DESCRIBING THE "LEARNING LOOP": AN OVERALL STRUCTURAL ORGANIZATION OF SCAN-ECHO VIDEO CONSULTATIONS BETWEEN SPECIALIST AND GENERALIST PROVIDERS FOR SPECIALTY CARE LIVER PROBLEMS

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Consultations are the traditional method of communication between generalists and specialists managing patients with specialty care needs. Videoconferencing health information technology enables generalist and specialist providers to co-manage patients with complex chronic illness and can facilitate workplace learning about specialty care. This study analyzes 32 video consultations between generalist and specialist providers caring for patients with chronic liver disease at two U.S. sites to describe the overall organizational features and constituent interactional activities. Results show that video consultations have a four phase overall structure and three distinct consultation types: *full cases* in which generalists presented new patient cases; *updates* in which generalists or specialists revisited previously discussed cases; and *summaries* in which specialists presented new cases. Results suggest that providers take-for-granted the learning opportunities available in each consultation type. Increased awareness of the overall organization and interactional activities help providers diversify specialty care learning opportunities and, ultimately, improve health outcomes.

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While up to 20% of primary care visits in the U.S. result in a specialty care referral, (Barnett, 2012; Donohoe et al., 1999), a significant number of people have restricted access to specialty care providers for complex, chronic conditions, such as hepatitis C infection, rheumatoid arthritis, chronic pain, and others. Reduced access to specialty care means that generalists are often called to manage specialty care problems, but have limited knowledge and support they need. When generalists encounter specialty care problems about which they have little experience, the traditional method of communication between generalist and specialist providers is the consultation, popularly known as a specialty care referral. Research characterizing consultation communication has shown that generalists may inappropriately request specialist consultations (Goldman, 1983; Salerno, 2007), may not ask clear consultation questions (Bowling & Redfern, 2000; Donohoe, 1998; Lingard, Hodges, Macrae, & Freeman, 2004), and may not specify the reason for the consultation (O'Malley & Reschovsky, 2011).

Health Information Technology (HIT) innovations, such as electronic health records and videoconferencing, have the potential to enhance connectivity between specialist and generalist providers (Donohoe et al., 1999; Pearson, 1999; Salerno, 2007; Sears & Charlson, 1983) and enable novel models for provider-to-provider communication and care coordination about specialty care problems (Berendsen et al., 2006; Harrison, Clayton, & Wallace, 1996; Hungin & Seifert, 2004; O'Malley & Reschovsky, 2011). HIT can also provide a platform to devise and test new models of generalist-specialist communication to support patient management (Arora et al., 2010, 2011; Frank et al., 2015; Ho et al., 2013; Lundvoll Nilsen, 2011a, 2011b). For example, the Extension for Community Health Care Outcomes (ECHO) project, also known as Project ECHO or simply ECHO, uses videoconferencing to blend patient management with ongoing workplace education for specialty care problems to improve access to specialty care providers. The Project ECHO model is a collaborative model to facilitate a "knowledge network" of generalist providers with "deep domain expertise" (Arora et al., 2007) of a specialty care area achieved through participation in regular video-based consultations with specialists to increase generalists' knowledge about and practical knowledge of specialty care issues (Arora et al., 2010). The ECHO model has shown to be associated with positive patient health outcomes for patients with hepatitis C infection (Arora et al., 2011), chronic pain (Frank et al., 2015; Katzman et al., 2014), and other chronic conditions. Based on this success, in 2011 the United States' Veterans Affairs Health Administration (hereafter: VA) adapted the ECHO model (Knapp & Pangarkar, 2015; Scott et al., 2012) as the Specialty Care Access Network-Extension for Community Healthcare Outcomes (SCAN-ECHO). Mirroring Project ECHO, SCAN-ECHO was introduced as a workplace-based continuing medical education program to help educate generalist providers serving military veterans throughout the United States about specialty care problems.

