals have to attend to, and care for the Other (e.g., students and/or patients) (Noddings, 1988, 2013; Raia, in press; Raia & Deng, 2015); both have to attend to the interactions of the persons they care for with other professionals, for example in training novices of the practice (Raia, 2018); (2) we study noticing in practice within participants' embodied, situated interactions (Goodwin, 2017; Hall & Stevens, 2015) showing how participants in the Advanced Heart Failure (AdHF) team display their understanding of what it means to be a competent practitioner and what counts as a relevant practice of noticing.

In our study, we investigate the teaching and learning and patient care concurrent activities conducted during the invasive medical procedure of endomyocardial biopsy (heart

biopsy). The relevance of the context can be best understood by first taking the perspective of the Patient who is at the center of the procedure: Imagine that your heart has failed catastrophically and you had to undergo heart transplantation surgery. Your heart has been removed and replaced with a donor heart that needs to be repeatedly monitored for potential rejection because your immune system recognizes it as a potentially dangerous foreign body and tries to destroy it. If it does, the consequences can be dire, including death. The nurse brings you into the biopsy procedure room and your fear of its results is mounting. You, were told that the doctors will make an opening in your jugular vein in your neck through which they will insert needles, wires, and the biopptome to reach the heart in order to collect pieces of your new heart—all while you lay there awake. They are preparing you for the procedure, you feel the cold gel on your neck for the use of ultrasound, your mind races as you think of everything that can go wrong with the procedure: What if the doctors perforate your heart wall causing all the life threatening complications they told you about. You will need to have another emergency heart surgery. Oh no, you can't bear it! You can't walk away either though. You need to be monitored for rejection. Your thoughts are interrupted by the doctors' voices. They are inspecting your heart with ultrasound. You listen attentively. You cannot see them from under the surgical dressing but can hear their voices. The Attending is describing how, in general, to map an anatomical area with an ultrasound probe. He's teaching! Oh, Yes! You are in a teaching hospital, and the person conducting the procedure will be the Fellow in training. At that moment, the Nurse sensing your mounting anxiety walks over and squeezes your hand, reassuring you.

How multifaceted and important is the ability to notice in such a context where the medical professional has to attend to multiple synchronous activities, from conducting a complex medical

procedure, to caring for you -the Patient-, while simultaneously teaching and caring for the Fellow in training during that procedure? What can we learn studying noticing in practice to support the care for you, the patient, and a safe learning space for the Fellow?

In the following sections, we address these issues by first discussing different bodies of work that can help us expand the concept of noticing in: 1) multi-activity and multiple relational frameworks of teaching and patient care, 2) practices other than classroom practices, and 3) the moment-to-moment participants' embodied and situated interactions. In the methodology section, we describe the theoretical and methodological approach, the methods of data collection, and analysis and how we extend the method to study noticing in practice. We then present the data to systematically show how we made sense of studying noticing in practice. We conclude with a discussion of our work, its possible implications, and further applications.

Noticing in Multi-Activity and Multiple Relational Frameworks

During the heart biopsy procedure, the participants, i.e., Patient (who is awake), Fellow (AdHF cardiologist in training), Attending (senior AdHF cardiologist) and Nurse, engage in concurrent activities: (a) teaching and learning in advanced graduate medical education; and (b) patient care (Raia, 2018). It is during multi-activity that learning to participate in the specific activities of a community of practice intersects with the practitioner's developing the ability to notice.

In her work on the situated practice in surgery, Mondada (2011), using conversation analysis (CA) and concerned with questions related to the transcription of multimodal analysis, suggests that rather than considering the surgeon's successive actions as independent concomitant activities of (a) conducting and (b) demonstrating the surgical procedure to an

audience of trainees, these should be studied as "parallel streams of action, which on certain occasions intersect and consequently suspend one another" (p. 207) within a multi-activity space. Based on her Relational Ontology framework, Raia (2018) argues that while it is important to consider the complexity of the different streams of action that participants engage in a multi-activity practice, it is essential to consider the purpose of each activity, that is, teaching and learning and caring for another, because the purpose of each activity defines an existential space. In each existential space, participants inhabit different identities and consequently accountability varies. In the moment-to-moment actions within multi-activity, participants must negotiate not only the meaning-making of each action, but the passage from one existential space to another (e.g., from being a doctor in a patient care activity to being a trainee in a teaching and learning activity). Making relevant the relational aspect of teaching, Raia shows that caring-for-the-Other involves helping the Other negotiating these existential spaces safely. The relational ontological framework allows for studying the multi-activity as an existential space of care-for-the-Other becoming a practitioner in a community of practice.

The US Accreditation Council for Graduate Medical Education (ACGME), defines Residency and Fellowship Programs as "essential dimensions of the transformation of the medical student to the independent practitioner along the continuum of medical education." Within the specific AdHF competencies, Fellows' learning trajectories are seen as progression from an initial stage of "Unready for unsupervised practice" to a stage of "Ready for unsupervised practice" at the end of training, with an aspirational stage that includes the capacity to teach, to serve as role models and to supervise others. This process involves a movement from peripheral to full participation in the activities of a community of practice (Lave & Wenger, 1991), as the meanings of these activities within the set of practices constitute professional

competence (Gherardi, 2009). In the ethnomethodological tradition (Alby & Zuccheromaglio, 2006; Goodwin, 2017; Llewellyn & Hindmarsh, 2010) attentive to the details of ordinary action and practices in naturally occurring interactions, Goodwin (1994) describes this as a process that results in the development of a professional vision within a community of practice of a specific discipline. In the learning sciences, Stevens and Hall (1998) further argue that in technoscientific practices, learning to see with and through inscriptions and what practitioners “treat as properly visible and invisible” (p.109) defines relevant practices in the development of a “disciplined perception.” However, in the practices of teaching and learning, as van Es and colleagues (2017) in this journal and others have argued elsewhere (Erickson, 2011; Gibson & Ross, 2016; Herbst & Chazan, 2003; Jacobs, Lamb, & Philipp, 2010; Lampert et al., 2013; M. G. Sherin et al., 2011), practitioners also need to develop the ability to notice. These scholars agree that teachers’ noticing, albeit in the specificity of each community of practice, is the ability to attune to certain aspects of practice that “enable teachers to hone in on noteworthy features of classroom interactions” (van Es et al 2017 p.167) with the specific purpose of enhancing meaningful learning possibilities (Herbst & Chazan, 2003; Luna, 2018). In studying medical practitioners in teaching hospitals engaged in the multiactivity space of teaching and learning as well as patient care, we are particularly interested in making visible how practitioners’ noticing is embedded and embodied in the professional practice.

Practitioners’ Noticing Research

There is currently no work on noticing in either medical education or in research on medical practices in teaching hospitals. Discussing Ensley’s situation awareness model (1995) in the context of teachers’ noticing, Miller (2011) argues that the capacity to perceive and understand elements in an environment as meaningful and project their possible development in

the coming actions for decision making, seems to overlap with aspects of van Es & Sherin's (2002) definition of noticing. We argue that "situation awareness" and similar cognitive operations of "situation monitoring" and "team monitoring" (Marks & Panzer, 2004) included in the ACGME as important skills to develop (Alonso et al., 2006; Salas & Frush, 2012; Salas, Sims, & Burke, 2005) do not require the day-to-day relational pedagogical skills to support students' intellectual and personal growth in a safe space and in a multiactivity space (Raia 2018) such as the one we find in our study. A more nuanced and complex capacity to navigate the teaching and learning and patient care activities is required. The concept of noticing developed for teachers' practices where teachers need to employ subject-specific knowledge for pedagogical tasks and care for their students is more appropriate for our use.

The Need to Study Noticing in Practice

Research on teachers' noticing of classroom practice spans from the most fundamental abilities to develop for novices (Santagata, Zannoni, & Stigler, 2007; van Es & Sherin, 2002) to more sophisticated aspects (Chazan & Herbst, 2012; Herbst & Kosko, 2014; Lampert et al., 2013; Luna, 2018; Sherin & Star, 2011; M. G. Sherin & Han, 2004; M. G. Sherin & van Es, 2009; Star, Lynch, & Perova, 2011; Star & Strickland, 2008; van Es et al., 2017). Goffman (1959) argued that humans conduct themselves in social life as a "performance" enacting particular roles (e.g. teacher, doctor) for others who, in turn, play the part of the audience (e.g. students, patient) distinguishing the "frontstage" performance for an audience from a "backstage" behavior where an actor might be alone or hidden from the audience's view or hearing. Following this argument, we understand that the research on teachers' noticing has concentrated its effort in studying "backstage" activities where the audience, the students, are not present. Our intent in studying noticing in "frontstage" is not to discard the richness and the

variety of approaches to study noticing, which have been very fruitful in informing and designing learning activities for teacher candidates and in service. Our interest here is to add another layer of possibilities to study practitioner noticing that takes into account noticing in multi-activity practice and brings the attention on studying noticing in “frontstage” in the presence of the students as an audience. This shift in analytic focus addresses the issues identified in the noticing research literature as Sherin and Star reflect, (2011):

We are explicitly excluding what goes on within automated processes from our treatment of noticing, which might be undesirable. [...]. Much of what distinguishes expert teachers (and expert teacher noticing) from more novice teachers might be their abilities to recognize and react to complex stimuli automatically. Expert teachers might recognize and react to some aspects of classroom events with little conscious and effortful processing. A notion of noticing that excludes this type of processing might, thus, be narrower than we desire. (p. 75)

Their reflection is supported by phenomenological study of skill acquisition (Benner, 2004; H. L. Dreyfus & Dreyfus, 1988) showing that what become noticeable and salient changes with participation in the community of practice, as a fluid “automated” response, that is different from pausing to share what was noticed, as shown by Luna (2018).

In this article, we shift the analytic focus from an observer's interpretation of a scene to a concerted production of the scenic features (Lynch, 2005) to make sense of “noticing in practice” as Goodwin's professional vision framework would advocate. With *noticing in practice* we refer to a move “from what is going on in the minds of the actors, to practices understood as ‘routine activities (rather than consciously chosen actions) notable for their unconscious, automatic, un-thought character” (Swilder, 2005, p. 84). Based on this, we do not take the cognitive and

psychological perspectives common in teachers' noticing literature, but the interpretivist socio-cultural and historical perspectives. To this end, we employ a microethnographic multimodal approach (Streeck & Mehus, 2005) to the analysis of embodied action in social spaces (cf., Goodwin, 2017; Heath, 1986; Heath, Hindmarsh, & Luff, 2010; Koschmann, Stahl, & Zemel, 2007; Mondada, 2011; Streeck, Goodwin, & LeBaron, 2011). The value of this approach has been discussed in the learning sciences by Stahl (2012) and by Stevens and Hall (2015).

