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"Can you see the cystic artery yet?" A simple matter of trust

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Abstract

As our contribution to this special issue, we examine how understandings of objects are talked and worked into being within concerted action. We will argue that formal procedure can serve as a resource in this regard. Procedures make relevant certain kinds of objects, objects that serve as its materials, tools, end-products, agents, etc. Our analysis traces all references to a particular object, the cystic artery, over the course of a surgery conducted at a teaching hospital. The arrangements of the operating theatre impose certain constraints on how the key participants, a surgeon in training, a faculty member and a medical student, were able to display and detect particular features of their material environment. Also, because of the surgery's status as a 'site of instruction,' a special set of accountabilities came into play during its performance. Talk was frequently seen to do both instructional and instrumental work. The team members were called upon to interpret the visual field in congruent ways and, more specifically, to strike agreements as to what would serve as salient objects for the purposes of the work at hand. The identification of the cystic artery was called into question and its thingness had to be renegotiated. We draw on Garfinkel's notion of 'trust' to describe the prospective/retrospective processes of referring to what comes to be the cystic-artery-for-the-purposes-of-*this*-surgery. We argue that procedure both determines and is determined by its objects.

Keywords: Objects; Procedure work; Ethnomethodology

> There is no information about the thingness of the thing without knowledge of the kind of truth in which the thing stands. But there is no information about the truth of this thing without knowledge of the thingness of the thing whose truth is in question. (Heidegger, 1967:27)

1. Bringing procedures and objects into relation

A crucial aspect of understanding understanding in action is understanding how we produce the world around us as itself understandable. Considerable attention has been paid in previous writing to the practices of visual perception and recognition (e.g., Coulter and Parsons, 1990; Goodwin, 1994; Law and Lynch, 1988). One aspect of this has pertained to how parties engaged in some form of concerted action coordinate attention to particular features of their material environment (e.g., Goodwin, 1994, 1997; Goodwin and Goodwin, 1997; Hindmarsh and Heath, 2000a; Hutchins and

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Palen, 1997; LeBaron and Jones, 2002; Mondada, 2003; Nishizaka, this issue) and produce objects as understood in particular ways (Garfinkel, 2008; Garfinkel et al., 1981; Hindmarsh and Heath, 2000b; Lindwall and Lymer, 2008). Other work has focused on the relation between plans, procedures and instructions, and action (e.g., Amerine and Bilmes, 1988; Lynch, 2002; Suchman, 1987, 2007). Here we look at a slightly different issue—the relation of formal procedures to the objects that they engender.

In an early and influential essay, Zimmerman and Pollner (1970) proposed that the practices whereby objects are produced as understood be a special focus of study. They argued that, from a participant's perspective, the "setting presents itself as the objective, recalcitrant theatre of [his/her] actions" (p. 95), but from an analyst's perspective, "the presented texture of the scene, *including* its appearance as an objective, recalcitrant, order of affairs, is conceived as the accomplishment of members' methods for displaying and detecting the setting's features" (1970:95, italics in the original). They referred to the setting's features in aggregate as the "occasioned corpus." Zimmerman and Pollner's essay represented a programmatic proposal for the study of "the family of practices employed by members to assemble, recognize, and realize the corpus-as-a-product" (1970:95).

Our interest here is in how particular objects emerge as such within the occasioned corpus, how they achieve their 'thingness'. From the perspective of the analyst, Zimmerman and Pollner argued, "The availability of a particular element is conceived to be the consequence of a course of work through which it is displayed and detected, regardless of the recalcitrance and obviousness the element may appear to possess when viewed under the jurisdiction of the attitude of the everyday life" (p. 96). Given this recalcitrance and obviousness, one might wonder how it would be possible to uncover the methods used to display and detect any particular object. Garfinkel et al. (1981:140) wrote that such practices "are occasioned; they are 'hidden' in and as their apt and familiar efficacy; they are only available to practitioners; and only to their vulgar competence, they are done unwittingly." In circumstances of concerted action, however, where there is a need to understand relevant objects in congruent ways, witnessable effort may be required to bring this about. Also, when newcomers are being inducted into a novel form of practice, relevant objects must be rendered visible in practice-specific ways (Goodwin, 1994, 1997, 2003). The practices of realizing some object as what it is, therefore, may be study-able in such situations.[1]

Procedures make relevant certain kinds of objects, objects that serve as its materials, tools, end-products, agents, etc. They offer ready-made plans for carrying out a course of action. Like all "prescriptive representations" (Suchman, 2007:187), procedures must be construed and made concrete within the particulars of the current situation. We will argue that procedures determine their objects, but that they are also determined by these very objects. Sharrock and Button (2003:263) described two ways in which the term *determine* might be used:

> One is the causal sense, in which a cause determines—makes happen—its effect. The other is the sense in which something is fixed or located, as when our position on the high seas is determined (i.e., ascertained) by consulting a chart.

Following the second usage, Suchman (1987, 2007) described how plans 'determine' situated action. As she explained, her interest was in the practices whereby these two entities were "brought into relation" (2007:20). Our interests here are in the practices whereby procedures are brought into relation with the objects they entail. We will look specifically at the methods through which objects are pointed out and referred to within the course of carrying out a procedure. We will also examine the role that objects, so recognized, play in producing procedures as procedures.

2. How something came to be the cystic-artery-for-the-purposes-of-*this*-surgery

2.1. Preliminaries

For an instance of a procedure enacted we turn to a surgery performed at a teaching hospital.[2] Surgeries have long held a fascination for social scientists (e.g., Hirschauer, 1991; Mondada, 2003; Prentice, 2007; Sanchez Svensson et al., 2007).

[1] Terms like realize, actualize, constitute, construe, formulate, instantiate, reify, etc. are used more or less interchangeably throughout to describe the processes whereby some matter is produced as understandable (and understood) as a particular sort of thing. None of them really serves perfectly. Our interest, specifically, is in the embodied practices whereby this is achieved.

[2] Our recordings of this surgery came from the Southern Illinois University Surgical Education Video Corpus. This is a collection of videotaped surgeries gathered over a decade at two teaching hospitals affiliated with a surgical residency program. Further information can be found at this URL: http://www.siumed.edu/call/index.html.

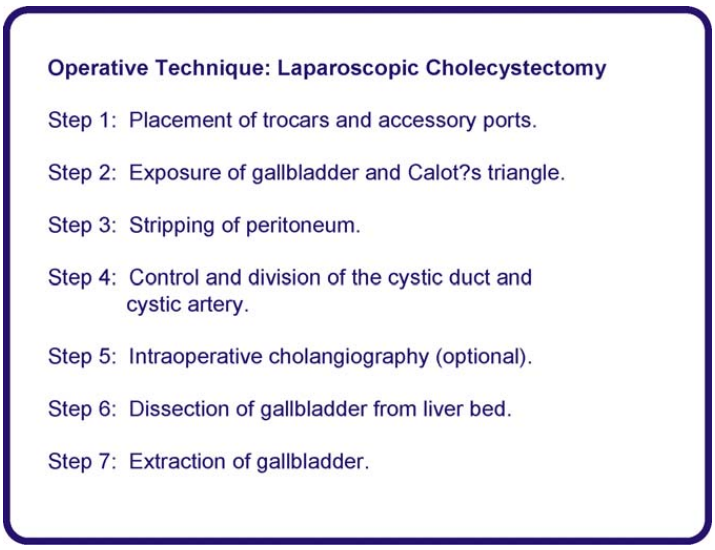

Fig. 1. Operative procedure for performing a laparoscopic cholecystectomy from Fried et al. (2006:656–663).

For a variety of reasons that will be recounted shortly (i.e., its status as a 'site of instruction', its brevity and relative simplicity, our ability to visualize the unfolding work) the surgery to be described offers a particularly "perspicuous setting"[3] for studying the practices of producing objects as understood.[4]

Surgeons refer to the work of performing a surgery as "doing a procedure." Their usage is consistent with our earlier discussion of procedures and their objects. As with any procedure, surgical procedures project a course of action within which understanding of objects are produced and made relevant. They define a prescribed set of steps designed with an eye toward exerting greater control over outcomes.[5] The surgery studied here was organized as a *cholecystectomy.* A cholecystectomy is an operative procedure for removing the gallbladder.

Cholecystectomies can be done open or laparoscopically. In an open cholecystectomy, an incision is made in the patient's abdomen of sufficient size to allow the relevant structures to be seen and manipulated. In a laparoscopic or "keyhole" surgery, small "ports" are made in the patient's flank, the belly is inflated with gas, a camera, known as a endoscope, is inserted into the space so created, and the surgeons' work is carried out within the body using specially-adapted instruments. As surgeries go, cholecystectomies (both open and laparoscopic) tend to be brief and relatively simple. A textbook description of the steps in a laparoscopic cholecystectomy is presented in Fig. 1. It is only a gloss, however, for what actually needs to be done in any particular case. Though cursory and necessarily incomplete (see Lynch, 2002), it represents a standard of practice of a sort, in that it specifies in a minimal way the sequence of steps needed to make a concerted activity recognizable as a laparoscopic cholecystectomy.[6] It also specifies an inventory of objects relevant at each stage of the procedure.