The ECHO and SCAN-ECHO models are educational programs in which generalists are partnered with specialist mentors to present patient cases from everyday general practice through a videoconference portal to receive advice about managing and treatment specialty care problems. Multiple generalists attend ECHO sessions, and non-presenting generalist providers observe via videoconference discussion as overhearing (peripheral) participants (Lave & Wenger, 1991). Early literature claimed that the primary mechanism driving the ECHO model was the "learning loop," defined as "case-based educational experiences in which community providers learn through three main routes: 1) longitudinal co-management of patients with specialists; 2) other primary care providers on the network via shared case management decision-making; and

3) short, didactic presentations on relevant topics" (Arora et al., 2007, p. 156). Prior literature has theorized that the learning loop is the core of the ECHO model (Arora et al., 2010), but no prior research has empirically characterized ECHO or SCAN-ECHO sessions. In this article, we use video recordings of SCAN-ECHO sessions to empirically investigate the overall structure organization and to discern the order and composition of activities that constitute that organization. We argue that the overall organization and interactional activities within the sessions offer multiple affordances for collaborative patient care and distinct workplace learning opportunities for specialty care, reminiscent of the theorized "learning loop."

STUDY DESIGN AND METHODS

Data Collection Procedures

Using national VA administrative data, we identified two high-performing sites defined by the total number of SCAN-ECHO video consultations between community-based generalists and gastroenterologist specialists for military veterans with complex hepatitis C virus (HCV) infection and liver disease. The videoconferencing platform used to conduct the SCAN-ECHO consultations was equipped with endogenous recording capability, enabling unobtrusive session recording. The goal of video recording was to empirically capture the interactive communication among generalist and specialist providers as they conduct routine video consultations (Heritage & Maynard, 2006; Roberts & Sarangi, 2005), maximizing environmental validity by documenting actual cross-provider communication behavior in real-time. While video recording has been extensively used to analyze provider-patient communication during medical encounters (Drew & Heritage, 1992; Heritage & Maynard, 2006), naturalistic video recording techniques have not been widely used to investigate provider-to-provider communication (Frank et al., 2015; Lundvoll Nilsen, 2011a, 2011b). We pilot tested recording before beginning data collection to ensure the platform could generate a high-quality recording without disrupting normal session activities. Once we verified these criteria, we sequentially recorded sessions first at Site 1 and later at Site 2. Participating providers were informed of the video recording before beginning data collection and at the beginning of each session. Data collection began in September 2013 and was continuous through April 2014. The University of California, San Francisco and Stanford University Institutional Review Boards approved this study protocol. Data collection ultimately resulted in recording 37 total SCAN-ECHO sessions (Site 1 $n = 19$; Site 2 $n = 18$) consisting of 14 hours and 21 minutes of video. Five sessions contained significant recording errors and were discarded, resulting in 32 sessions for analysis.

Research Sites

We recorded sessions from two research sites. Site 1 was located in a large Western academic VA medical center, and Site 2 was located in a large Mid-Western VA medical center. Each site served as a hub for an extended network of community-based outpatient clinics located in geographically rural or suburban areas within each medical center's catchment area. Site 1 sessions included generalist participants from seven associated rural community-based clinics. Site 2 sessions included participants from 15 associated rural and suburban community-based clinics.

While most participants came from community-based clinics relatively local to the associated medical center, some participants attended sessions from other locations nationally.

Research Participants

Participants were 36 generalist physicians, nurses, pharmacists, and nurse practitioners working in general primary care practice settings, and four administrative staff. Specialist providers were three gastroenterologists who specialized in complex, chronic liver disease, two psychologists, and one pharmacist whose expertise was specialty liver care. Site 1 participants were an interdisciplinary specialist team composed of a gastroenterologist mentor who facilitated SCAN-ECHO sessions, a psychologist, and a pharmacist, a small group of six generalists who attended every week during data collection, and six generalists who attended one or two times during data collection. Site 2 participants were two gastroenterologists who co-facilitated the sessions, a small group of four generalists who regularly attended, and a large group of 20 generalists who attended one or two times during data collection.