Mindful of Erickson's (2011) finding that teachers' noticing is profoundly influenced by their philosophical stand on their profession, before presenting our study, we discuss below the sociocultural context of modern medicine and the high-tech AdHF specialty, necessary in our work to make sense of the practitioners' noticing.

Context

Medicine with its study of organs and diseases that afflict patients' bodies is seen and understood in the modern cultural paradigm as an evidence-based science and as the practice of a subject, the doctor, acting on an object, the patient's body (Timmermans & Almeling, 2009). While issues of objectivity and objectification emerge in understanding, studying and controlling things and other beings, (Daston & Galison, 2009; Haraway, 1988; Harding, 2015), research on the experience of transplantation shows a life lived at the tension between regarding the grafted organ as an intrusion into, an addition to, or as a replacement of the self (Haddow, 2005; Lock, 2002; Sharp, 1995, 2006; Shildrick, 2012; Raia, in press; Raia and Deng, 2015). Ethnographic work on caring for AdHF patients points to the ideological contradictions emerging in high-tech medicine from the competing needs to, on one hand, personalize care for the patient as a person and, on the other hand, to objectify bodies and organs (Sharp, 1995). This work demonstrates the challenges of taking care of patients experiencing these struggles in high-tech medicine.

The Study

The data reported in this paper stem from an ongoing ethnographic and participatory research project studying the practice of teaching, learning and patient care in the high-tech medical practices involved in an AdHF program in a large US university hospital described in detail elsewhere (Raia and Deng, 2015).

University hospital training programs in the United States must be approved by the ACGME to train Residents (post-medical school training in practice) and Fellows (specialization after residency). Their transformation from a medical student into an independent practitioner along the continuum of medical education (ACGME 2014) is “physically, emotionally, and intellectually demanding, and requires a longitudinally-concentrated effort on the part of the resident or fellow.” The AdHF Fellowship is an intensive one-year training in the care of AdHF patients program.

In this context, we analyze video recordings of medical interactions during the invasive procedure of the heart biopsy where participants: Patient, Fellow (AdHF cardiologist in training), Attending (senior AdHF cardiologist) and Nurse, are engaged simultaneously in multiple activities: (a) advanced graduate medical education teaching and learning, and (b) patient care. The AdHF Fellows learn the technical, relational and communication skills necessary to conduct a humane, safe and successful invasive heart catheter diagnostic procedure, the endomyocardial biopsy (heart biopsy), as part of their future specialized practice in the specific context of high-tech modern AdHF medicine.

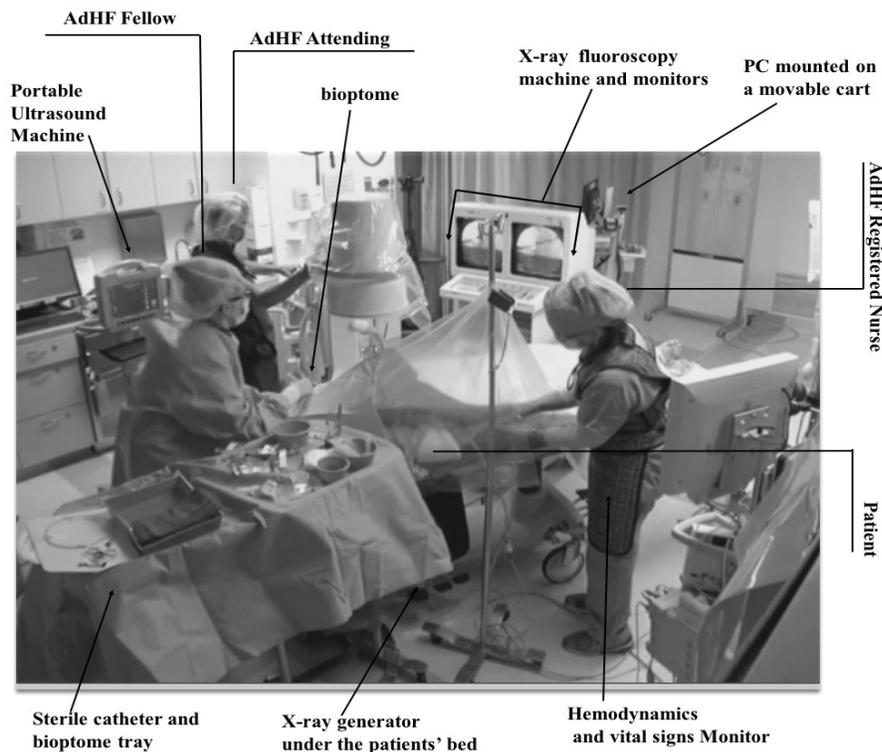
The Heart Biopsy

The purpose of the heart biopsy is to monitor whether the patient’s immune system is rejecting the transplanted heart. The histological process of rejection is studied at the tissue level

by routinely taking three to six one-millimeter-size pieces from the transplanted heart, in order to analyze them for the presence of immune cells. To do so, the AdHF cardiologists need to gain access to the patient's heart through the jugular vein. The procedure room shown in Figure 1 is a carefully designed space for the organization of the biopsy activity, where computer-assisted equipment – (a) ultrasound probe and monitor screen, (b) X-ray fluoroscopy machine and monitor, (c) desktop mounted on rolling cart and (d) hemodynamics and vital signs machine and monitor – mediate the meaning of the actions, where participants orient, in their shared space, to the relevance of what shows up on the screens. The information taken up from these computer-mediated resources is reformulated to others and into action, making visible what the practitioners “treat as properly visible and invisible” in the development of a disciplined perception Stevens and Hall (1998, p. 109). During the heart biopsy procedure, multiple test data at the organ level (e.g. right heart catheter, heart ultrasound, and electrocardiogram) are used to monitor heart function at the organ level, safely conduct the procedure, and monitor possible dysfunction related to rejection. The procedure, described in detail by Raia and Deng (2015), begins with AdHF Attending and Fellow using the ultrasound to determine how to best gain access to the jugular vein through which they will then insert needles, wires, and the bioptome to reach the heart. After entering the vein and reaching the heart, they check the position of the devices using the X-ray Fluoroscope (marked in Figure 1).

Figure 1

The endomyocardial biopsy suite during a procedure



Numerous difficulties can arise in collecting tissue samples. Presence of clots or scar tissue from repeated biopsies can make it difficult or even impossible to access the vein. Mistakes in identifying the right access increases the risk of accidentally puncturing the carotid artery which runs parallel and directly adjacent to the jugular vein. If punctured, a rapid flow of blood can invade the surrounding tissue with subsequent large hematoma formation. These difficulties may prolong placing the guide-wire and are associated with varying degrees of pain and/or discomfort for the patient. Difficulties also arise when approaching the heart with the biptome including the possibility of perforating the heart wall, causing life threatening arrhythmias or destroying the tricuspid valve – a very serious complication requiring emergency heart surgery. During the entire procedure, the Patient lies awake on the catheter table and is covered with surgical drapes and placed under an impermeable sterile tent (indicated in Figure 1) with his/her head turned away from the physicians conducting the procedure, in order to expose

to them the side of the neck where the jugular vein runs.

Methodology

This paper is part of a larger and multifaceted participatory research (Raia and Deng, 2015; Raia, 2018; in press; Raia, Kwon & Deng, forthcoming). In the sections below, we describe how the project is organized with regard to data collection and analysis. Then, we describe the theoretical approach taken and the methodological approach to specifically study noticing in practice. The research model designed to specifically study the training practice of the biopsy procedure comprises three iterative stages:

Stage 1 – Video Recording are made of heart biopsy procedures carried out by a team composed of Attending (AdHF doctor), Fellow (AdHF doctor in training), and Nurse (AdHF Specialized Registered Nurse) for Patients who have been recently transplanted (1-4 weeks). Each Fellow (n=7) is recorded throughout the fellowship training (1 year). Three cameras are positioned to best capture the actions and the relative positions and movements of instrumentation and participants. A *GoPro* hooked to the ceiling captures the room view from above, while two *Sony HD Handycams* with wide-angle lenses are positioned on either side of the working area. As the different equipment (Figure 1) is used and moved around the catheter table at different times during the procedure, one of the Handycams is also moved following the reorganization of the equipment and the healthcare professionals' changing orientation in the room.

Stage 2 – This stage relates to co-generative dialoguing (cogen) (Elden & Levin, 1991; Roth & Tobin, 2004) research sessions (video/audio-taped). Participating AdHF Attending/Fellow/Nurse from the medical team whose interactions were recorded in Stage 1 are

invited to participate in weekly two-hour-long audio/video-recording viewing sessions to make sense of their taped practices and discuss the emerging elements and themes. As indicated by ACGME, the fellowship training is physically, emotionally, and intellectually demanding and, based on this, the Fellows are not expected to participate in more than six cogen sessions during the year. The recorded sessions are analyzed for emerging relevant themes. Patients are also invited to participate and share with their team their own perceptions of the medical encounter. Patients participate in no more than one or two sessions. This restriction is due not only to the interest in participating and barriers of health conditions and time availability that can impede participation, but by ethical concerns of intruding and possibly modifying healthcare-patient relations in unpredictable ways.

Jointly reviewing the data in cogen sessions allows for a richer perspective on the practice, to address issues and pose questions that are most relevant to practitioners and, as Sherin and van Es (2009) discuss, provides a window into what practitioners notice, including their interpretation of the videotaped activities. It also allows checking for validity of the emerging patterns identified and interpretation of the data. As part of an iterative method for analysis, we watch each biopsy in its entirety together, stopping the video according to what each participant and researcher finds relevant or unclear. These “ethnographic chunks” (Jordan & Henderson, 1995) are then utilized to select similar events from the biopsies video which are then reviewed by the researchers (Stage 3). We follow up in subsequent cogen sessions, viewing and reviewing the events and discuss interpretations. We report here parts of the cogen sessions in making sense of the data.

Stage 3 –Analysis of the practice-recordings (Stage 1) is done to identify the resources (Goodwin, 2000) utilized by participants to organize their conduct and reciprocal accountability.

Events that are recognized as important in the emergence of themes, ranging from 30 seconds to 5 min, are transcribed utilizing the transcription symbols elaborated by Sacks, Schegloff, & Jefferson (1974) shown in Table 1.

Table 1

Transcript Symbols.