As illustrated in Fig. 2, the gallbladder is a small sack-like organ, nestled beneath the liver. It stores bile for later secretion into the digestive tract through a vessel known as the cystic duct. The gallbladder is supplied with blood via the cystic artery. Before the gallbladder can be safely removed, both the cystic duct and cystic artery must be located, ligated, and divided. Of the infinite array of things that could potentially be noticed, procedures make relevant a

[3] "A perspicuous setting makes available, in that it consists of, material disclosures of practices of local production and natural accountability in technical details *with which to find, examine, elucidate, learn of, show, and teach the organizational object as in an* in vivo *work site*." (Garfinkel, 2002:181, author's emphasis).

[4] The paper concerns how some thing comes to be seen in a certain way by surgeons. It should be noted that none of the authors have formal training in surgical science. Our ability to understand what these more surgically knowledgeable subjects were talking about in the surgery was developed through interviews with the participants and other surgical experts and by consulting relevant texts (e.g., Fried et al., 2006; Hawn, 2001; Scott-Conner et al., 2000; Scott-Conner, 2002).

[5] Procedures are a means of standardizing or regularizing a course of action (Feltovich et al., 2007). For example, see Gawande's (2007) description of how a surgical procedure in obstetrics, the C-section, is displacing the more skilled but less predictable practice of forceps delivery.

[6] In this way, the list of steps constitutes a standard of practice. It brings to mind Garfinkel's (2004) description of the "shop floor problem." Though we will not pursue the connection here, the standardization of surgical procedures is a shop floor problem *par excellence*.

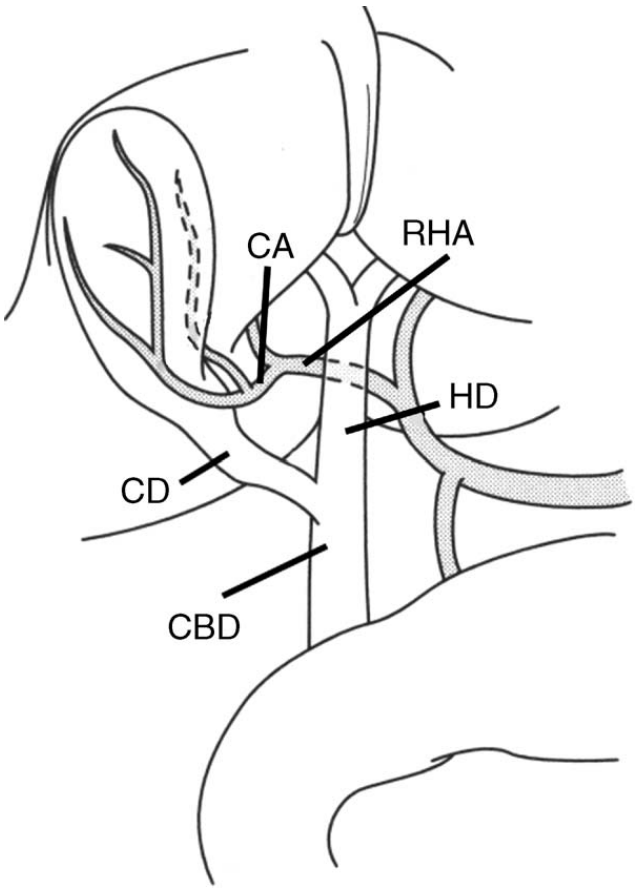

Fig. 2. Gross anatomy of the region of interest (adapted after Hawn, 2001) (CA: cystic artery; CD: cystic duct; CBD: common bile duct; HD: hepatic duct; RHA: right hepatic artery).

manageable set of objects to which attention must be paid. The structures summarized in Fig. 2 are idealized and must be mapped onto the considerably more obscure scene shown in the right panel of Fig. 4. Gallbladders are large and easily recognized; the cystic artery, however, can be small and may present itself in a variety of guises (Anson and McVay, 1971; Hawn, 2001; Scott-Conner, 2002; Scott-Conner et al., 2000). In the narrative describing Step 3 of the procedure in Fig. 1 we are instructed, ‘‘Dissection of Calot’s triangle should be completed before the cystic artery is clipped or divided (Fried et al., 2006:461). But at what point is the dissection ‘complete’? Surgeons must balance their need to accurately visualize structures while minimizing damage to adjacent structures through unnecessary dissection. At every turn, they must decide just how much dissection is enough. Relevant recognitions must be made on the basis of information that is often incomplete and possibly faulty. In the face of such uncertainties, surgeons must find ways of certifying their judgments, of convincing themselves of the correctness of their actions. Being able to identify structures like the cystic artery and cystic duct with a minimum amount of dissection, is a crucial part of what counts as expertise in the OR (Dominguez, 1997).

The surgery described here was only 35 min in duration. We focus on the interaction among three surgical team members, labeled for the purposes of this description, Attending (ATT), Resident (RES) and Clerk (CLK). Other members of a typical team include a scrub nurse, a circulating nurse and an anesthesiologist or anesthetist. Attending is a highly experienced surgeon, ultimately responsible for the safe and successful outcome of the surgery. Resident was, at the time of this recording, in the final year of his surgical residency training. He had participated in 80–90 surgeries of this type. By comparison, Attending estimated that he had performed 1200–1300 of these surgeries over the course of his career. Clerk was a third year medical student enrolled in a clerkship rotation. He had never previously participated in a laparoscopic surgery.

As the most senior member of the team, the attending surgeon was legally responsible for the safe outcome of the surgery. The easiest way to ensure a safe outcome, of course, would be for the most experienced member of the team to

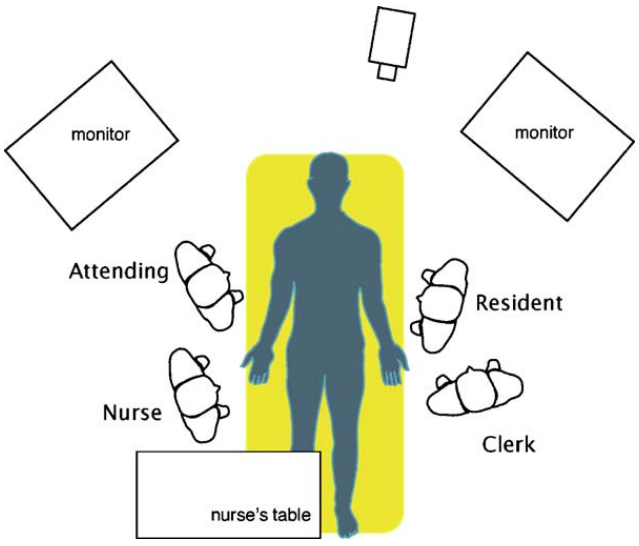

Fig. 3. Layout of the operating room.

perform all of the consequential parts of the procedure. Situated in a teaching hospital, however, the observed surgery exhibited the features of a 'scene of instruction.'[7] Attending was responsible not only for safely carrying out the procedure, but also for reproducing the skills of the profession. If he personally performed all of the consequential work with Resident and Clerk only observing, opportunities for them to develop skills as surgeons would be lost. In residency programs, therefore, residents and medical students are invited to participate in the ongoing work. Indeed, in the case we will examine here, the surgery was largely performed by the resident, with assistance from Attending and Clerk. It is an arrangement that made it necessary for all parties to work continuously to coordinate their understandings of what they were doing together.

The general layout of the operating room (OR) is shown in Fig. 3. As the operator, Resident was positioned to the left of the patient. Attending assisted and supervised from the opposite side of the table. Clerk, stood to Resident's left and operated the rod lens of the laparoscope, with close guidance from both Attending and the Resident. Their views into the interior working space were afforded by a pair of monitors positioned at the head of the table. The monitors were organized in such a way that each member of the team could observe the scene captured by the laparoscope without turning from the table. The room lights were darkened during the surgery to make the monitors easier to see. In a laparoscopic surgery, the view of the worksite is managed by the participants themselves (Mondada, 2003). They introduce the camera into the patient's body and direct it as needed to carry out their work. We captured this video stream and augmented it with a synchronized recording of the surgical team, shot from the head of the table. Taken together these two views provide an unusually detailed record for investigations into what the participants are doing and talking about at any particular moment (see Fig. 4).