Data Analysis

Recordings of the video-mediated consultations were professionally transcribed resulting in approximately 1300 double-spaced pages. Transcription protocols used specific conventions to ensure speakership designations and verbal contributions were adequate for analysis. Transcripts were reviewed for accuracy and de-identified using a system to preserve participants' roles and identities but ensured anonymity. We uploaded recordings and transcripts into TRANSANA, a qualitative data management package that coordinates digital recordings and transcript texts (Woods, 2008) for structural and substantive coding and interactional analysis.

Two authors, a health communication scientist with advanced training in health services research (Koenig) and a primary care physician (Wenger), led the analysis and presented findings to specialist (Rongey and Graham) and generalist (Asch) providers throughout the analytic process during weekly meetings. Our analysis was composed of multiple steps, and we used a combination of ethnographic (Koenig, Ho, Trupin, & Dohan, 2015; Maynard, 2003; Roberts & Sarangi, 2005) and interactional (Drew & Heritage, 1992; Heath, Hindmarsh, & Luff, 2010; Heritage & Maynard, 2006) methods to explore the social organization of video consultations across two sites. In the first six months of data collection, two authors (Koenig and Wenger) used ethnographic participant observational methods to observe activities that routinely occurred before, during, and after each session at Site 1. Observations were unstructured to develop a preliminary understanding of constituent activities and how these activities might contribute to the organization of the overall session and the learning loop. For interactional analyses, we repeatedly reviewed all video consultations together with their transcripts to analytically characterize the social process and content of recorded sessions. Our analytic goal was to identify and to describe recurrent activities, processes, and social actions to develop an overall structural organization of video consultation sessions (Robinson, 1999, 2013; Schegloff, 2006, 2007; Zimmerman, 1992). Finally, we created an original temporal coding scheme to structurally code the temporal duration

of each constituent activity (Saldaña, 2009). In the following sections, we first describe the organization of the SCAN-ECHO session ethnographically, and then we describe some gross interactional and substantive features of the learning loop in recorded SCAN-ECHO sessions.

RESULTS

An Ethnographic Description of SCAN-ECHO Sessions

SCAN-ECHO sessions are episodes of social interaction composed of an ordered series of regularly occurring activities organized into distinct phases. Figure 1 presents a working model of a generic SCAN-ECHO session with four phases: opening, case consultation, didactic segment, and closing. Similar to Byrne and Long's (1976) model of the acute medical visit, each phase has its own organization and constitutive activities and subactivities. Table 1 compares average activity duration for each site. The following sections briefly characterize each phase and describes how each fits into the overall organization of the SCAN-ECHO session.
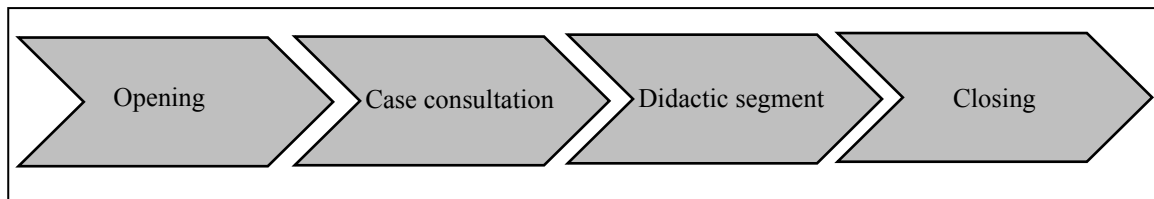

FIGURE 1
Generic SCAN-ECHO session phase structure.