[Left square bracket, on two successive lines with utterance by different speakers marks the point at which the talk above is overlapped by the other talk a line below
=	Equal signs in pairs indicates that there is no discernable silence between the end of the first and the start of the next utterance, the first is 'latched' to the following
(0.5)	Number in parentheses indicate silence in seconds
?	Question mark indicates raising intonation
:	Colons indicates that the sound that immediately precedes the colon has been sensibly prolonged or stretched
word	Underlining indicates some kind of stress or emphasis
Word	Capital letters indicate raised pitch or volume
(())	Double parentheses enclose comment by the transcriber

Note. The transcription system used here was developed by Gail Jefferson (Sacks, Schegloff, & Jefferson 1974).

The video-recordings are reviewed from the perspectives of all three video cameras to better recognize the spatiality of gesture, directions of gaze and the volume of different voices to differentiate talk available to all in the room (e.g. frontstage) or addressing only the practitioners (e.g. backstage). Microanalyses of gestures, body movements, and prosody (Goodwin, 2000) of the events are conducted on each event. The data at various stage of interpretation is also presented data sessions held in 1) the: Co-operative Action Lab (CoAL), a weekly data lab comprised of linguistic anthropologists, ethnomethodologists, conversation analysts and science studies researchers and 2) the C_LaB – The Care Learning and Becoming Lab, weekly

qualitative data analysis interest group comprised of education researchers, linguist anthropologists and medical practitioners. These meetings provide an additional research space to discuss methodological issues such as those presented by data transcriptions (Ochs, 1979) and organization of segments.

Theoretical and Methodological Approach

Relational ontology and phenomenology of practice is used to make sense of the AdHF practice. As defined elsewhere (Raia, 2018; in press), a phenomenological approach focuses on what practitioners attend to, what becomes relevant to them to call for an action and what catches their attention. As we show, inherent in the process of noticing in practice is the act of repairing or amending an action– noticing something that is relevant in the local context of the contingently relevant events and act to correct it.

The ontological approach extends the multimodal analysis of meaning-making from an epistemological to an ontological issue, studying the way practitioners engage in the world, based on the understanding of the kind of person/practitioner they are and are becoming (Raia, in press, 2018; Schatzki, 1996). This ontological stance opens different ways in which practitioners inhabit their pedagogical commitments (Erickson 2011). It also opens the possibility to understand the kind of practitioner we are, through the lens Relational Ontology (Raia, in press; 2018), focusing on how we care-for-the-Other, making relevant the relational aspect of teaching and patient care and of the responsibility of creating a safe space for another person (e.g., in training for becoming a AdHF cardiologist; living with a transplanted heart) to develop a meaningful sense of life in becoming this person.

We use Goffman's (1959) back/frontstage model to make sense of the diverse communication patterns in multi-activity practice of patient care and teaching and learning.

Goffman (1959) distinguishes the “frontstage” from a “backstage” behavior in relation to the audiences and argues that while most conducts performed in interaction with others is necessarily “onstage” or “frontstage”, a conduct occurs “backstage,” when an actor might be alone or hidden from the audience’s view or hearing. Hindmarsh and Pilnick’s (2002), in their study of inter-professional collaboration in surgery when anesthesia is administered to patients, extend the back/frontstage model to show that a backstage, rather than being demarcated by a separated physical region, can be created as extempore backstage, for example by performing actions outside the patient’s limited peripheral vision (ibid, p. 159). In their specific work setting, the patient’s participation shifts from being co-present and overhearing conversations before anesthesia to being absent after anesthesia is administered. The teamwork during surgery, in turn, is described by the authors as progressively becoming more backstage as the patient drifts off¹ and the transition between frontstage and backstage can be tracked alongside the patient’s changing state of consciousness as the general anesthesia is administered.

We extend the front/backstage model to study the communication patterns in the multi-activity practice of the heart biopsy in the AdHF setting. Here, the patient remains awake throughout the procedure and, therefore, is always at least potentially co-presently aware of and monitoring the clinicians’ talk. The co-participant healthcare professionals create extempore back regions in the interaction of the medical practice towards one another and each towards the co-present Patient as both a ratified and unratified² member in the various interactions. As we show

¹ This is consistent with Goffman’s definition if we consider only the patient as the audience and no other healthcare professionals co-present participants, whom the actor interacts or works with as an audience after the patient drifts off.

² Goffman reinterpreted the speaker – hearer model of communication by nuancing dyadic contrast and the roles. For example, the hearer role is divided into ratified hearers (addressed and unaddressed recipients) and unratified hearers (bystanders, and over-hearers).

in this article, the transitions between frontstage and back regions become important loci for studying what and how practitioners notice when having to attend to and care-for-the-Other (patient) and having to attend to the interactions of the persons they care for and other professionals such as AdHF professionals in training. The event as a unit is defined by the beginning and end of a back/front stage communication.

We identified the Patient as the audience in the back/front stage communication model and we identify noticing as a relational ability (Raia 2018; in press), encompassing the need to both attend to and care for the Other and to attend to the interactions between the person cared for and other professionals in training.

Organization of Data

As we discussed above, we intend to enrich the studying of practitioners noticing with an additional method that takes into account noticing in multi-activity practice and allows studying noticing in “frontstage.” Based on our intent, we chose the data and organizing it as it is shown in Table 2, we take the reader through an increasing complexity of participants’ communication actions in front and backstage spaces.

The cases are divided into two groups. In the first group, Biopsies A, B, and C, excerpts are clearest with regards to demarcating the distinction between front and backstage developing within one type of activity: patient care. Biopsy A demonstrates a classic example of Goffman’s frontstage where communication is clearly designed and intended for a co-present audience. This excerpt also helps us to clarify the distinction we made before between noticing and situation awareness. In the first part of Biopsy B we have a classic example of Goffman’s backstage wherein the clinicians completely remove themselves from the room so as to exclude the Patient from their talk. In the second excerpt from Biopsy B we show what Hindmarsh and Pilnick

(2002) referred to as an extempore backstage, wherein the clinicians create a backstage by designing their gestures and other actions outside the patient's visual field—again in an attempt to hide parts of their interaction from the Patient. We see another extempore backstage created in a similar manner in Biopsy C. The second set of biopsies (D, E and F) are more complex in the deployment and organization of front and backstage communication and show how this complexity emerges in multi-activity practice, in which both teaching and learning and patient care activities overlap and unfold in time. Biopsy F, in turn, shows how noticing becomes part of an advanced trainee's habitus (Bourdieu, 1977).

Table 2

Summary of data presented

Biopsy	Figure	Activity		Region		Type of back/front region
		<i>Patient care</i>	<i>Teaching & Learning</i>	<i>Back</i>	<i>Front</i>	
A	2	✓			✓	Classic frontstage
B	Fieldnotes	✓		✓		Classic backstage
	3	✓		✓		Extempore backstage
C	4, 5	✓		✓		Extempore backstage
D	6	✓	✓	✓	✓	Simultaneous b/f
E	7	✓	✓	✓	✓	Simultaneous b/f
F	8	✓	✓	✓	✓	Simultaneous b/f

Note. Classic back and/or frontstage refers to Goffman's model (1929), Extempore backstage is based on the work of Hindmarsh and Pilnick, (2002) and Simultaneous back/front regions (b/f) refer to the new type of back and front regions identified in this study.

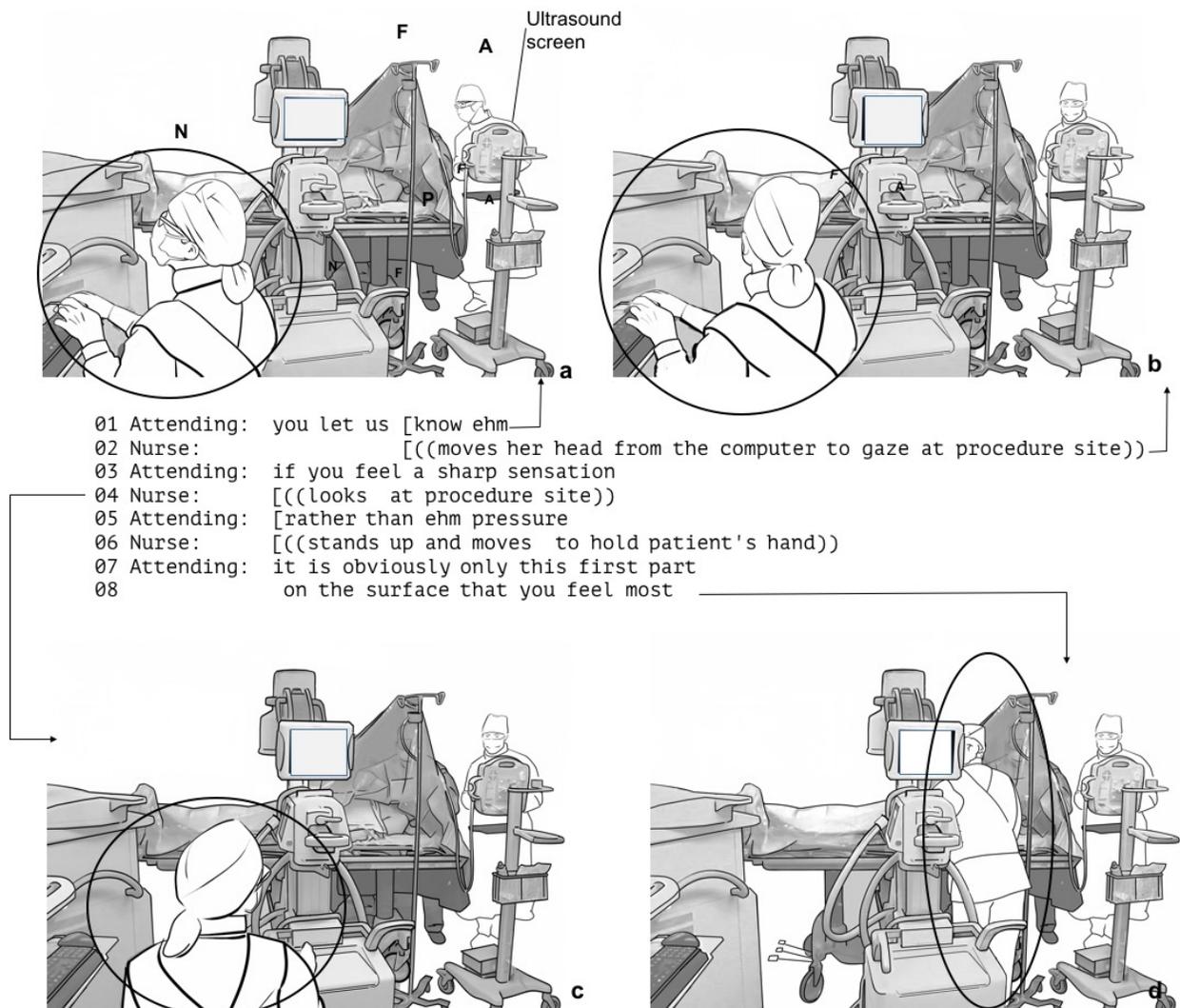
Classic and Extempore Back and Frontstages

The front and backstage constructed in biopsies A, B and C are the closest in structure to that previously described (Goffman, 1959; Hindmarsh & Pilnick, 200) and thus provide useful examples for examine how noticing is accomplished during one type of activity of patient care.