Our analysis involves tracing all references to, and understandings of, the cystic artery over the course of the described surgery. Previous studies (e.g., Goodwin, 1997, 2003; Goodwin and Goodwin, 1997; Hindmarsh and Heath, 2000a; Hutchins and Palen, 1997; Nishizaka, this issue) have examined situated practices of reference and their role in producing local features as discussables. We build upon on these findings to investigate the relation of these noted objects to the unfolding procedures within which they emerge. To better illustrate the emergent properties of objects and procedures, our presentation is organized chronologically. We begin our analysis, however, with an exchange that occurred near the end of the surgery.

2.2. *Object realized: "((RES)) did a nice job"*

Late in the surgery, after the gallbladder had been removed, the following exchange took place[8]:

[7] We thank one of our anonymous reviewers for suggesting this description.
[8] This excerpt and those that follow were prepared using the transcription conventions developed by Jefferson (2004).

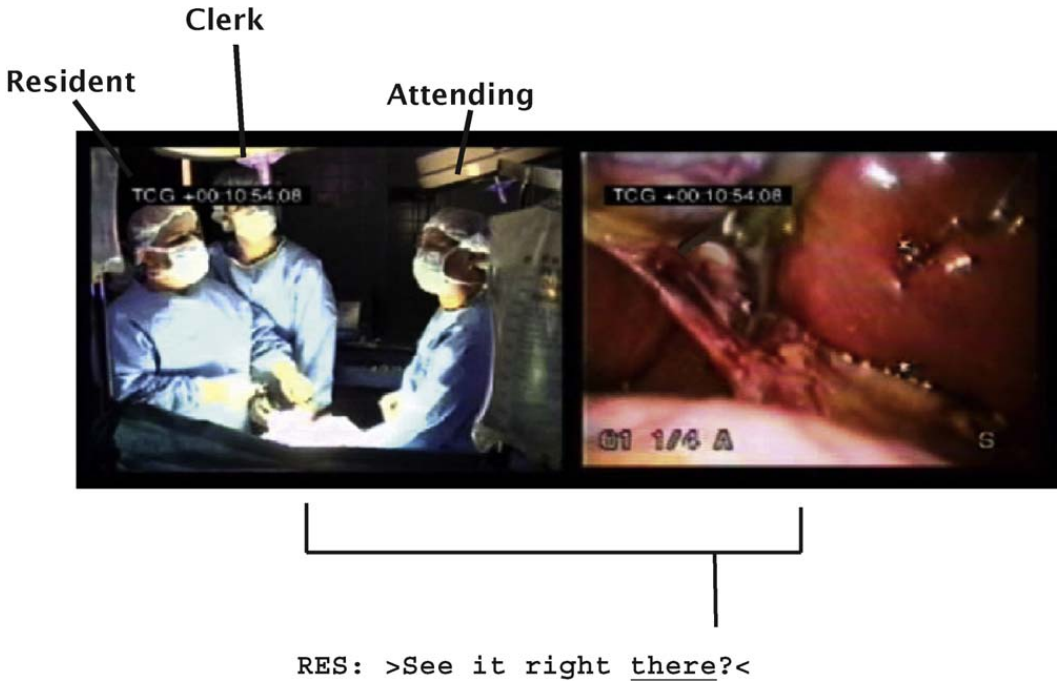

Fig. 4. Coordination of talk and gesture in Resident's demonstration of the cystic artery (Excerpt 3c, line 30).

Excerpt 1 (0:23:40;22–0:23:56;26)[8]

1 ATT: >Okay< you can see your clips there, (0.2) cystic duct,
2 cystic artery (0.7) no bleeding, no bile (0.3) the
3 liver bed's nice and dry (1.6) ((*Resident's given*
4 *name*)) did a nice job, now he's gonna flatten her out
5 and wash over the liver.
6 (0.8)
7 RES: Wou'd you go ahead and fla:tten out yon patient?

Attending's comment (lines 1–5) has two components, one an appraisal of the conduct of the procedure extant, the second a prompt for what was to come. The construction of the latter is interesting. It is not directly addressed to Resident, who is referenced in the third-person, but obligates him nonetheless to carry out the projected action. The pitch of the operating table, however, is controlled, not by the resident, but by the anesthesiologist. So Resident's response to Attending's embedded directive was to issue a request to someone else to carry out a required action. Attending's and Resident's respective turns at talk, therefore, function as a request/response pair, but one artfully constructed to preserve the Resident's autonomy as the operating surgeon.

Attending's assessment (''((*Resident's given name*)) did a nice job'') treats the surgery as a procedure realized. He appraises its performance positively, but what about it exactly was nice? Attending's appraisal might be heard as an instruction for how to read the post-operative scene presented on the endoscopic monitor. He directs our attention not to what we see, however, but rather to what we don't. Specifically, he notes the absence of blood and bile, suggesting that the ligations of the cystic artery and cystic duct were successful. His appraisal is concise in its construction and presumes as background not only what the three participants have just done together, but also a shared understanding of the role of the cystic duct and cystic artery within the enacted procedure. To successfully carry out the procedure, some *thing* must be realized as the cystic-artery-for-the-purposes-of-*this*-surgery. This is an indexical object, one that points both into the scene before them and into their shared environment of action. Attending's assessment of the procedure as complete, implies that this realization had been accomplished, but how,

precisely? To answer this question we must scroll back to "catch the work of 'fact production' in flight" (Garfinkel, 1967:79).[9]

2.3. Orientation to procedure: "You should find the cystic artery within that"

Moving back, then, to the beginning of the surgery well prior to the removal of the gallbladder, we find two orders of business being carried out simultaneously. Overlaying their primary project of removing a gallbladder was a second order of activity directed toward producing the surgery as an instructional event. In the early portion of the procedure, Attending introduced a variety of topics for discussion (e.g., the history of laparoscopic surgery, instrumentation, gallbladder pathology, surgical anatomy). The organization of this instructional talk followed the familiar format of the teacher (Attending, in this case) asking a known-information question, the student (Clerk) answering and the teacher providing an assessment or elaboration. This pattern, common in classroom recitation (Mehan, 1979), provided the participation structure for what Prentice (2007) described as "drilling" in the OR.

An example can be seen just after the trocars were inserted (Step 1) and the laparoscopic camera was being positioned to reveal the gallbladder and Calot's triangle (Step 2). As the work continued, Attending asked Clerk to define the triangle of Calot and he replied as follows:

Excerpt 2 (0:07:03;22–0:07:20;04)

```
1  CLK:   The inferior border of the liver, (0.6) the uh
2         (0.6) common bile duct, (0.3) and the cystic duct.
3          (5.3)
          ((some lines removed))
4          (1.6)
5  CLK:   And within it you find tha (.) cystic artery (1.2) or
6         you should find the cystic artery within that.
```

When asked, Clerk provided a textbook definition.[10] In the place in which an assessment from Attending (or possibly Resident) might be expected (i.e., line 3), however, we find only silence. So Clerk's definition was allowed to stand. In instructional discourse, a delay on the part of the teacher in producing an evaluation turn following a student's answer may in itself constitute a form of assessment (see Mehan, 1979; Macbeth, this issue). When teaching in the context of consequential work, however, the absence of overt uptake on the part of the question asker may be construed differently. There are many things taking place and much competing for the participants' attention.[11] Perhaps, however, Clerk was orienting to the absence of an overt assessment when he offered an amendment to his description in lines 5–6.

His repair of "within it you find the cystic artery" to "you should find the cystic artery within that" displays a recognition that the cystic artery may not be found in the triangle of Calot at all. As they discuss later in the surgery (Excerpt 8b), there are an assortment of configurations in which the cystic artery might present itself. Surgical texts (e.g., Anson and McVay, 1971; Hawn, 2001; Scott-Conner et al., 2000) offer varying accounts of these abnormalities and their incidence. Why, we might ask, this particular elaboration and why here? By raising the cystic artery as a topic, Clerk introduced an object that remained to be made concrete within the scene before them. It was not yet in view, but it was an

[9] Referring to this realization as an instance of "fact production" may require a little elaboration. The establishment of some matter as a fact might suggest a classical form of accountability (i.e., "The world is everything that is the case." [Wittgenstein, 1922:§1]). Garfinkel, however, alludes to a form of accountability of a different sort. The facts in which he is interested "are real worldly, and they consist of all that detail [found] in technical, material contents; they are only discoverable and cannot be imagined; *and they are naturally accountable*" (Garfinkel et al., 1981:140, author's emphasis). We thank Oskar Lindwall for pointing out the distinction.