TABLE 1
Average duration of SCAN-ECHO phases by site

Activity	Site 1	Site 2
Opening	09:15	04:53
Case consultation	28:14	42:06
Didactic segment	07:19	12:09
Closing	04:58	02:31
Total average time	49:47	1:01:39

Opening the Episode: Establishing Co-Presence and Starting Work

As with other ordinary and institutional episodes of social interaction, the opening phase of the SCAN-ECHO session is activity-dense. Because sessions are held via videoconference, once participants log in they become co-present in visual and auditory modalities, and they can interact with other participants. Thus, one of the first orders of business is to establish co-presence of partic-

ipants through both informal and formal resources. Informally, participants greet one another when they log in and sometimes engage in social talk before the session starts. Formally, once the session starts, the specialist typically opens the session with a roll-call attendance taking wherein each participant present says her or his name in succession until everyone is accounted for. On the occasion in which a participant attends the session for the first time, the specialist often provides a general introduction to the session and its goals, which establishes the general order of activities and typically implies participants' roles and responsibilities. Of particular importance to setting the session agenda is the negotiation about who will first present a case consultation, which often begins with the opening and serves as the activity transition to start the business of the next phase.

The Case Consultation Segment: Case-Based Workplace Learning

After the opening, generalists and specialists present and discuss patient problems during the case consultation phase. Out of the 32 sessions analyzed, we identified 115 individual consultations (Site 1 $n = 55$; Site 2 $n = 60$), with an average number of four consultations per session (range 2-6). We discovered three consultation types, the *full case*, the *update*, and the *summary*, which we discuss below. Each consultation type has its own speakership negotiation techniques, participant roles and responsibilities, action trajectories, and opportunities for learning. We discerned three gross regularities across the three consultation types. First, participants negotiate speakership for who will hold the conversational floor. Second, one participant presents a patient case with a specialty care problem for consultation. Third, patient case discussions can include questions about the patient's medical and psychosocial history; specialist advice about liver disease prevention, management and treatment; and organizational, medical, and legal context about specialty liver care. Case consultations are discussed in detail the next major section.

The Didactic Segment: Focused Continuing Medical Education

The second activity recognized in prior literature of the Project ECHO model is the didactic segment. Specialists are responsible for the content of the didactic segment, as generalists typically listened to specialist presentations and did not speak until the end of the didactic segment. While specific formats vary, didactic segments are overwhelmingly composed of specialist-produced extended multi-unit turns. Didactic content typically includes pre-recorded (video) research presentations, slides from research presentations that the specialist or an invited guest narrates, informal discussions about liver health and disease, reviews of VA-specific and general medical clinical guidelines for prevention, screening, and treatment of liver disease, and discussions of various treatments for a broad range of liver disorders. However, after the formal presentation specialists often answer questions and respond to generalists' comments. Educational content aside, the didactic segment has professional and organizational functions as well. Professionally, generalists can apply for Continuing Medical Education (CME) credits they need to maintain medical credentials. Organizationally, generalist participants frequently invoke the CME as the primary reason to justify their participation in the sessions because participation takes away from patient care responsibilities.

Closing the Episode: Concluding Work and Disengaging Co-Presence

As with the opening, the closing phase of the SCAN-ECHO session is filled with diverse activities. While some activities are occasioned by the session itself, such as final thoughts on one or more case consultation discussed during the session and coordinating organizational logistics, other closing activities mirror activities documented in other ordinary and institutional settings, such as coordinating future occasions of contact, social talk, and formal leave-taking. However, when generalist participants leave during the middle of sessions to attend to patient care duties, they neither bid farewell nor conduct other leave-taking behavior. Episode closings depend on what happened in the immediately prior phase. Sessions that incorporate a formal presentation in the didactic segment typically end with a short, functional sign-off in which participants reciprocally thank one another and immediately disappear from the screen, thereby ending their session participation until the last participant disappears. Sessions that do not include a didactic segment typically end with coordinating activities resulting from patient case consultations, administrative reminders, and making plans for future case discussions.

Contingencies in the Composition and Ordering of Session Activities

As an ideal-type phase model, the phase composition and phase order can vary. Similar to the Byrne and Long's (1976) model of the acute medical visit, not all SCAN-ECHO sessions contain all phases. While all sessions contain openings and closings, some openings and closings are extended and others are concise. Some sessions contain no patient case consultations and focus only on didactic segments. Other sessions contain no didactic segment, but sessions are composed of multiple case consultations. Similarly, phase order can also vary. While most sessions tend to follow the normative order illustrated in Figure 1, after opening some sessions place the didactic segment first and move to patient case consultations second.