Biopsy A

The Attending is supervising the Fellow, who is a few months into his training. Both Attending and Fellow are “scrubbed in”—hands and forearms thoroughly washed and disinfected and wearing sterile gowns. As such, they can only touch sterile tools and materials (e.g., needles, bioptome, probes), and they can only see the area of the Patient's neck exposed for biopsy. The rest of the Patient, including his face, is covered by the sterile tent, and not visually accessible without moving to the other side of the procedure table. If anything is needed outside the sterile area or a need to change orientation and distribution of equipment arises, the Nurse who is not in sterile attire will have to take care of it.

In the excerpt shown in Figure 2, the Attending informs the Patient that he could feel some pressure as the Fellow inserts the needle in the jugular vein. As described above, mistakes at this point could include accidentally puncturing the carotid artery with varying degrees of pain and/or discomfort for the patient. The Attending engages the Patient in reporting, rather than pressure, a sharp sensation (line 1-3), something that he should not feel as the area has been anesthetized.

Figure 2*Biopsy A*

Note. AdHF Attending (A), Fellow (F) and Nurse (N). The Patient, lying awake on the catheter table -head on the right and feet to the left, is partially covered by sterile cloth and tent. White circles highlight N's attention and position changes.

As soon as the Attending says “you let us know” (line 1) loud enough to be heard by the Patient under the sterile tent and therefore by all in the room, the Nurse turns from the computer (Figure 2a), where she inputs the dosage of anesthetic used so far, to face the locus of the

procedure (Figure 2b). As the Attending utters “sharp sensation” (line 3), the Nurse stands up and walks toward the patient to hold his hand (Figure 2d).

In addressing the Patient as frontstage communication, the Attending simultaneously 1) prepares the Patient to actively monitor for sharp pain and inform the doctors, 2) informs the team members about the current stage in the procedure protocol, and 2) highlights the relevance of this moment. To the Fellow, the Attending's frontstage communication also signals the importance of keeping the Patient informed and that informing the Patient in frontstage also cues in the entire team about various contingencies and expectations as it has oriented the Nurse in discerning the trajectory of actions and contributing to its organization through her participation.

In research on teamwork and communication, the attention displayed by the Nurse would be identified as “situation awareness” (Alonso et al., 2006; Salas & Frush, 2012; Salas et al., 2005). From the Attending utterances (line 1-3) the Nurse understands which exact aspect of the procedure the clinicians are attending to, the actual access to the jugular vein. The Nurse's situational awareness should resolve in what to do to respond to the healthcare team's needs. However, at this stage in the procedure, there is nothing that she needs to do rather than inputting information into the electronic record. So, what solicitation is the Nurse responding to by leaving her post and moving toward the Patient to hold his hand?

In analyzing the Nurse's response in the context of the Attending's utterance voiced in frontstage, the communication reveals a more nuanced conception of competency than simply having the ability to monitor the team's needs and conduct the procedure safely. Both the Attending and the Nurse know that this moment is difficult for any patient who, already nervous about the procedure, is acutely aware of the needle penetrating his/her jugular vein. Holding the Patient's hands at this stage of the biopsy respond to the relational need. It has been often

commented on by patients as an important moment in which, feeling as an object on which the doctor needs to act, they are rather offered comfort as persons. As Ms. Kizer recounts:

To me the nurse, just to start, takes my hands. Her hands are so warm and I've said it before, but it's like good medicine you know to feel a human being, someone supporting you, someone with you. Just, it's ... it's so powerful. (Raia & Deng, 2015, p. 124).

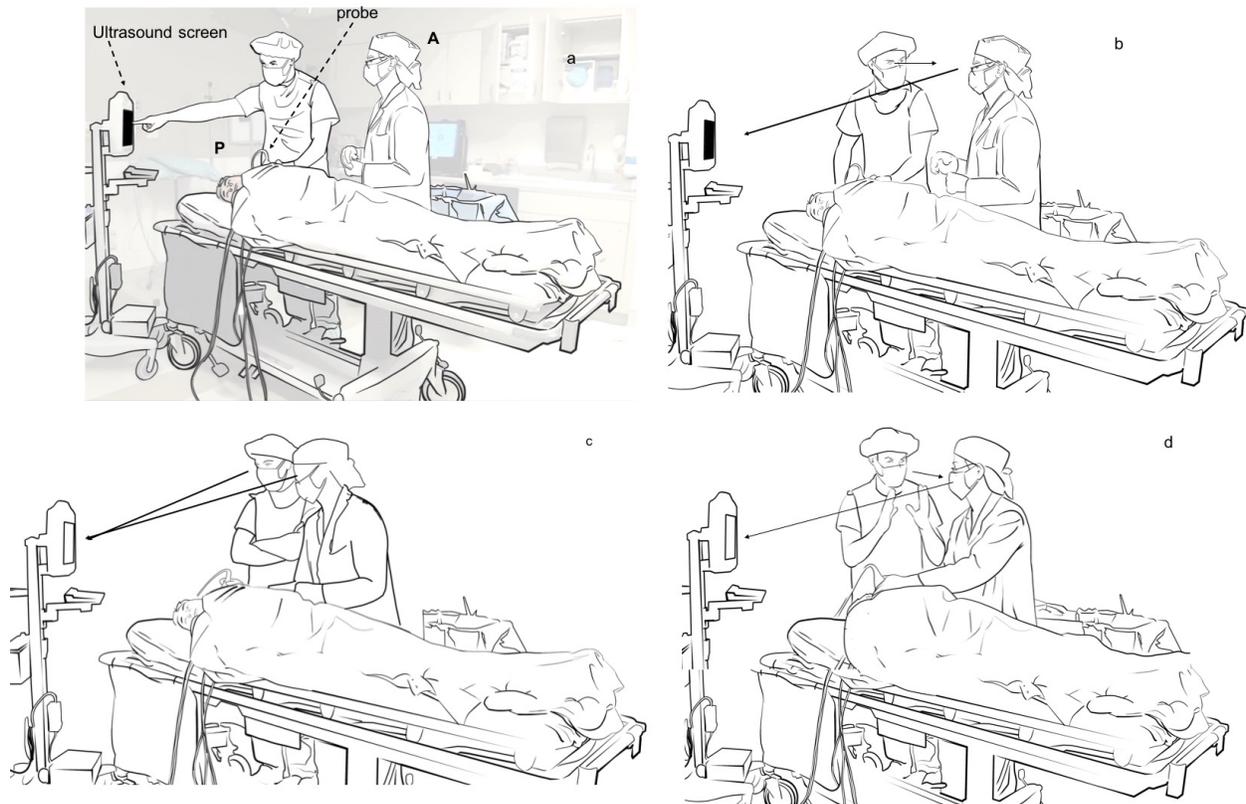
The attention to the relational demands shows that both Attending and Nurse have an understanding of the Patient as a person to care for. This is particularly relevant because Medicine, with its study of organs and diseases that afflict patients' bodies has been taught in the modern cultural paradigm, as a science and a practice of a subject, the doctor, acting on the object, the patient's body (Timmermans and Almeling 2009). However, our data from AdHF care practice reveal a far more nuanced and discerning practice of care in high-tech medicine. Here we can see the conceptual distinction between discipline knowledge based perception and noticing. During the biopsy procedure the healthcare professionals while responding to solicitations that allow for a safe procedure to acquire pieces of the heart to test for rejection (subject acting on an object, the heart, to study and control it), also, at the same time, respond to solicitations that engage the Patient as a person, not as an organ. This is consistent with previous work (Raia, in press; Raia & Deng, 2015) studying medical encounters in hospital Intensive Care Units patient rooms, where AdHF doctors and nurses actively work to socialize patients into an engaged acceptance and ownership of medical care. While the Fellows in this graduate program are practicing physicians and often already quite accomplished as general cardiologists, they can often be quite inexperienced in the relational work involved in not only performing invasive procedures on a conscious patient, but importantly in working with AdHF patients through the months and years of treatment that follow the heart transplantation. A Fellow who has been

trained in general cardiology has not yet encountered training in the high-tech medicine subspecialty of AdHF where a Patient's existence is ultimately being completely disrupted (Raia and Deng 2015, Raia in press; Haddow, 2005; Sharp 2006). As a result, Fellows at the beginning of the AdHF training, are not necessarily immediately solicited to *noticing* the Patient as a person during an invasive procedure. This concern for patients and their experience of the procedure can also be seen in how the clinicians construct their talk, gesture, and embodied actions to create backstage communication, as seen in Biopsy B and C.

Biopsy B

While waiting for the Attending, the Fellow, using the ultrasound probe, finds a serious problem in accessing the patient's vein caused by the presence of a clot. He waits outside the biopsy suite to meet the Attending and reports his concerns to avoid worrying the patient that the procedure may not be possible because of this access problem. This is the second attempt after transplantation and the doctors are worried that without access to the heart they will not be able to monitor rejection. This is particularly worrisome in the early weeks after transplantation when the chance of rejection is high. The gathering of Attending and Fellow outside the biopsy suite to talk about the issue in absence of the Patient is a backstage communication in its most classical sense (Goffman, 1959).

After having discussed it, the clinicians enter the room, and it will be the Attending trying to gain access. Figure 3 shows them after reentering the room. The Fellow uses the ultrasound probe (in his left hand) on the Patient's neck pointing to the monitor where the Attending can see the clot (Figure 3a).

Figure 3

Note. AdHF Attending (A), AdHF Fellow (F) and Patient (P) at the beginning of the procedure. Black arrows highlight A' and F' gazes. Note that the gesturing is out of the Patient's view and in backstage.