[10] In a later interview, Resident (personal communication, 1 April, 2000) defined Calot's triangle as the region delimited by the hepatic duct medially, by the cystic artery superiorly and by the cystic duct. The region specified by Resident overlaps with that proposed by Clerk, but is not precisely the same. Both specifications appear within the surgical literature. It suggests that even technical concepts, such as this one, are often used with a certain amount of flexibility.

[11] Clerk's description of Calot's triangle was produced in response to a question issued 40 s earlier (0:06:19;08) and provided the same answer. There followed a period of high activity in which Clerk was called upon to reposition the camera. Attending then said, "I'm sorry ((*Clerk's given name*)), what is the triangle of Calot?" (0:06:51;06). Clerk began to repeat his answer, but was again interrupted by other activities. Shortly thereafter, Attending prompted him with the hearably incomplete utterance, "The inferior border of the liver" (0:07:02:08). Clerk's response was thrice produced, therefore. It suggests that consequential work trumps didactic instruction in apprenticeship training.

important focus for the steps that followed. He invoked a procedurally relevant category, one that stood in need of instantiation. Through this expansion of his prior turn, he displayed an orientation to where they were within the procedure and what was to come.

2.4. Creating the 'critical view': "Can you see the cystic artery yet?"

A few minutes later, Resident began the work of exposing the relevant structures. Hirschauer (1991:300) wrote, "Dissection, which is the precision work of making objects visible, is at the same time classification work." Strasberg and Vollmer (2001:434) elaborated, describing a laparoscopic cholecystectomy:

> The aim of dissection should be the compete clearance of fat and fibrous tissue from the triangle of Calot and the dissection of the lower part of the gallbladder off the liver bed. When two and only two structures are seen to enter the gallbladder at the completion of this dissection, the "critical view" has been obtained and the structures are identified as the cystic duct and cystic artery.

As he worked to produce this 'critical view,' Resident commented on the importance of retracting the gallbladder properly:

Excerpt 3a (0:10:14;08–0:10:35;04)

```
1  RES:    Key tah getting the cystic duct not the common bile
2          duct ther:e  is to retract this laterally.  If you
3          retract you know up in the air like ⌈this
4  CLK:                                       ⌊Uh huh
5  RES:    You can you can tent up you can see the common bile
6          duct down here ⌈(0.6) so you ⌈wanna
7  CLK:                  ⌊uh huh       ⌊but can can you (.) which
8          is the common bile duct?  If you just ah=
9  RES:    =It just runs runs right down in here
10 CLK:    Okay.
11           (0.8)
12 RES: →  Right down where that lives so that looks like cystic
13      →  duct to me↑ are you happy with that Doctor
14      →  ((Attending's surname))?
15           (0.4)
```

Hirschauer (1991:336) observed, "in an operation, the patient is transformed from a person into a body, and from an everyday-body into an anatomical one." He (1991:310) went on,

> In two respects the patient-body becomes the base of a disciplinary education: as a constant *memory aid* of the abstract body, which is so easily forgotten, and as a *visual aid* for an anatomical demonstration. During an operation, a junior surgeon learns to use the anatomy atlas in the broken ground of the flesh. (author's emphasis)

Here we see the surgical field being used as a resource for an impromptu lesson in anatomy and surgical practice. The cystic duct branches off the common bile duct (see Fig. 2). A common source of post-surgical complications in cholecystectomies arises from accidental injuries to this structure (Scott-Conner, 2002). Clear visualization of the cystic duct, therefore, is essential to the safe conduct of the surgery.

Suchman (2007:263) writes, "[T]he objects being defined and their categorization exist within a professional matrix of social and material accountability, subject to contest by the readings of others and by the objects themselves." We see these complex accountabilities come into play here. Resident is performing the dissection, but Attending is responsible for the ultimate outcome of the surgery. Before any vital structures can be cut, agreements must be struck with regard to what they are doing and seeing. Resident needs to align understandings, but must do so without repeatedly asking for assistance and thereby running the risk of appearing indecisive or unsure. He must present himself as capable and

self-reliant, but not cocky or overconfident. Resident's solution in this case was to begin by providing Clerk with a bit of instruction on how the dissection was to proceed (lines 1–3, 5–6, 9, 12–14) and in the process displayed his mastery of the relevant anatomy ("so that looks like cystic duct to me"). Then, almost as an afterthought, he requested a confirmation of the identification that he had already made ("are you happy with that Doctor ((*Attending's surname*))?").

The exchange continued:

Excerpt 3b (0:10:34;22–0:10:46;14)

```
15          (0.4)
16 ATT: →Yeah (.) the other ⌈thing to do: is make sure you
17        have your cystic (.) artery out too.
18 RES:                     ⌊(right)
19 CLK:   Uh huh
20 RES:   ⌈⌈°That's right back in here°
21 ATT: →⌊⌊That way there is nuthin else before you h- (.) hit
22        the edge of the liver (1.6) that guarantees you're
23        safe too
```

We see some of the classification work to which Hirschauer referred. Resident's earlier "so that looks like cystic duct to me" (lines 12–13) is an instance of what philosophers of language refer to as an *ostensive demonstration*. His audience is obliged to search the scene before them to locate a possible referent for *that*. Attending's "yeah" (line 16) ratified Resident's formulation of what would serve as the cystic duct for purposes of the surgery in progress. Attending raised a reminder (lines 16–17) that the task remained of isolating the cystic artery. Note the use of visual metaphor—their efforts were to be focused on getting the cystic artery "out," as in 'out of hiding' and, thereby, into plain sight. There are, however, many, many blood vessels in the body. How were they to ensure that they were looking at the correct one? Attending offered a clue (lines 21–23) by suggesting that they would know they had found the cystic artery when there were no other obvious structures within the triangle of Calot and they could see through to the liver bed behind ("nuthin else before you hit the edge of the liver"). Attending is offering a rule of thumb, a means of "guaranteeing you are safe." It ensures that they have identified the proper vessel and indicates that no more dissection is needed.

It might be noted that the term *cystic artery* is a familiar one here for all parties. As a third year medical student, Clerk must have encountered it in previous reading and in required coursework. In fact, it was Clerk who introduced it in Excerpt 2 when he volunteered a fact about where such vessels are (usually) found (lines 5–6). His understanding of cystic arteries might be considered, however, to be of a conceptual nature. He has yet to attain a surgeon's understanding of cystic arteries as everyday work objects. Indeed, as we are about to see, he requests assistance in recognizing the structure in the scene before them.

Excerpt 3c (0:10:46;27–0:10:57;25)

```
24 CLK:   Can you see the cystic artery yet?
25        I ⌈(       )
26 RES: →  ⌊It's ↑ri::ght back in there
27          (2.1)
28 ATT:   °(He)'ll° get it out here in a minute.
29          (0.2)
30 RES: →>See it right there?<
31          (0.2)
32 CLK:   U::mmmmm=
33 RES: →=Ri:ght (0.2) ⌈there
34 CLK:                ⌊Okay yeah (.) yeah
```

Clerk's question takes an interesting form. Positioned after Attending's observation about the importance of exposing the cystic artery (''that guarantees you're safe''), he asks whether Attending is able to view the structure at the moment. By tagging his query with 'yet' he orients to unfolding procedure. The eventual production of some thing as the cystic artery is treated as an inevitability. But by asking the question, he reveals himself as someone who has not yet developed the competent practices of seeing that underlie understanding in the OR.

Whereas Clerk had discussed the cystic artery previously as an abstraction, as a structure sometimes found in the triangle of Calot, he now speaks of it as something potentially available in the current phenomenal field. They have shifted, therefore, to talking about particularities, about the cystic-artery-for-the-purposes-of-*this*-surgery. In response to Clerk's query, Resident provided three demonstrations of what he was taking to be the cystic artery.[12] They employ a parallel syntactic structure, one that gets pared down in each subsequent production. The use of *it* here is Janus-faced in that it points indexically in two directions. As an anaphoric reference, it points retrospectively to the structure previously named by Clerk (line 24). At the same time, it points prospectively to the object or place in the material environment yet to be located by Clerk that is the focus of their ongoing work and scrutiny.

As noted earlier, the monitors were positioned (see Fig. 3) so that workers on either side of the table could view the scene captured by the laparoscopic camera without having to look behind them. Since the eyes of the participants are directed to different places, however, gestures performed for the benefit of the other parties had to be produced within the field captured by this camera, if they were to be seen at all. Pointing within the operative space, however, required using some sort of prosthetic pointing device and not every piece of equipment lends itself to this purpose (Mondada, 2003). The laparoscopic camera can be directed toward an object, but it can't be used to point out an object within a field of view. Similarly, the retractors used by the Attending were of limited use as pointers because they couldn't be moved without simultaneously losing the view. At the time of the exchange shown in Excerpt 3c, only the Resident was in a position to easily point within the operative space. He was holding a pair of devices known as ''endo graspers'' which he used interchangeably to perform blunt dissection, to retract and to point.