THE CASE CONSULTATION: THE ENGINE OF THE ECHO MODEL

While prior research has claimed that case consultations form the core of the ECHO model (Arora et al., 2007, 2010), little work has been done to characterize case consultations empirically. In this section, we describe the activities composing the case consultation and show how each activity balances the dual goals of specialty patient care and workplace learning during SCAN-ECHO sessions. In our analysis, we identified three types of case consultation: the *full case*, in which a generalist presents a new patient case for consultation; an *update*, in which a generalist or specialist participant revisits a case discussed in a previous session; and a *summary*, in which a specialist presents a new patient case for consultation on behalf of a generalist participant. Table 2 describes the frequency of each consultation type across sites. Figure 2 illustrates the gross activities that compose each consultation type. In the following sections, we characterize the overall activity structure and some interactional features of each consultation type, but we describe full case consultations in detail because they were the majority of cases.

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TABLE 2
Frequency of consultation types by site

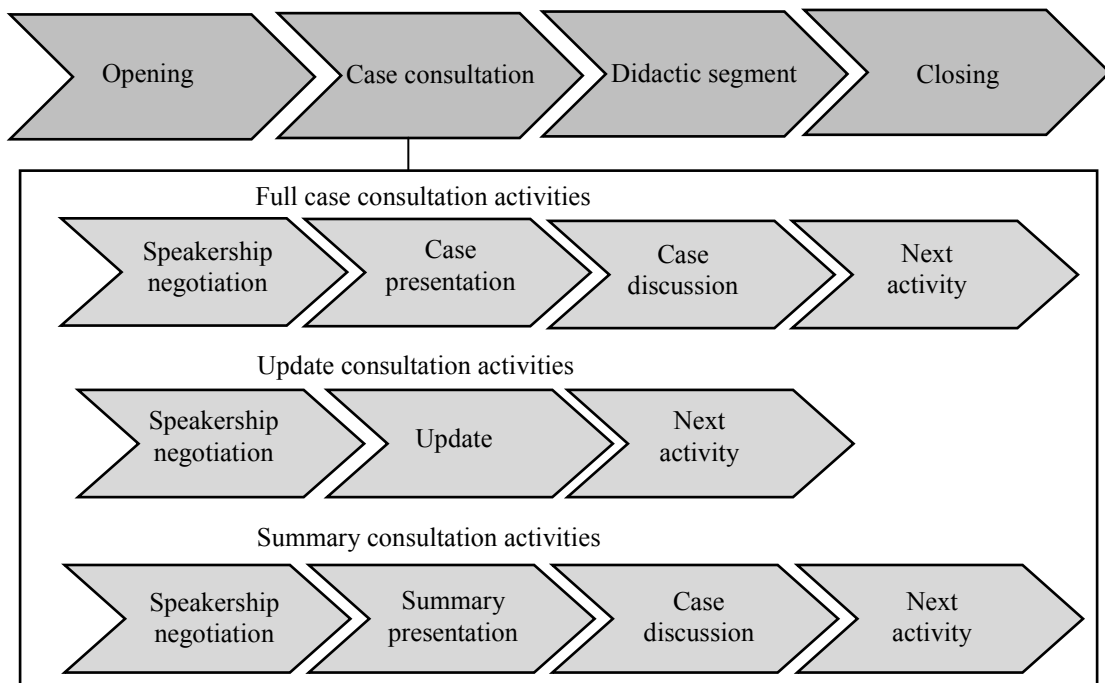| Consultation type	Site 1 % (*n*)	Site 2 % (*n*)	Average % (n)
Full case	71% (39)	78% (47)	75% (86)
Update	27% (15)	3% (2)	15% (17)
Summary	2% (1)	19% (11)	10% (12)
Total	100% (55)	100% (60)	100% (115)

FIGURE 2
Overall structural organization of the SCAN-ECHO session
in relation to the overall activity organization of each consultation type.