Attending and Fellow both orient to the relevance of what shows up on the ultrasound screen. The relevance of what shows up on the screen is reformulated by the Fellow who orients the probe in order to explore and show on the ultrasound screen the location and the extent of the obstacle in the vein, and by the Attending who does not move his gaze from it, and then moves his right hand to take the probe (Figure 3b). While the Attending operates the probe on the Patient's neck, both clinicians keep their gaze on the screen (Figure 3c). The sequence lasts for

approximately 5 minutes and 30 seconds and very few words are exchanged. The Attending's and Fellow's voices are barely audible even to each other. Most of the communication is done in backstage, by pointing to the monitor or gesturing, outside the Patient's view, to point to the clot on the screen (Figure 3a) or to mimic the space occupied by the clot in the vein (Figure 3d).

We can also separate the clinicians' disciplined perception – what they attend to as visible and relevant on the ultrasound screen and the clinician's noticing. What they attend to on the screen is relevant to their assessing of the difficulty in conducting the procedure. Their noticing is acting as being aware of the worries of the Patient. Sacks (1992) discusses the possibilities of perceiving “something that didn't happen.” From observing the scene, we have no way of knowing that the patient is worried. However, moving the communication to backstage is a relevant event done with the specific goal to exclude the Patient from understanding. It is in this sense that we can say that the clinicians are noticing. In spite of the Patient's conscious co-presence in the setting, the clinicians are able to interact with one another in a *sub rosa* manner outside of the Patient's purview. This is the type of interactive (dis)engagement has previously been described in the interaction in the operating room. Hindmarsh and Pilnick (2002) show how Goffman's distinction between the variable physical presence or absence of the audience, in an operating room can be instead defined by the patient undergoing a change in wakefulness: “When a patient is wheeled in fully conscious, the room is ‘frontstage.’ Then, as the minutes progress and the patient is anesthetized, the room becomes a ‘backstage’ environment in which the patient is prone and unconscious and where backstage talk and activity can be accomplished” (Hindmarsh & Pilnick, 2002, p. 145). In Figure 3, the backstage is created to avoid worrying the patient that the procedure may not be possible because of the vein's access problem. After 5:30 minutes of studying the patient's vein path to find a possible way to proceed, the Attending

agrees with the Fellow's assessment that it is impossible to proceed and discusses with him and the Patient the next step to take. Now, both the Attending and Fellow's voices are audible to everybody in the room; all is brought to front-stage during patient care activity.

Biopsy C

This situation requires some background: The Fellow is at the very beginning of her training year and unfamiliar with both the biopsy procedures and with the settings and the protocols of this particular catheter lab. The unfamiliarity with the space and its organization is evident in her movement: She has difficulty in finding tools, e.g., she looks around to find where the ultrasound is, and cannot use it while, at the same time, talking to the Patient or the Attending; and overall lacks the fluidity of movements characteristic of a person familiar with an environment (Dreyfus, 1991; Heidegger, 1962). As described by Koschmann and colleagues (Koschmann, Kuutti, & Hickman, 1998), the Fellow does not display the know-how as "acquired through successive experiences of trying, failing, and eventually acquiring the skills (and knowledge) we need to function competently in the world." (p. 40). The lack of familiarity is part of any learning process. But it is picked up by the Patient, who voices his concern that a Fellow at the beginning of the training will conduct the procedure and asks the Attending, who he knows very well as an expert in the field, how many biopsies he has conducted in his career. During a cogen session (stage 2 of the research model) the Attending interpreted this as "a delicate situation," reasoning that since the Patient was already very anxious to go through this new and invasive procedure, his questions are a manifestation of a rising anxiety that need to be taken into account. Ultimately, the Patient needed to be sedated, requiring higher doses of medication and a longer stay in the hospital. The kind of noticing done in cogen sessions is similar to and consistent with those identified by van Es's and Sherin (2002) in understanding teachers'

noticing as they review the video-recording of their practice. In our instance, the practitioner is attending to an issue and offering an explanation based on the professional's understanding of his own way of caring.

Just prior to the excerpts shown in Figure 4 and 5, the Attending had taught the Fellow a mapping technique for finding access to the vein by varying the angulation of the ultrasound probe on the surface of the patient's neck, allowing different images on the ultrasound screen to build a tri-dimensional understanding of the region. The next step is to apply surgical cloths over and around the Patient's head. The Attending repeats 'ok' twice, both marking an expectation for the beginning the next step (LeBaron & Jones, 2002; Scheflen, 1964) and showing he is ready to continue the actual procedure, but the Fellow does not move nor display any up-take. The Attending prompts the Fellow again with a quick deep and rise of his head and shoulders (Figure 4 a and b) as an invitation to dive into the work. The Fellow again does not move and shows no uptake. After 5 seconds, the Attending then resorts to directing the Fellow in what to do: he silently points to the table where the cloths are located (Figure 4 c).

Figure 4

Biopsy C



5 s. no action



Note. Fellow (left) and Attending at the beginning of the procedure. The Attending's head and shoulder movement are indicted by arrow (b).

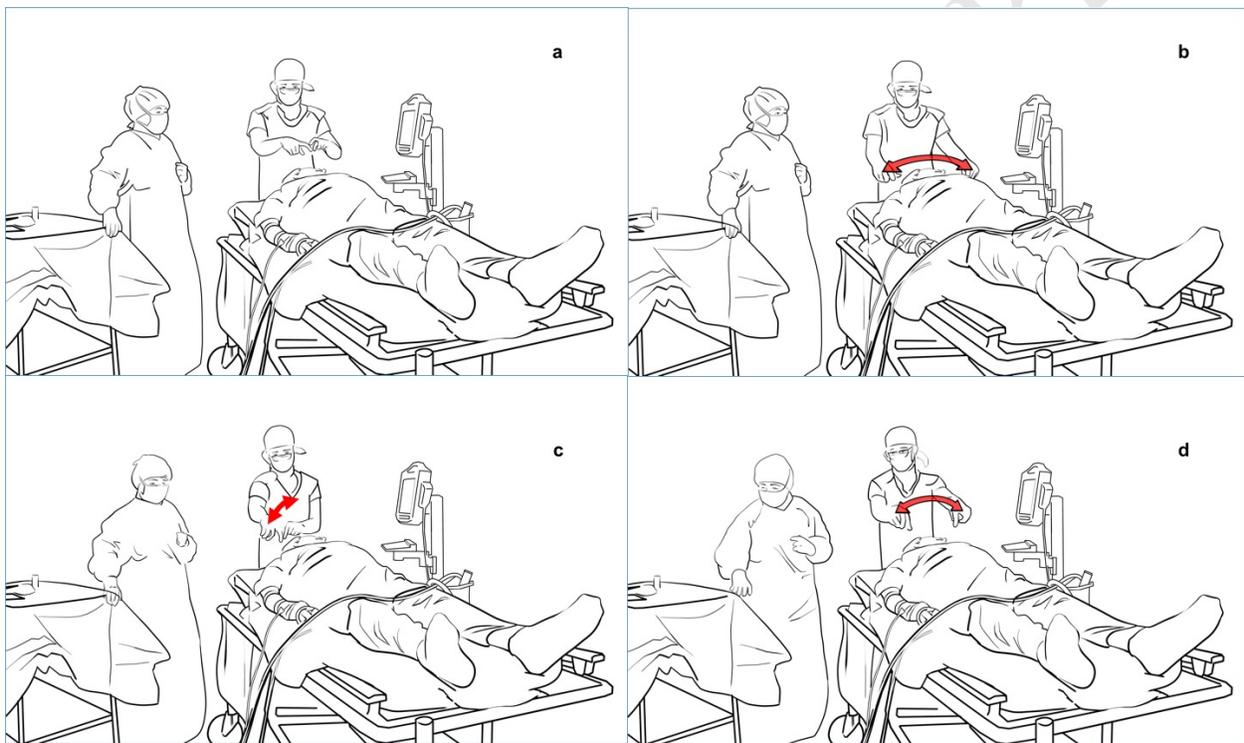
The invitation by the Attending to "dive in" is done in backstage and demarcates for the

Fellow a passage from one activity where she is a student learning a mapping technique to another activity in which she needs to engage as the doctor conducting a biopsy procedure to care for this Patient. Raia (2018) describes in detail how the Attending carefully guides the Fellow in through these spaces and operationally defines them at the interactional level as existential, based on the dialectic relations between the meaning and use of tools and the purpose of the activity and the participant's role/identity. These existential spaces beget what is relevant for the participants and what to respond to. Significantly, in order to make sense of excerpts from Biopsy C we need to consider that, in a teaching and learning existential space, the Patient's body is acted upon not for the sake of making sense of this specific Patient's anatomy and caring for him, but as generic platform to show how to map an anatomical area with an ultrasound probe. As Raia (2018) shows, the Fellow is a learner who learns something "more in general", i.e. the mapping of the area, not addressing the specificity of this Patient's anatomy. This is consistent with Hindmarsh's work (2010) during training in various dental procedures, where instructor and student discuss the dental work without taking into account the patient's immediate subjective stake in the process. There is no participation of the Patient as a person in the teaching and learning space (Raia, 2018). In the excerpt from Biopsy C, the Attending's prompts can be interpreted as passage in multi-activity practice from one activity of teaching and learning to the other activity of patient care. This passage requires a negotiation of the diverse identities in and through these existential spaces, from being a student to being a doctor (Raia, 2018). Here the passage is complicated by the presence of an awake Patient, his understandable anxiety, and dwindling trust in whether he is in (sufficiently) expert hands. This could explain the Fellow's delayed response and/or hesitation, but it also accounts for the Attending's attempt to put his teaching squarely in the backstage, so as to not further worry the Patient. In Figure 5,

we see that the Attending continues facilitating this passage by miming the actions of putting the sterile cloth on the patient's head to partly protect his face from possible spills (Figure 5 a, b, c, d). The Fellow's uptake is visible in Figure 5c, where she reorients to the left to pick up the sterile cloth from the sterile table (Figure 5d).

Figure 5

Biopsy C



Note. Fellow and Attending at the beginning of the procedure. The Attending's gestures to mimic how to put the cloth is also indicated by the arrows. Note the posture of the Fellow in a and b indicating no movement in response to Attending's requests.

Each series of gestures with no audible talk is overtly positioned outside the Patient's visual field. The Fellow similarly aligns with each directive with no audible response. This also means that while unfamiliar with the specificity of this room and its organization and still

unfamiliar with the professional style of each Attending, the Fellow knows enough of the general biopsy protocol to understand the meaning of the Attending's gestures. As some of us commented during cogen session, a novice in the field would not have recognized the Attending's gestures, explains why he might, instead be able to be delivering them silently with an AdHF Fellow.