Ostensive demonstrations consist of carefully coordinated ensembles of talk and embodied conduct. Embodied actions, such as deictic gestures, are often characterized as supplementing speech, but the relationship is reciprocal. As Hindmarsh and Heath (2000a) described, the timing of a deictic term such as *here* or *there* ''segments'' an accompanying gesture and in so doing displays ''just the moment at which it is sequentially relevant.'' In this way, they argue, ''the talk reflexively works on behalf of the gesture'' (p. 1864). This would suggest that to locate the cystic artery, one should track Resident's visible grasper at the moment that he enunciates *there* in line 26. Concurrent with the talk produced in lines 26–31, however, Resident appeared to be continuously engaged in the work of dissection. At the moment that he enunciated *there* in line 26, the grasper was being withdrawn, its jaws slowly opening. Resident's pointing with the grasper would be equivalent to pointing with two spread fingers while withdrawing the hand. Such a gesture would be ambiguous, both because it would be withdrawing from the very feature being specified and because it intends in two different directions. It defines a region rather than a point in space.

The enunciation of *there*, in line 30, was coordinated with a different gesture with the pointing tool. In this case, Resident spread the jaws of the grasper, opening a veil of connective tissue to produce a window into the space behind (see Fig. 4). Though not a conventional point, it is a gesture that disclosed a region within which Clerk might search for the object of reference. Unlike the earlier demonstrations (lines 20 and 26), this one was produced syntactically as a question projecting some form of response on the part of Clerk. Clerk's response (''Ummmm''), however, was at best equivocal. Resident's most elliptic demonstration (''Right there''), produced in line 33, was accompanied for the first time with a more canonical form of pointing. The work of the dissection was interrupted and the tool was closed to form a single point. The enunciation of *right* was dramatically prolonged so that when *there* was vocalized, it was produced in concert with a sharp motion of the grasper, marking a spot within the current plane of dissection. Only after this fourth and most conventional demonstration did Clerk provide a claim of recognition (''Okay yeah yeah'').[13]

[12] Resident had, in fact, already provided a demonstration of the cystic artery in line 20, but it was produced softly, and in overlap with Attending's turn in line 21. There is no evidence of uptake on the part of Clerk. An alert reader also questioned whether this was indeed a demonstration, since it may only reveal where the structure might be found in the future (as in ''He'll get it our here in a minute.''), rather than where it can be seen at that moment.

[13] One reviewer noted that Clerk's avowal of recognition in line 34 may not have been informed by Resident's most recent ostensive demonstration (line 33), since Clerk's ''Okay'' and Resident's ''there'' were delivered in overlap. It is possible that Clerk's claim of recognition, therefore, was a delayed response to Resident's earlier demonstration (line 30). This exchange was analyzed previously in the light of standard models of reference repair (Koschmann et al., 2001) and Clark's contribution theory (Koschmann and LeBaron, 2003).

Sacks (1992:252) made an important distinction between "claimed" and "exhibited" understandings.[14] Marjorie Goodwin, for example, described a situation in which a listener produced a nod in response to something previously said. Goodwin (1980:304–305) observed that, "while the hearer's gesture acknowledges the speaker's talk, it does not show in detail the sense that the hearer is making of it and thus does not provide proof that adequate understanding has in fact been achieved." In many social situations, it might be considered impolite to pursue an explicit proof once a claim of understanding has been produced. Here it is crucially important, however, that all members understand the scene before them in congruent ways. In the talk that followed, therefore, we find Resident offering two additional ostensive demonstrations, despite Clerk's triple avowal of recognition in line 34.

Excerpt 3d (0:10:55;27-0:11:11;08)

```
33 RES: →=Ri:ght (0.2) ⌈there
34 CLK:                ⌊Okay yeah (.) yeah
35 RES: →That looks like the (0.2) where the money's a:t
36 CLK:  Uhkay
37         (0.2)
38 RES: →En yih can see it's hanging out in that
39       ⌈tract.
40 ATT:  ⌊°>That's (actually) big<° that's pretty bi:g
41       that may be ri:ght
42         (0.4)
43 RES:  That's right hepatic?
44         (1.2)
45 (ATT): ⌈⌈(Comin' up)
46 RES:   ⌊⌊The cystic may be up a little higher?=
47 (ATT): =(Yup)
```

Resident's fifth and sixth demonstrations of the cystic artery were more verbose than those produced earlier. His utterance in lines 38–39 was coordinated with an explicit gesture. Concurrent with the articulation of "that tract," he performed a window-making action, accentuated with a slight twist of the grasper. Resident's ostensive demonstrations were presumably designed to instruct Clerk's viewing of the displayed scene. Not only were these demonstrations more verbose than those produced earlier, but they seem to evince a high level of confidence. By making his identification explicit for Clerk, however, it was also made explicit for Attending, and a potential difference in understanding was revealed for the first time.

The surgical texts suggest several ways in which the identification of the cystic artery might go awry.[15] Ordinarily, the cystic artery branches off the right hepatic artery which, in turn, branches off the hepatic artery proper (see Fig. 2). As mentioned earlier, there are several anatomical variations in the ways that blood might be supplied to the gallbladder. Scott-Conner et al. (2000:104) reported that the cystic artery and cystic duct can sometimes be confused.

[14] "*Proved* relationships are attended by parties as systematically different than other sorts of relationships, e.g. *claimed* relationships. Things like, e.g., at the end of some first story a recipient says, "I know just what you mean." Period. We can say that that's a claimed understanding as compared to having some way to produce some materials that *exhibit* an understanding." (Sacks, 1992:252, author's emphasis).

[15] One reviewer asked, what would happen if the operating surgeon cannot find the cystic artery at all? Functionally, there must be a cystic artery because the gallbladder, up to the time that it is removed, is living tissue and must, therefore, be supplied with blood. As a practical matter, however, it is possible that a situation would arise in which a surgical team was simply unable to locate the structure. As Scott-Conner (2002:4) observed, the qualities that define competence in a surgeon are "accuracy and delicacy of technique." A failure to locate relevant structures, therefore, would raise concerns about the adequacy of the dissection. In other words, it would call the execution of the procedure itself into question.

When attempting to distinguish between them they note that the cystic artery is "generally observed to be smaller. . ., to have visible pulsations when traction is relaxed, and to terminate by running onto the surface of the gallbladder." Fried et al. (2006:660) also advised that care be taken to "ensure that the right hepatic artery is not inadvertently injured as a result of being mistaken for the cystic artery."[16] Surgeons, therefore, must examine candidate structures closely to ensure that they exhibit the properties (i.e., size, pulsatility, place of origin, point of connection) of the sought structure.

There is some apparent ambiguity with regard to Attending's "That may be right" (line 41). The question hinges on whether to construe *right* as being synonymous with *correct* or whether we should treat it as a relative locator as in "that may be right [hepatic]." By the first reading, the clause would be heard as a tentative positive appraisal of Resident's demonstration. However, the prolonged enunciation of *big* and *right*, the absence of a falling intonation contour, and Attending's intent stare at the monitor are more suggestive of a recognition-in-process. Attending's observation "that's pretty big" (line 40) directs attention to one of the properties of the identified structure, a property that might not be consistent with how a cystic artery might be expected to appear. In short, Resident's identification was being called into question and its thingness had to be renegotiated.

In the talk that followed shortly thereafter, Clerk attempted to verify his understanding of what had just happened:

Excerpt 3e (0:11:14;23-0:11:39;07)

((*lines omitted*))

48 CLK: So you jus' dissect until you'r:e absolutely sure

49 ATT: Ah ⌈hah

50 RES: ⌊Yeah=

51 CLK: =Till you see both the right hepatic and the

52 cystic and then

53 (4.6)

54 RES: Remember how we talked about there's no:: (1.0)

55 no collateral flow beyond (0.8) the ga- the right

56 gastric so if you happen to clip the right (1.1)

57 you're kind of in trouble. Ya hit you've clipped

58 an end artery.

59 (2.1)

As in Attending's turn in the previous excerpt, the subject of Resident's reply ("the right") is ambiguously specified. It is clear, however, that he is describing the consequences of inadvertently clipping the right hepatic artery. We hear "the right" (line 56) as a contraction of Clerk's previous "the right hepatic" (line 51).[17] Resident's first enunciation of 'no' (line 54) is prolonged and emphasizes the seriousness of this potential error. This reminder is offered as instruction for Clerk, but, in producing it, Resident also displayed (to Attending and others present) his awareness of and orientation to this potential risk.[18]

[16] On being shown in Fig. 2, attending (personal communication, 6 April, 2009) indicated that in most cases one never even sees the right hepatic artery. It is usually concealed in the liver.