The Full Case Consultation

Full case consultations are characterized by a generalist presenting a new patient case to a specialist for a specialty care problem encountered in her or his everyday clinical practice. Full case consultations were the most frequent consultation type and were found in nearly equal numbers across sites (see Table 2). Case consultations are presented serially, and multiple cases are typically presented in a single session. In SCAN-ECHO, generalists typically submit patient cases to specialists before the session, but generalists sometimes presented cases spontaneously as well. Full cases are organized in three sequenced activities shown in Figure 2: negotiating speak-

er selection for who will present next; a case presentation in which the generalist describes the patient case and normatively ends with a consultation question (Koenig, Wenger, Graham, Asch & Rongey, 2016); a case discussion first between presenting generalist and specialist about the patient case, which routinely leads to a group discussion among the specialist and all generalist providers about the patient case related to generic issues of specialty liver care. Extract 1 shows a typical case consultation and characterizes each activity.

Participants negotiate speakership for a full case consultation in various ways shown in Extract 1A. Generalists can self-select as next speaker, specialists can select a generalist as next speaker, or either generalist or specialist can bid to continue as current speaker from some prior activity as a bid present a full case. The following segment starts immediately after the episode opening. The speakership negotiation sequence (Lines 1-17) begins with the specialist (SP MD) asking two generalist providers (GEN MD, GEN NP1) if they have patient cases to present (Lines 1-3).

Extract 1A. Site 1 30924 Consultation 1. Speakership negotiation

```
 1 SP MD:    Okay. Okay. Great. So, do either of you
 2           have any cases you'd like to talk about
 3           today?
 4 ADMIN:    [GEN NP2] entered one in.
 5 SP MD:    [GEN MD2] entered two, but I don't know
 6           if [GEN NP2] wants to give one – I mean,
 7           talk about it herself in October. And then,
 8            [GEN MD3], we have one from her.
 9 GEN MD:   Okay. Let me go try and track her down. I
10           think she's just with the residents.
11 GEN NP1:  I have one I want to talk about. And [GEN NP2]'s
12           not here today, [SP MD].
13 SP MD:    Okay. Yeah, sure. Let me open this up and
14           let's go ahead and talk. So, I'm waiting
15           for my computer to boot up here. Yeah,
16           that would be great. ((Pause)) Alright,
17           [GEN NP1], who do you have?
```

Before either can respond, the administrative assistant (ADMIN) announces that a non-present generalist (GEN NP2) submitted a patient case for consultation (Line 4). The specialist notes that other generalists also submitted consultations (Lines 5-8), but none are currently present. GEN NP1, who is present, announces he has a case ready to present (Line 11) and that his colleague, GEN NP2, will be absent for the session (Line 12). SP MD first acknowledges his bid to talk next (Line 13) and begins organizing herself to the case by logging into her computer (Lines 14-16). Once completed, she ratifies GEN NP1 as next speaker asking, "who do you have?" (Line 17), an organizationally specific shorthand asking him to identify the patient to be discussed. Once ratified as the first presenter for the session, GEN NP1 begins a multi-unit case presentation shown in Extract 1B.

Extract 1B. Site 1 30924 Consultation 1. Case presentation
18 GEN NP1:   I have a gentleman – in fact, I just