One common outcome of the discontinuous, complementary orientations in Biopsy B and C excerpts is in barring the Patients from various domains of interaction by the clinical staff. Since the Patient is awake during the biopsy and is thus always potentially aware and able to monitor the clinicians' conduct, we observe the clinicians constructing their talk, gestural, and embodied actions outside the Patient's purview. In Biopsy C (Figure 4 and 5) the Attending and Fellow act and move their interaction backstage minimizing the number of events that clearly show the Fellow's unfamiliarity with the room and procedure to not further worry the Patient. With the Patient's comments as the local context of the contingently relevant events, the Attending's action to move of communication with Fellow into a backstage, in response to the Fellow learning to participate in the specific activities of the community, constitutes evidence of the Attending's noticing.

These overt attempts at restricting Patient's participation are generally confined to situations with similar demands. As we show in Biopsy A, the clinicians continuously attend to the Patient's co-presence during the biopsy. Not only would it be difficult to sustain extended backstage communication during the biopsy, as the Patient can monitor the clinicians' talk and conduct throughout the procedure, but as showed in Biopsy A the team actively avoids excluding the Patient in their own care practice. As discussed in cogen sessions, continuously hiding talk from the patient in back region is seen as promoting passivity on the Patient's part. One of the

more evident ways in which we see the clinicians orient to this concern, not only when engaged in patient care activity, is in the training of Fellows in the procedure of heart biopsy teaching and learning activity. This is because Attending and Nurse are not only part of the team conducting the procedure and caring for the Patient, but they are also concomitantly teaching the Fellow and therefore, intervene with corrections or repairs into what is specifically important for the procedure at hand and what they think is salient for their high-tech AdHF medical profession. In the following section, we show how the use of front and back region helps identify what professionals treat as “visible and invisible,” we specifically show their noticing when engaged in simultaneous activities of teaching and medical care.

Noticing During Multi-Activity: Simultaneous Back/Front Communication

We start this section with an example of a repair in front-region. A repair is understood in CA as providing a window into the speaker’s concerns for something that cannot be properly said in conversation, or needs to be modified or corrected (Schegloff, 1992). In the act of repair, therefore, the process of noticing is inherent – noticing something that is relevant in the local context of the contingently relevant events and acting to correct it. Noticing is done not as sequential or separable steps as proposed by van Es’s and Sherin’s model, but “with little conscious and effortful processing” (2002, p.75).

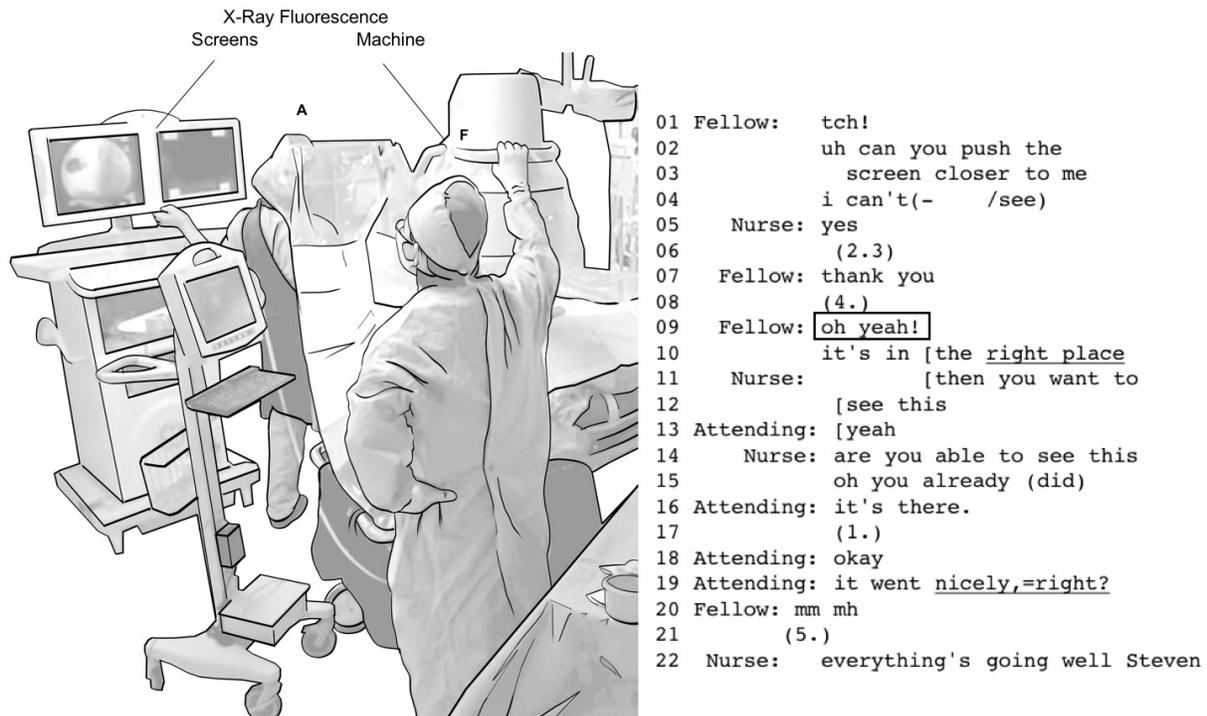
The following excerpts (D and E) from the same biopsy show how repairs can emerge simultaneously in front and backstage in a multi-activity space, and how Attending and Nurse understand the difference between front and backstage and how their noticing shows in their repair of the Fellow’s mistreatment of the two regions. The third example, Biopsy F, shows how a Fellow uses the team members’ repairs as resource to amend her action, an example of noticing in training.

Biopsy D

In this excerpt, we see the Attending and Nurse respond to the Fellow's talk and behavior as showing a lack of concern for the Patient. The Fellow checks if his positioning of the wire in the vein is correct when viewed by X ray- fluoroscopy (displaying a subject - object relation). The manner in which the Attending and later the Nurse pursue the Fellow's confirmation suggests that they treat this as problematic and thus in need of repair. In prefacing his confirmation of “the right place” (lines 09-10) with surprise (“oh”), the Fellow can be heard as treating the success of the wire insertion as being unexpected or at least worthy of surprise (Heritage, 1998). From the Patient’s perspective, under the tent, unable to see but able to hear, worried about his life, possibly threatened by heart rejection (Raia and Deng, 2015), the Fellow who is operating on his body, unexpectedly advances the wire into the right position, which may undermine the Patient's confidence that he is in capable hands. This may undermine the Patient's confidence in the Fellow's skill and in his care.

Figure 6

Biopsy D



Note. The Fellow is looking at the position of the wire as shown by the X-ray Fluoroscope double-monitors. The Attending is on the other side, holding the Patient's hand. He is also looking at the screens.

The Fellow's conduct is also problematic with respect to whose experiences it prioritizes. Saying it to the entire room brings his utterances (line 9-10) to frontstage. Here the Patient hears it and, not only is he unable to see the monitor to understand where the right place is, but lacks the disciplined perception to understand what is shown by the X-ray monitor. In this way, the Fellow is treating the Patient as an unrati ed hearer (Goffman, 1959)– e.g. as a bystander– and as a body in frontstage; the reconfirmation “right place” essentially formulates the patient's body as an object, i.e., referring to the Patient's veins and heart as “the right place.” Altogether, there is self-referential quality to how the Fellow formulates the significance of the event. This is how it is interpreted by the Attending and the Nurse, both performing a repair on the same sentence.

The repair is not done as a correction on something wrong, after all the wire is in the right place, but on a mistreatment of a front region where the concern is for the person. Both the Attending and the Nurse repair the Fellow's the sentence "oh yeah it's in the right place" and transform it into a procedure that is going well for the Patient and for the Fellow conducting the biopsy. The Attending keeps the tenor of his response even, a "yeah of course" with a intonation counteracting the surprise of the Fellow. He continues by asserting that 'it went nicely' with a smiley voice on line 19, prompting the Fellow to agree.

The operated repair transforms the Fellow's accomplishment into something expected and dramatically re-interprets the meaning for all participants. Specifically, for the Fellow, the repair re-interprets any difficulty the Fellow may have perceived and for the Patient it reformulates the significance of the action of the Fellow: this portion of the procedure was successful, allowing to proceed to the next stage. The Nurse further repairs line 9-10 by making an explicit statement directly talking to the Patient: "Everything is going well, Steven" on line 22.

As Erickson argued in his work on teachers' noticing (2011), expert teachers' noticing is profoundly influenced by their philosophical stance towards on their profession, which he calls "pedagogical commitments." In AdHF, expert practitioners' noticing is also influenced by their philosophical stance towards their profession. If the Nurse and the Attending had a Cartesian understanding characteristic of the biomedical paradigm (Scheper-Hughes and Lock 1987) that objectify persons and bodies alongside organs (Sharp 1995; 2006), they would not have been solicited by the Fellow's statement in the same way. In contrast, for them it is something to repair as their understanding of being a healthcare professional is one of care of the person, nurturing the person and helping the patient deal with the experience of the biopsy and heart

transplantation as a person.

Biopsy E

The hemodynamics and vital signs monitor for the heart shows an irregular heartbeat: the sound of the beating heart changes its rhythm and the electrocardiogram shows a change in the waveform. The Attending looks up (Figure 7, line 01), calling the attention to it. In this way, he ensures that the Fellow also recognizes it (line 03-04). Here we can identify a disciplined perception in discerning a different rhythm, a change in the electrocardiogram shown by the monitor and understanding them as an arrhythmia (line 3-4). By providing a discipline specific description as in line 3 and 4, the Attending develops and sustains this understanding. He also marks its importance by moving into a supervision position, wherein he moves from one side of catheter table where he can see the Patient's face, to the other side where there is no visual or tactile access to the Patient and positioning behind the Fellow conducting the procedure to monitor his action.

Figure 7

Biopsy E



01 A: ((lifts head))
 02 A: ((looks))
 03 A: looks uh::
 04 A: like a two two one there right
 ((walks toward F))
 05 (2.8)



06 F: ((nods))
 07 F: yeah
 08 A: you have a- you have a rhythmic device going in
 09 A: sometimes it (converts) that direction
 ((smiley voice))
 10 A: sometimes it promotes from the sinus to: atrial
 11 F: ((nods))

Note. AdHF Attending (A) Fellow (F) and Patient (P). The Attending notices the Patient's abnormal heart beat (line 01). His gaze remains on the monitor showing the electrocardiogram but he moves from the far side of the Patient's bed to a position closer to F.