[17] Though both Attending and Resident agree here with Clerk's summation, they decidedly do not "dissect until [they] are absolutely sure" (line 48). This is a crucial difference between an anatomist's dissection and that of a surgeon. To avoid damaging surrounding tissue, surgeons try to minimize their dissection. The detailed mappings of the vascular architecture presented, for example, in Anson and McVay (1971) were produced on cadavers.

[18] One reviewer noted the contrast between Resident's warning that when you clip the right hepatic artery "you've clipped an end artery" and his assessment that in such circumstances "you're kind of in trouble." His low-key treatment presents it as a situation that, while best avoided, could be competently managed should it arise.

The exchange went on:

Excerpt 3f (0:11:37;03–0:11:46;09)

```
59          (2.9)
60 RES:    °I don't know° want me to take that (.) duct down?
61          (0.6)
62 ATT:    °Yeah.°


63 RES:    And to look up in here for the ⌈(0.6) cystic artery?
64 ATT:                                  ⌊Yeah.
61          (0.8)
62 RES:    The clip applier please.
```

"Taking down" the duct involves sealing it with surgical clips and then dividing it. This is a consequential step and one that would be difficult to undo. Resident and Attending had previously reached an accord to treat a particular structure ("that duct") as the cystic duct for the purposes of the surgery at hand. Resident now seeks approval to cut. His request to the scrub nurse (line 62) for a clip-applier, therefore, marks a shift from the preparatory work of dissection to a more consequential form of action.

To this point, the surgery was produced as a scene of instruction through Attending's "drilling" (Prentice, 2007) of Clerk. As the surgery advanced, however, a different form of instructional dialog emerged. Instead of the familiar pattern of classroom recitation, the instruction took the form of a running narrative closely integrated with the unfolding procedure. Though ostensibly produced for Clerk's benefit, this running narrative also played a role in coordinating and advancing the ongoing work. For example, immediately following Excerpt 3f, Attending described just how the cystic duct would be ligated: "So he's going to put one clip high right near the duct and the neck of the gallbladder and he's going to put two low" (0:12:19;12–0:12:26;20). This description was provided just as the second and third clip were being applied. It was constructed as though addressed to Clerk, but contained information concerning the number and positioning of the clips that was highly relevant to what the Resident was about to do at that very moment.[19] By providing this narrative in advance of the action, Attending presents the advancing procedure as routine and well-rehearsed.

Clerk's query (line 23), "Can you see the cystic artery yet?" was procedurally-related. It presumed knowledge of what they are doing together and acknowledged the importance of locating the cystic artery to the work in progress. Resident's "And look up in here for the cystic artery" is similarly tied to procedure. By prefacing his utterance with *and*, Resident retrospectively ties the search for the cystic artery to his proposal to take the cystic duct down. In this way, the projected action becomes joined with the work of realizing the cystic artery.

2.5. *Instrumental action: "I think it's right there"*

Attending and Resident jointly resolved (Excerpt 3f, lines 63–64) to "take down" the cystic duct before dissecting out the cystic artery. In an interview after the surgery, Resident (personal communication, 12 April, 2000) described the dissection leading up to the identification of the cystic duct:

> We don't generally go and dissect out all of the common hepatic duct and the common bowel duct because if you go messing around near it you worry about damaging it. We don't have to see it. I know this is the gallbladder, this is the neck of the gallbladder and um there's one structure leaving it so I know that's the uh, cystic duct.

[19] Koschmann et al. (2007) described a similar situation in which the presentation of an instructional account, delivered by an attending and addressed to a pair of medical students, was produced just before the resident undertook a consequential action.

His description displays some of the practical reasoning leading up to an identification. In the same interview we asked him to point out some of the relevant structures in a still frame from the recording of the surgery. His response was instructive.

> In a case like this where the cystic duct is relatively small, it's hard to tell, with a static shot like this, with a still image, whether at this point in the dissection is this really the cystic duct or is it just some loose tissue that I haven't dissected away yet. But, I had, I suspect with how the gallbladder is retracted, where I've dissected here if I had identified, I wouldn't be dissecting here if I hadn't already identified the cystic duct.

The surgical field is littered with amorphous stuff (''loose tissue'') from which relevant structure must be distinguished. Resident demonstrates that making these distinctions without access to the procedural context can be difficult, even for someone highly familiar with these scenes. To evaluate what he was seeing, therefore, he needed to reconstruct some of that context.

Returning to the surgery, Resident installed clips on the cystic duct and transected it shortly after Excerpt 3f. Dividing the cystic duct mobilizes the duct end of the gallbladder, simplifying the remaining dissection. The exchange continued as follows:

Excerpt 4 (0:13:07;05-0:13:12;03)

```
1  ATT:   Now he's got to free up the cystic (.) artery.
2         (3.0)
3  CLK:   (°Which is?°)
```

When Attending brought up the topic of freeing the cystic artery earlier (lines 16–17, Excerpt 3b), it was a projected step. Returning to the matter here, but prefacing his statement with the temporal deictic *now*, he presented the projected step as having had arrived. His announcement, therefore, served to align his procedural account with the surgery in progress, marking their place in the unfolding procedure. Effort is required when doing a procedure together to keep everyone on the 'same page', as it were. This might be termed *procedure work*, not the work of carrying out the procedure itself, but the work of locally producing the procedure as procedure.

A few moments later, Resident made the following announcement:

Excerpt 5 (0:13:26;03-0:13:30;10)

```
1  RES:   I think it's right ther:e.
2  ATT:   °Yeah, so do I.°
3         (1.4)
4  RES:   Kind'a short.
```

As he made this demonstration, Resident plunged the tip of his grasper into the bundle of connective tissue within which he had been dissecting. As he enunciated *there* he drew open the jaws of the tool thereby marking a particular region. Resident's anaphoric reference (''it's'') links his demonstration to Attending's earlier turn at talk (Excerpt 4, line 1). The two utterances are paired, therefore, referentially and functionally.

Resident's ostensive demonstration marks the successful conclusion of a search that was subsequently ratified by Attending. A candidate for the role of the cystic-artery-for-the-purposes-of-*this*-surgery has, therefore, been located and agreed upon. That object and the procedure are reflexively related—the procedure requires that some thing fill the cystic artery slot. This object, therefore, was both produced through, and obliged by, the procedure.[20] But the procedure itself is also reflexively realized through its various relevant objects, such as the cystic artery, since it is only through the production of these signified objects that it can be understood as having been accomplished.

At this point in the procedure, the sought after object had been realized, but no consequential action has yet been taken with respect to it. The dissection continued in the excerpt that follows:

[20] We take this to be close to Dewey's (1991:122) observation, ''For things exist as objects for us only as they have been previously determined as outcomes of inquires.''

Excerpt 6 (0:15:27;18-0:15:52;27)

```
1  RES:    I can't get around that (.) it's just awfully high up
           in there.
2          (15.7)
3  RES:    (Pretty sma) pretty wimpy artery.
4  ATT:    °Yeah(h)°
5          (2.8)
6  RES:    °Clip Applier.°
```

After the pause near the end of Excerpt 6, Resident set aside the grasper tool and issued a request to the scrub nurse for a clip-applier (line 6). Sanchez Svensson et al. (2007:42) described how, ''In surgery the very passing of an instrument to another, rests upon a sensitivity to, an awareness, an understanding, and an anticipation of how and when the implement will be used at this moment on this occasion.'' As in Excerpt 3f, the exchange of tools marked a transition in the unfolding activity. It represented an instrumental (in both senses of the word) step toward the final realization of the cystic artery.

2.6. *Object confirmation: "That's the right artery there"*

The work of the team continued. After applying three surgical clips to the vessel identified as the cystic artery, Resident called for a cutting instrument and divided it. With the division of the cystic duct and cystic artery now complete and the dissection of gallbladder from liver bed yet to be undertaken, the following exchange occurred:

Excerpt 7 (0:18:33;25-0:18:50;04)

```
1  RES: →  Think I'm pretty comfy  that that's the ah (1.3) the right
           artery there
2          (1.2)
3  RES:    I don't think there is anything else in there.
4          (1.9)
5  CLK:    hgh (.) hhh
6          (3.2)
7  ATT: →  That's your edge
8  RES:    The right hepatic comes up in that direction.
9  RES:    Bovey.
```

The exchange occurred immediately following the division of the vessel conditionally-identified in Excerpt 5. Resident exchanged the cutting tool for the grasper and probed the region, using the grasper tool to separate the two sections of the recently severed vessel. He began the excerpt with a compound utterance in which the first *that* serves as a subordinating conjunction or complementizer. Setting the first clause (''Think I'm pretty comfy'') aside for the moment, we will explore the second (''that's the right artery there'') in some detail.