19		submitted the consult early this morning.
20		His name is [NAME] – E as in Echo – 0000.
21	SP MD:	Okay.
22	GEN NP1:	And this gentleman, he's a 54-year-old male,
23		HCV geno[type] 3-A. He's been on Peg-Riba
24		treatment 24 weeks since May 10. He's a
25		previous relapser. And since he's been on the
26		treatment, his ALT and AST have been progressively
27		going up to the point where, as of last week,
28		his ALT was five times the normal. And his AST
29		is probably two to three times normal. He's at
30		week – actually, he's at week 20 of 24 week
31		treatment.
32	SP MD:	Wow.
33	GEN NP1:	He had a liver biopsy about five or six years
34		ago when he was incarcerated. And when they
35		treated him, also, and then he was – he relapsed
36		afterward. He hasn't – we've done repeated U-toxes
37		on him. He hasn't had any alcohol for probably
38		about a year. He was on some Naproxen probably
39		up until about two or three months ago. He stopped
40		all that. He stopped his Percocet maybe about a
41		little bit over a month ago. He uses a topical
42		cannabis-based spray for his back pain. But other
43		than that, I mean, he's on a little bit of
44		Tramadol for his pain. He's really not on anything
45		else – I'm looking right now, yeah – that might be
46		stressing his liver. So, [NAME] is looking at the
47		situation. I just thought I'd discuss it with you,
48		too, and I'll be seeing her in a little bit. But
49		we're trying to decide what's best. I mean, he's
50		been – he's been non-detective with his virus
51		probably for the last three or four months. So, he–
52		the question is, should we discontinue treatment
53		now? What do you think?

Case presentations are structured by the generalist first identifying the patient's last name and the last four digits of her or his social security number (Line 20) and then moving on to a *clinical characterization* of the patient's specialty care problem, which in this case is a hepatitis C infection. The presentation identifies the hepatitis genotype (Line 23), the patient's current treatment regimen (Lines 23-25), liver enzyme levels (Lines 26-29), treatment duration (Lines 29-31), biopsy results (Lines 33-36), alcohol and drug use monitoring results (Lines 36-38), and current medications (Lines 38-46). While the specialist demonstrates active verbal recipiency throughout the presentation (Lines 21, 32), visually she is oriented to her computer screen, look-

ing at the details of the patient case in the electronic medical record. VA participants in the same geographical catchment area typically have equal access to patient electronic medical records, which is often used as a resource throughout SCAN-ECHO sessions.

The generalist projects an upcoming end to his speaking turn by mentioning that a local specialist will also consult on this patient case (Lines 46-48), as "we're trying to decide what's best." (Line 49). Before he completes his turn, however, he states the core clinical problem for which he wants a specialist consultation: the patient's viral load has been so low that it is currently undetectable (Lines 49-51). This leads to a specific *consultation question*, "So, he– the question is, should we discontinue treatment now? What do you think?" (Lines 51-53). One characteristic of full cases is that generalist case presentations typically end in one or more consultation question (Koenig, et al., 2016). As the selected recipient, the specialist is structurally selected as the next speaker to provide an answer. As in other settings, questions initiated by one party normatively require an answer by another party to bring the paired action sequence to possible completion. In response to the generalist's consultation question, the specialist projects a multi-unit turn, "Well, a couple things." (Line 54, Extract 1C), that begins the next major component of the full case consultation, the case discussion.

Extract 1C. Site 1 30924 Consultation 1. Case discussion
54 SP MD: Well, a couple things. I'm just pulling up his–
55   it's for some reason going pretty slow here.
56   Has he been screened for autoimmune hepatitis
57   before therapy? I'm sure you guys did that.
58   ((case discussion continues))

Before delivering an answer, the specialist elicits additional information about the patient case (Lines 56-57), which expands the discussion into various related elements, including medical, behavioral, social, and administrative domains. While space limits a detailed description of the case discussion activity, once the generalist asks a consultation question, the answer is progressively answered throughout the ensuring case discussion. Rarely does the consultation question receive a straightforward answer and can be characterized as a process of negotiation in which specialists evaluate clinical evidence, recommend additional labs, imaging, or other discovery procedures, recommend treatment options and next steps. This suggests that specialists orient to full case consultations both as occasions for (co-)managing complex specialty care issues with generalist primary care providers and as a workplace learning opportunity to socialize generalists into one facet of routine specialist practice.

While the activity structure for full consultations was consistent across sites, there was variation in generalist and specialist roles and responsibilities (see Table 3 and Figure 3). Site 1 generalists were exclusively responsible for presenting patient cases, and they had more time to explain general issues relevant to the specialty care problem. By contrast, Site 2 generalists had only a short time to characterize the main problem or concise consultation question before the specialist provided a comprehensive case consultation, suggesting that generalists and specialists share responsibility for case consultations. The distinct organizations of case presentations across sites suggest different opportunities for workplace learning about specialty care problems, which we present in the discussion section below.