The Fellow's response is delayed (2.8 seconds) compared to long silences reported to cluster around the one-second interval (0.9–1.2 s) (Jefferson, 1989). It comes with a nod and a “yeah” pronounced with a resigned voice. However, the Attending continues to communicate this sensitive information using elliptical language (M. H. Goodwin, 1996) that restricts an audience's accessibility to delicate matters in the talk in a manner that is comprehensible only to the Fellow (line 08-09). Hindmarsh and Pilnick (2002) would define this action as operated in backstage because there is no accessibility for the Patient. On the other hand, the Attending's voice is perfectly audible to all in the room and therefore to the Patient. The Attending's words (line 8-10) are uttered with a smiley voice. A person who in Stevens's and Hall's words has no “disciplined perception” not only could not make sense of the words, but would treat this exchange as nothing out of the ordinary, possibly as “invisible.” However, this is not the case for the Patient who feels his own heart rate changing. During a cogen session, the Attending reflects on the smiley voice (line 8-10) as follows: “The patient right now has a 140 of beats per minute (heart rate) and that's what we both hear. Derp, derp, derp, derp, derp. [...] And the patient hears it too, which theoretically can be biofeedback for the patient, and [...] he may have the sense ‘oh something is wrong with my heart,’ which makes this adrenergic drive or stress hormones go up, which makes the heart faster, which makes the sympathetic nervous system go more active, and is a spiraling effect. So uhm that's why it's important to just insert a mood of just ‘okay’.” The Attending's words (line 8-10) communicate delicate information on how to possibly resolve a situation in backstage and a mood given by a smiley voice (intonation) that all is going “okay” in frontstage. The Attending, by utilizing differential elements of the utterance (word and intonation), produces simultaneous back and frontstages to communicate different messages to the respective audiences. This is a more complex and subtle understanding of back and frontstage

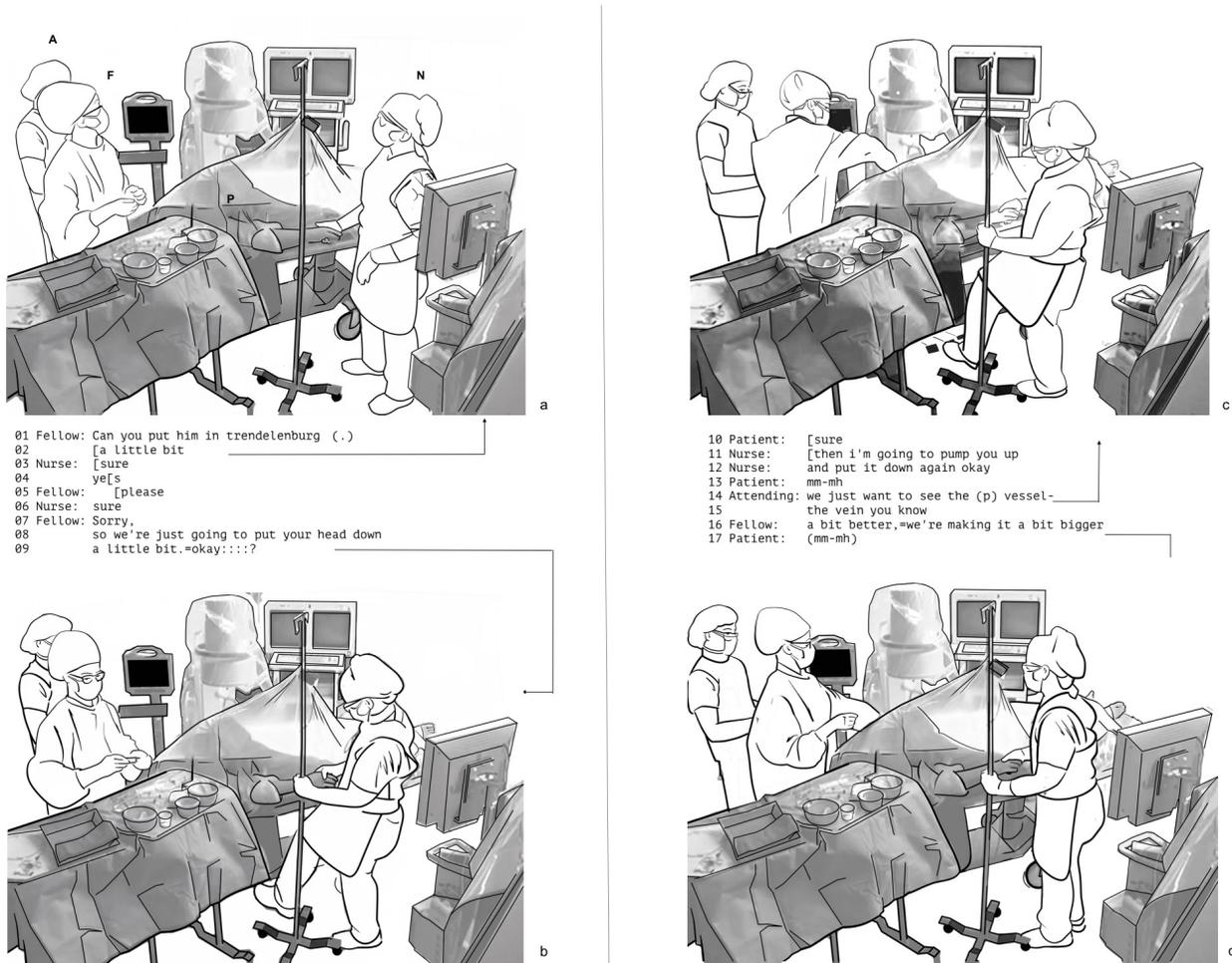
that changes from being defined by different geometrical and temporal spaces where there is actual presence or absence of the audience (Goffman 1958) or defined by the patient undergoing a change in wakefulness (Hindmarsh and Pilnick, 2002) to simultaneous regions defined by the talk, intonation and words, directed to front and backstage respectively. Here, actions need to intersect for the successful continuation of the simultaneous activities of teaching and medical care. As the Attending states in cogen "...and is a spiraling effect. So uhm that's why it's important to just insert a mood of just 'okay.'" In addition, the intonation of voice can also be understood as a concomitant repair in frontstage of the Fellow's silence, not acknowledging the complexity of the situation with the Patient who is well aware of the problem.

In our final excerpt from Biopsy F, we show a Fellow noticing the importance of the team members' repairs in front region and her use of it as resource to amend her action.

Biopsy F

In the segment, Figure 8, the Attending is working with a Fellow who is at the end of her training year in AdHF. The Attending has his hands disinfected but is not in sterile attire. As such, he can neither touch any tool on the sterile table (needles, bioptome, probe) nor the Patient's exposed neck. The use of the sterile coat by the Attending is dependent on the Attending's understanding of the Fellow's level of skillful practice and defined by the teaching style and level of mastery and comfort in supervision (Raia, 2018).

The procedure presents some difficulties because the patient's veins are small and collapsible and therefore very difficult to identify on the ultrasound screen and to access with the needle. The Fellow asks the Nurse to tilt the bed, bringing it in the Trendelenburg position (line 1-3) with the head of the patient lower than his feet. This position uses gravity to fill the veins with blood, extending them to their maximum diameter, which makes them more visible.

Figure 8*Biopsy F*

Note. AdHF Attending (A), Fellow (F), Nurse (N) and the Patient (P). The Patient lies awake on the catheter table under the sterile tent – head on the left and feet to the right of the figures. Note that only F is wearing the sterile coat and N on the other side of the bed is attending to the release of the bed while continuing to hold P's hand.

The Nurse releases the catheter bed from a halt position to be able to maneuver the tilt. The noise produced to release the bed is audible to all in the room and the Patient feels the bed jolt. The Fellow apologizes for the upcoming discomfort (line 07). She informs the Patient about

the upcoming tilt that will move his head down with respect to the feet. Her apology could be interpreted as a self-repair, not having informed the Patient of the actions prior. To operate the tilt, however, the Nurse needs to first pump the bed up and then tilt it, of which she informs the patient (line 11-12). This clarification is important for the Nurse because the Patient cannot see much and will feel a different movement than the one announced by the Fellow, i.e., the Patient feels the bed lifting first and then the tilt. This segment is streaming in front region and the Patient responds with acknowledgements (line 10, 13). At line 14-15 the Attending, continuing in frontstage, adds the reason why they need to tilt the bed. What the Nurse and the Attending do respectively is to inform the Patient of what exactly he will feel during the maneuver (N) and the reason for tilting him (A). At the same time, they repair the Fellow's action. The repair is not on correcting what has been said as wrong, but expanding it; it is on the specificity of what will happen to the Patient and the reason why it will. This shows that both Nurse and Attending find it relevant to amend the initial statement of the Fellow, attending to its organization with their own contribution. On line 16, the Fellow uses the repairs as a resource to correct her action by an act of appropriation (Newman, Griffin, & Cole, 1989; Rogoff, 1990; Roth & Bowen, 1995). She makes her own what has been communicated in the repair exchanges with the team members. On lines 16-17, she provides her own explanation to the patient. Similar acts of appropriation are common in front regions showing that the Fellows understand them as relevant in their learning and medical practice.

Discussion & Conclusions

In this paper, we extend the concept of teachers' noticing to that of *noticing in practice*, studying it within participants' embodied, situated interactions (e.g., Streek & Mehus, 2005; Goodwin, 2017). We build on different lines of thought, Goffman's model (1959) of

back/frontstage to identify various forms of communication in multi-activity (Raia, 2018) and Raia's Relational Ontology (in press) to understand the complexity of the relational ability of noticing in practice: attending to and caring for the Other. As we discuss below, this allows us to point to significant and so far unexplored aspects of noticing, complexifying and nuance it: a) teachers' noticing can be extended to study other practices (*practitioner's noticing*) such as those of teaching and learning and patient care we studied in a teaching hospital; b) It should be considered a relational ability because both teachers and medical professionals have to attend to and care for the Other, e.g., students and/or patients (*care for the Other*); and c) both have to attend to the interactions of the persons they care for with other professionals, for example in training novices of the practice (*attending to the carer in training*)

Noticing in Practice

In taking an interpretivist perspective to study the moment-to-moment interaction of the practice, rather than a cognitive perspective, common in teachers' noticing literature, we show that noticing can be studied not only as detached thinking and deliberating reflections and reasoning of the observer's interpretation of a scene, what is traditionally studied as teachers' noticing, but also as non-reflective noticing in practice.