This clause could be interpreted in at least three different ways:

i. ''that's the correct [cystic] artery there'' (indicating the vessel just divided)
ii. ''that's the correct [cystic] artery there'' (indicating some other structure)
iii. ''that's the right [hepatic] artery there''

We can eliminate the second reading immediately on the basis of how Resident's utterance was taken up by his interlocutors. Stating that some vessel other than the one just cut was in fact the cystic artery would be to declare the procedure in error and raise the need for immediate corrective action. Since there is no evidence that Attending construed Resident's utterance in this way, we remove it from further consideration.

There is no way of resolving between the first and third readings, however, based solely on the transcript. Like Attending's earlier "that may be right" (Excerpt 3d, line 41), the difference between the two constructions rests on how one construes the modifier *right*. *Right* might be used as a synonym for *correct*, as in the first reading, or it can be used as a relative locator as in the third.[21] Construing it in the latter way, would convert the clause into an ostensive demonstration of the artery, the right hepatic, from which the cystic artery usually (but not always) branches.

As discussed earlier, Resident's audience must scrutinize his embodied actions (e.g., nods, gestures, gaze) for clues regarding how to determine what is referenced by *that* and where *there* might be found. The exophoric indications provided by Resident in this strip of activity were obscure, however. We detect no observable action resembling a conventional point. His work of probing and blunt dissection began at "I feel pretty comfy" (line 1) and continued without break right up to Attending's "That's your edge" (line 7). The fact, however, that the object that had been taken to be the cystic artery had just moments before been cut and that as he produced this statement Resident could be seen to be actively manipulating the remnants of that same structure, lend it special salience and suggest that the first reading of this clause is probably the correct one.[22] There are still some interpretational issues remaining, however, related to the claim that "that's the right artery there."

It should be noted, for instance, that the contraction *that's* in "that's the right artery there" (lines 1–2) is ambiguous with regard to tense (i.e., it could be a contraction of 'that is' or 'that was'). It might be further observed that the deictic *there* can, in some circumstances, be used to refer, not spatially, but temporally. One might, for example, colloquially use "What I just did there. . ." to describe an action just completed. The action need not have been performed in a place different from that designated by *here*, but rather in a time different from that designated by *now*. This is how we hear Resident's two-part utterance issued in lines 1 and 2. We hear it as consisting of a qualifying clause joined to a special kind of demonstration.[23] The qualifying clause "I feel comfy that. . ." serves as a wrapper for a demonstration that gestures toward what has just been done. So tailored, the exchange artfully addresses the adequacy of the work extant. It provides a place for the attending to call for additional dissection, if needed, while presenting the resident as capable of offering his own assessment of the work's status. In this way, it contributes both to the procedure work that we have been describing and to the situated work of identity construction.

Even though a vessel had been divided, the surgeons revisited their decision here and reevaluated its correctness. The vessel taken was, by Resident's appraisal, small and high up behind the gallbladder. One danger in such a situation might be that one could mistake the right hepatic artery for the searched object. After his statement affirming their realization of the cystic artery, Resident added "I don't think there is anything else in there" (line 3). Attending had previously suggested (Excerpt 3b, lines 16–17, 21–23) a stopping rule for discontinuing dissection within the triangle of Calot. He observed that if one could see through to the liver ("That way there is nuthin' else before you hit the edge of the liver") and there were no other candidate structures evident, then the structure in hand must be the cystic artery. and no further dissection was necessary. Attending's "that's your edge" (line 7) harks back to this previous discussion. It instructs a particular way of evaluating the scene and endorses Resident's prior assessment in line 3. Resident's response (line 8) demonstrates an appreciation of this logic.

When Resident declared, "I feel pretty comfy that that's the right artery there" (lines 1–2), what was the basis for his confidence? Amerine and Bilmes (1988:330) observed, "Successfully following instructions can be described as constructing a course of action such that, having done this course of action, the instructions will serve as a descriptive account of what has been done, as well as provide a basis for describing the consequences of such action." Procedures serve a retrospective function in providing a means of rationalizing what was done.

Immediately following a surgery, the operating surgeon dictates an account of the operative course. Such reports follow a standard format (Hoballah and Scott-Conner, 2004). It is the legal record of the event and was added to the

[21] There is also a third way in which *right* can be used. Resident's "I think it's *right* there" in Excerpt 5 uses it as an intensifier as in "It's there exactly."

[22] As we will take up shortly, Resident's "The right hepatic comes up in that direction" (line 8) is heard as responsive to Attending's "That's your edge" (line 7). It might be noted in passing, however, that when this utterance was actually produced, Resident had already withdrawn his grasper from the patient's body. Though it looks syntactically like some sort of demonstration, his listeners' were left to examine their recollections of where he had just been in order to resolve where 'there' could be.

[23] An examination of Resident's utterance (lines 1–2) was presented in Koschmann et al. (2006) under the title, "The Mystery of the Missing Referent." We should state clearly, however, that it is an analyst's puzzle—there is no evidence that his announcement presented any difficulty for Clerk or Attending.

patient's chart. The operative report for this case was authored by Resident and co-signed by Attending. The part of the procedure described in Sections 2.3–2.5 was summarized in this report as follows:

> A three-prong grasper was used through the lateral most right upper quadrant port to grasp the gallbladder at the fundus and retract it superiorly. A black grasper was then placed through the second 5 mm port and used to retract the neck of the gallbladder laterally, after which a black grasper and a Maryland dissector were both used to isolate the cystic duct. This was then clipped twice proximally and once distally and transected with the Endo-scissors. *The right hepatic artery was seen coursing through the hepatobiliary triangle and further dissection in this region revealed a very small cystic artery branch.* This was clipped twice proximally and once distally and then transected with the Endo-scissors. (italics added)

The effort required to locate what was to become the cystic-artery-for-the-purposes-of-*this*-surgery is only hinted at (''a *very* small cystic artery''). The agency of this identification is neatly elided through use of passive voice. The cystic artery is presented as there for the finding, and it was the procedure that ''revealed'' it.

2.7. An object by any other name: "The main complication you run into..."

Resident's call for the cautery tool (Excerpt 7, line 9) represented another transition in activity. With it he began dissecting the gallbladder from the liver wall in preparation for its removal. After the gallbladder was completely separated from the liver, Attending announced, ''(So) now we're off. Now I'm, he's got a hold of it so I'm going to let go of mine. Now he's going to put a grasper in and grab it and I'll take a Kelly'' (0:21:43;15–0:21:54;03). As this extended utterance began, Attending and Resident both were holding the recently freed gallbladder. To extract it through one of the ports, however, one of them would have to let go. Attending's statement, though presented as part of the instructional narrative, served the ancillary (but crucial) purpose of announcing his intention to release the gallbladder. This announcement had greatest significance for Resident's next action, but was relevant as procedure-marking information for all parties.[24] Procedure, therefore, was not only made visible through Attending's narrative presentation, but was, at the same time, put into action through his produced account. Additional examples of this can be seen in Attending's direction to the resident to flatten the table (Excerpt 1) and his statement ''Now he's got to free up the cystic artery'' (Excerpt 4). Both represent instructional narrative that directs present action.

The procedure by at this point having been largely completed, they returned once more to survey the dissection site producing the context for Excerpt 1. It would seem that our analytic task of documenting all the practical and consequential referential work that was performed with respect to the cystic artery is also complete. We will argue, however, that there is one more place where the topic of the cystic artery comes up, though it is not mentioned explicitly by name. As the parties surveyed the worksite, they took a moment to reflect on the procedure. Attending asked Clerk:

Excerpt 8a (0:24:08;01–0:24:25;10)

```
1  ATT:   Do you have any questions ((Clerk's given name))
2         (0.6) about the surgery?
3         (3.2)
4  CLK:   Well that was °actually° pretty (1.3) that was pretty
5         straight forward
6         (0.5)
7  RES:   Well:
8  ATT:   Not always
9  RES:   Oh yeah heh heh heh
10         (0.8)
11 RES:   I was pretty lucky.
12         (1.6)
```

[24] It also, of course, initiates an exchange of tools with the scrub nurse.