Through a phenomenological interpretation of interactions that focuses on what practitioners attend to, what becomes relevant to them to call for an action, and their comportment in making sense of situations and others in practice, we recognize that in the process of noticing in practice the act of repairing or amending an action is inherent – noticing something that is relevant in the local context of the contingently relevant events and acting on it. We borrowed the concept of repair (Schegloff, 1992) to make visible the professionals' move to

repair or amend as windows into what they notice in the moment-to-moment interactions with the Other.

Working specifically in the context of the heart biopsy, we show how to approach and investigate what Sherin and Star (2011) invited us to study: expert educators in practice “recognize and react to some aspects of the [scene] with little conscious and effortful processing” (p. 75). For example, in biopsy C and D we show how it is possible to make sense of how the AdHF experts, Attending and Nurse, *recognize* and *react* by studying their repairs of the Fellow’s actions and how, these repairs are understood and learned with practice, as shown in Biopsy F, by a Fellow at the end of the AdHF training.

Our analysis is complicated by a practice that engages participants in simultaneously partaking in multiple and often synchronous activities (multi-activity) of teaching and learning and patient care. We show that simultaneous back and frontstage modes of social interaction can emerge so that the multiple activities can intersect without needing to suspend one another for their successful continuation. The capacities to create and operate in these different modes are important skills. They are part of the tacit knowledge of a practice identified through the study of the interactional level of the local practice. For example, the Attending repairs the Fellow’s conduct when the separation of these spaces are not respected. We also find that, as shown in biopsy D, E and F, experts can use differential elements of the utterance intonation and words to produce simultaneous back and frontstages to communicate different messages to different respective audiences (Fellow and Patient). This is a more complex and subtle understanding of back and frontstages than the ones defined by different geometrical and temporal spaces where there is actual presence or absence of the audience (Goffman 1958) or defined by extemporaneous backstage (Hindmarsh and Pilnick, 2002).

Our work, through the lenses of relational ontology (Raia, 2018) complexifies the understanding of noticing as a relational practice of care. This allows us to extend the concept of noticing to highlight the dynamic and relational sense in which participants engage in noticing a person (e.g., becoming a patient, becoming an AdHF practitioner).

In a multi-activity, participants create dynamic back/frontstages necessary to conduct patient care and teaching and learning successfully. Specifically, we show that AdHF healthcare professionals:

1. Create extempore backstages using the restricted visual field imposed on the Patient by the supine position and/or by the sterile tent covering the patient to muffle their voices with the specific function of a) protecting the Patient from becoming more anxious, b) protecting the Patient from feeling treated as an organ and not as a person, and c) creating a learning environment that sets these as expectations for the learner.
2. Use talk directed to the Patient in frontstage to not only discern the trajectory of actions and attend to their organization through their own contribution (e.g. situation awareness), but also to create a learning environment where both, mutual monitoring and the treatment of the Patient as a person, are made relevant to the trainee (noticing).
3. Treat the back and front regions as necessary for the safe and humane conduction of the procedure and as a necessary skill to be developed in the training of the Fellows.

Our work, by showing how practitioners' noticing can be studied in practice, points to important and so far unexplored aspects of noticing. We discuss them below in separate segments: a) *practitioner's noticing*; b) *care for the Other* and c) *attending to the carer in training*, however, these are all part of one, yet more nuanced and complex understanding of noticing in practice.

Practitioners' noticing. Similar to schoolteachers, healthcare practitioners have to develop the necessary discipline knowledge (technical and content) that, at the interactional level, constitute a set of community and discipline specific forms of embodied action (Goodwin, 1994; Stevens & Hall, 1998). However, healthcare practitioners as well as schoolteachers need to develop the ability to notice because they need to attend to others, they need to notice how learning of the discipline knowledge is developing by learners. In medical education, "situation awareness" and similar cognitive operations of "situation monitoring" and "team monitoring" (Marks & Panzer, 2004) are considered essential for the safe operation of any team work, specifically in the critical medical settings of the Emergency Room (ER) or the Operating Room (OR). They are included in the ACGME as important skills to develop (Alonso et al., 2006; Salas & Frush, 2012; Salas et al., 2005) and comparable to noticing (Miller, 2011). In a multi-activity space (Raia, 2018), such as the one we find in our study, however, these cognitive operations do not allow for the nuanced and complex capacity to navigate the teaching and learning and patient care activities that are running simultaneously and intersecting each other. For example, in Biopsy D the Attending noticing is evident in the intervention to re-interpret the meaning of the actions for all participants: for the Fellow, any difficulty that was perceived by him and for the Patient, the significance of the action of the Fellow. Studying noticing in teamwork practice can give important clues on what is perceived as important to act upon by team members as the feedback provided on the performance and process in practice (Gabelica, Bossche, Segers, & Gijsselaers, 2012). This is specifically relevant in medical education because the study of feedback to improve team practice and support learning is conventionally understood as a transfer of information either to the team or to a single individual team member in order to

reflect on the actions taken, by an external observer. In contrast, our study shows that the feedback is given also *in practice* by team members who notice and act accordingly with repairs.

As showed in the excerpts from Biopsy D, the Attending marks the importance of the situation and monitors the Fellow actions close enough to intervene by moving into a supervision position, behind the Fellow conducting the procedure. In medical education studies of teamwork, a move to support a team member perceived in need of help is called backup (Dickinson & McIntyre, 1997). We show, that both team feedback and backup in the actual practice are forms of noticing in practice made visible by studying the interactional level.

Noticing as care for the Other. Practitioners not only notice the development of discipline specific knowledge, but notice also how caring for the Other is attended to and developing. In encountering the Other in asymmetrical power and knowledge distribution situations as it is in the case in teacher/student encounters, professionals have the responsibility to care for their students to safely develop an identity congruent and integrated with others, e.g., being a cardiologist but also a learner developing the new practice-linked identity in AdHF (Raia, 2018). Numerous scholars studying classroom activities relate the development of a *sense of being* to the process of transformation and appropriation of discipline discourse (e.g. Gutierrez, 1997, 2011; Levrini et al 2015; Kazemi et al) learning (e.g Arvaja, 2015; Langer-Osuna, 2015a) motivation, involvement and agency (Barton & Tan, 2010; Cobb, Gresalfi, & Hodge, 2009; Gee, 2000; Holland, Lachicotte, Skinner, & Cain, 1998; Rogoff, 2008; Sfard & Prusak, 2005). However, as Susan Jurow (2015) shows, issues of shifting engagement can emerge when classroom students work on contextualized problems. If on the one hand, the engagement in problem based learning and contextualized problems provide important connections between what is learned in the classroom and the world of practice outside it, it also

points to issues relating to how the engagement shifts from participating in different activities. In these cases, as Raia (2018) argues, the identification of existential spaces in which one is a student or a practitioner, in a multi-activity engagement, is necessary for educators to help students negotiating the diverse identities, and develop and sustain what Nasir and Hand (2008) and Van Horne and Bell (2017) call practice-linked identities (e.g., mathematics-linked identity; AdHF medical practitioner-linked identity). Our study of noticing in practice points to the benefits of considering multi-activity settings where practitioners attend to different activities to best support *learning as becoming*. In the heart biopsy setting, as exemplified by the excerpt from Biopsy C, such activities can be identified as patient care and teaching and learning: the Attending guides the Fellow from one activity of teaching and learning to the other activity of patient care requiring a negotiation of the diverse identities in and through existential spaces (Raia 2018) from being a graduate medical Fellow learner to being a AdHF doctor. In the classroom settings, what is learned in the classroom positions the learner as a student. In participating in learning the world of practice, the learner is positioned as a practitioner, albeit young. As we showed, this requires more than attending to and noticing how learning of the discipline knowledge is developing.

As one of the reviewers of this article reflects, our work highlights the important issue that: “much of the noticing literature speaks about noticing students’ mathematical thinking (which could be assimilated with thinking of the patient as an organ) and possibly not enough about the actual student who is the ‘vessel’ of that thinking. For those of us who are fascinated by the mathematical errors students make (and the rationality behind those errors), your point is apparent in the conflict teachers experience between making those errors a matter of classroom discussion and caring for the emotional wellbeing and social standing of the student who made

the error.” Thus, we posit that the concept of noticing benefits from including a relational ontological dimensions of attending to and caring for the Other (Raia, 2018) and utilizing this ontological dimension towards understanding what it means to be a competent practitioner and what counts as relevant practice of noticing in their moment-to-moment training and teaching interactions.

Noticing as attending to the carer in training. Similar to schoolteachers, medical professionals, albeit in the specificity of their practice context in teaching hospitals, have to attend to the interactions of the persons they care for with other professionals in training (novices of the practice).

During the biopsy procedure, healthcare professionals while responding to solicitations that allow for a safe procedure to acquire pieces of the heart to test for rejection, respond at the same time, to solicitations that engage the Patient as a person, not as an organ, and repair any action that does not support this understanding, as shown in Biopsy D where both the Attending and Nurse repair the Fellow’s action in frontstage. As shown in excerpt from Biopsy D the Fellow in training can be quite accomplished in their general cardiology medical and scholarly work, but can often be quite inexperienced in the relational work involved in not only performing invasive procedures on a conscious patient, but importantly in working with AdHF patients through the months and years of treatment that proceed and follow the heart transplantation. In fact, the practice and the training in high-tech medicine as exemplified in the subspecialty of AdHF where a Patient’s existence is ultimately being completely disrupted, requires a normative framework best understood in a logic of care (Raia & Deng, 2015; Raia, 2018).

In research-based approaches to teacher preparation programs there is a growing interest in changing the teacher-dominated classroom discourse to a discourse of teacher-students-

co-constructed discourse. This change can vary in structure and approach, from learning to build on students' unexpected insights in science classroom (Bang, Warren, Rosebery, & Medin, 2012) to designing professional development courses in which novice teachers co-design with students community-based field investigation (Philip, 2019) or year-long math labs where teachers and coaches learn together with students about students' mathematical thinking. This change requires valuing modes of improvisation (Juwon & Creighton, 2005; Philip, 2019) that are generative of new ways of engagement and approaches to knowledge, to support students in navigating between dominant expectations in science and math learning and their own effort in the transformative experience of seeing themselves doing math and science (Elmesky, 2005) or to dislodge the settled expectations of science curricula (Bang et al., 2012). Because becoming a practitioner is enacted in practice interactions and grounds the pedagogical and care commitments (Erickson 2011; Raia 2018) of what counts as noticing in practice, we hope that our work is generative in studying *noticing in practice*.

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