Instead of using Attending's invitation (lines 1–2) as an opportunity to explore points of possible confusion, Clerk allowed that he found the procedure to be simple and readily comprehensible. Attending's reminder that cholescystectomies are not always so simple and smoothly performed, carried an implied compliment for Resident's handling of the case, a compliment he deflected.[25] After a brief pause, Clerk took up Attending's invitation:

Excerpt 8b (0:24:23;17–0:24:45;25)

```
12          (1.6)
13 CLK: →Well the main complication you run into is any
14        kinda that ten percent of patients with the anatomical
15        abnormalities that that's where you're going to have
16        problems, right?
17 ATT:   Is that what the books are sayin' now, ten percent?
18 CLK:   Uh hah.
19 RES:   (    ) percent ⌈have it.
20 ATT:                 ⌊(Moore) used to say twenty percent had
21 RES:   Well ten percent have a replaced (.) right, ten percent
22        >or eleven percent< have a replaced (.) left, replaced
23        right would even be
```

Clerk is doing the work here of being a good student. Rather than identifying areas of true misunderstanding and running the risk of being exposed as ill-prepared or incapable, Clerk described something he already understood and asks for confirmation. The fact embedded in his confirmatory query would have seemed particularly safe since it was one he had articulated before.[26]

Here we find the last reference to the cystic artery, though it is not mentioned by name. The only hitch in what had otherwise been a "straight forward" execution of the procedure had concerned the realization of the cystic artery. Resident had suggested earlier that the structure, eventually taken to be the cystic artery, had been, in his words, both "kind'a short" (Excerpt 5, line 3) and "pretty wimpy" (Excerpt 6, line 3). But these would not qualify as "anatomical abnormalities" in the sense discussed by Clerk. Resident enumerates here the common abnormalities and reports estimates of the incidence of each (lines 21–23).[27] They all involve the location of the cystic artery, so even though it has not been mentioned by name, it is understood to be the matter upon which the conversation bears. As Schegloff (1992:1340) described: "Any reference to an object, person, action, dream, fantasy, that is, anything real, or unreal but mentionable, and indeed anything understood to be presumed or presupposed by what is said or conveyed, can be made the object of talk—not necessarily a topic, but what the talk is understood to bear on."

Recall that in Excerpt 2 Clerk observed that cystic arteries are usually found in the triangle of Calot. He, therefore, produces both the first and the last reference to the structure. In Excerpt 8, however, the participants have returned to discussing cystic arteries as an abstraction, not as a realized object. They are no longer discussing the object produced, the cystic-artery-for-the-purposes-of-*this*-surgery.

3. A simple matter of trust

In one of his early papers, Garfinkel (1963:237) took up the topic of "trust" and its importance to "the commonsensically ordered and ordering routines of everyday actions and their objects." He described how players in a game such as tic-tac-toe or chess participate with certain "constitutive expectancies" (1963:190). That is to say, they

[25] One of the reviewers suggested that rather than deflecting praise, Resident's "I was pretty lucky" (line 11) could be an expression of genuine gratitude that he had been spared from making a serious error by Attending's timely intervention. The statement is, therefore, ambiguous.

[26] After Clerk reported in Excerpt 2 (lines 5–6) that you "should" find the cystic artery in Calot's triangle, Attending asked him, "What percentage of the time is it not there?" to which Clerk replied, "Ten percent." Like his earlier definition of the triangle of Calot, Clerk's answer passed without comment.

[27] His remarks bring to mind Hirschauer's (1991) account of how anatomical atlases (e.g., Anson and McVay, 1971) are made relevant in the practical work of doing a surgery.

rely upon each other to operate within ''the constitutive order of game events'' (Garfinkel, 1963:194). He argued that each player must ''trust'' the other to do so in order for the game to go on. In this way Garfinkel introduced a normative component to the description of action, one that entitles expectations and that imposes responsibilities.

In an early technical report Garfinkel (2008:211) discussed how conversational sense is built upon ''retrospective and prospective significances'':

> Not only is the 'sense of conversation' progressively realized through a succession of realized meanings of the thus-far accomplished course of the conversation but every 'thus-far' is informed by *its* anticipations. Further, as of any here-and-now, as well as over the succession of here-and-nows, the conversation. . .has both its retrospective and prospective significances. (author's italics)

Listeners trust that what will be said next will be meaningful in terms of what has been said previously; speakers, in turn, trust that what they are saying will prove meaningful as the conversation unfolds. As Garfinkel later wrote: ''The anticipation that persons will understand, the occasionality of expressions, the specific vagueness of references, the retrospective-prospective sense of a present occurrence, waiting for something later in order to see what was meant before, are sanctioned properties of common discourse'' (1967:41, cited in Clayman and Maynard, 1995). Reference, therefore, is accomplished contingently and as needed for the purposes of the task(s) at hand. The problem of the ''inscrutability of reference'' described by Quine (1968:194) is thus overcome.

Our goal in this paper was to provide a perspicuous case, one that would permit us to reflect upon how understandings of objects are produced in the nonce. We described the ways in which three participants produced a particular object, the cystic-artery-for-the-purposes-of-*this*-surgery, as understood. Garfinkel's account of reflexivity in conversation has bearing on our observations concerning the surgery in that both descriptions deal with the processes whereby some *thing* is produced as a this or a that. What was illuminated here was that at all points the participants' understandings of (and references to) the object in question relied upon expectations that arose from their understanding of the procedure that they were enacting together. This understanding of procedure was not a given, however, but was itself produced and made incarnate within their unfolding interaction.

The 'thingness of the thing' is built upon trust, trust of the sort described by Garfinkel. But the ''knowledge of the kind of truth in which the thing stands'' (Heidegger, 1967:27) resides, at least in case studied here, in procedure. Rawls (2008:723) writes, ''Displays of competence are also displays of trust.'' Members trust each other to do the right thing, to produce a situationally appropriate next action. When Attending appraises Resident's performance (Excerpt 1, lines 3–4), he evaluates it as a ''nice job'' precisely because it fulfilled this kind of expectation. The negotiation of what would serve as the cystic-artery-for-the-purposes-of-*this*-surgery was, in this way, built on trust. Rawls (2008:713), describing how objects are ''conjured'' up, wrote: ''No object or word is clear in itself. Over the course of a sequence they become clear.'' She was alluding to Garfinkel's conversational illustration, but the prospective/retrospective process of sense making described by Garfinkel applies with equal force to procedural sequences and to other forms of concerted action. Game playing, conversation, and enacting procedures all entail meaning making and all meaning making requires trust in the sense described by Garfinkel.

We see an example of Garfinkel's ''retrospective-prospective sense of a present occurrence'' (1967:41) in the way in which the cystic-artery-for-the-purposes-of-*this*-surgery is produced. When Clerk asked, ''Can you see the cystic artery yet?'' (Excerpt 3c, line 24), his question suggested trust on two levels. He relied on the competence of his interlocutors, Attending and Resident, to see something that he apparently could not. His ''yet'', however, also displayed another form of trust, a trust that the procedure would, in due course, make the object available to all. Similarly, Attending's reply, ''(He)'ll get out it out here in a minute'' (Excerpt 3c, line 28) and his later direction to Resident, ''Comin' up'' (Excerpt 3d, line 45), were both prospective references to what would come to serve as the cystic artery. They project an understanding to be. But, there were also retrospective references. When Resident offered this assessment late in the surgery, ''I feel pretty comfy that's the ah (1.3) the right artery there'' (Excerpt 7, lines 1–2), he referenced the end of ''a succession of realized meanings of the thus-far accomplished course'' that Garfinkel (2008:211) had described. His statement, not only affirms the recognition, but displays his trust in the procedure, when diligently carried out, to produce the ''right'' structure. Thus, we see how procedure 'determines' this particular object, in the sense suggested by Sharrock and Button.

One might ask, where was the procedure here? The answer would have to be, nowhere and everywhere. The participants were not following a set of written instructions and there was no bookstand at tableside bearing a surgical text. Work was required of all parties and at all points to coordinate understandings of what they were doing together. We have

described this effort as *procedure work*. In the surgery described here, the presence of Clerk afforded participants an accessory method of marking procedural progress in the form of a narrative commentary presented by the attending and, occasionally, the resident. This explication, for the most part, preceded the described work and, as we have noted, sometimes played a role in its enactment. Absent a non-initiate and this running commentary, the work of producing the procedure as what it is must be carried out within the procedure itself. For example, when Resident issued a request in Excerpt 6 for a clip-applier, his request implied the achievement of a ''critical view'' (Strasberg and Vollmer, 2001:434) and constituted an avowal of recognition. The steps that followed (clipping and transection) were the clearest possible ostensive demonstrations of what he was taking to be the cystic-artery-for-the-purposes-of-*this*-surgery. They not only announce to those present how a particular feature of occasioned corpus was to be understood, but also that a particular juncture in the advancing procedure had been reached. Just as the production of a particular instrument reading as a manifestation of ''independent Galilean pulsar'' transformed the astronomer's work described by Garfinkel et al. (1981) into the work of producing a discovery, we see here that the production of something as the cystic-artery-for-the-purposes-of-*this*-surgery crucially contributed to the transformation of the surgical team's collective activities into an enactment of a laparoscopic cholecystectomy. Procedures, in this way, both determine and are determined by the objects they entail.

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