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TABLE 3
Average duration of full case consultation activities by site

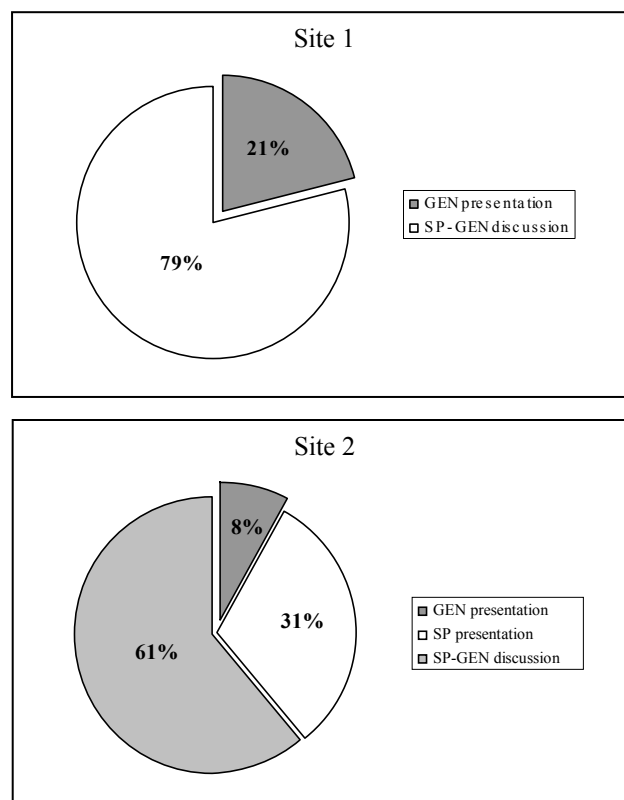| Activity	Site 1	Site 2
Case presentation		
Generalist	1:48 minutes	0:54 seconds
Specialist		3:24 minutes
Case discussion	6:42 minutes	7:20 minutes
Total average	8:30 minutes	11:38 minutes

FIGURE 3
Average time spent on each full case activity by participant role and site.
GEN = generalist; SP = specialist.

Full case consultations have several interactional and substantive elements. Interactionally, specialists facilitate the order of and which generalist is responsible for each patient case presentation. Full case presentations typically end with one or more consultation questions that projects the upcoming completion of the case presentation and signals to the specialist that a speakership change is imminent. As selected next speaker, the specialist begins the next activity, the case discussion that

progressively answers the generalist's consultation question. One implication is that the consultation question and its resulting answer are a candidate core sequence underlying the larger activity structure of the full case consultation. Both generalists and specialists orient to the normative presence of the consultation question, as consultations that have no discernable consultation question are treated as accountably absent. Finally, differences in speakership roles and responsibilities demonstrate differences in session organization and suggest distinct educational objectives across sites.

The Update Consultation

Update consultations are characterized by either a generalist or specialist revisiting a patient case discussed in a prior session to announce a treatment success or failure, to relay normal or abnormal test results, or to convey other patient-related news, such as a patient death. Update consultations were the second most frequent consultation type, and the majority of cases were from Site 1 data (see Table 2). Updates were mostly unplanned or emergent during SCAN-ECHO sessions and were typically brief, though occasionally update consultations emerged into longer case discussions. Updates are organized in two sequenced activities (see Figure 2): a speakership negotiation sequence and the update itself, which is typically delivered in a multi-unit turn by either generalist or specialist. In the following extract, we identify some features of this consultation type.

When negotiating speakership for an update consultation, participants typically bid to continue as current speaker that extends a current speaking turn beyond the upcoming point of projectable completion. For example, Extract 2A begins as the specialist (SP MD) concludes the prior full case consultation (Lines 1-3) and begins a pre-sequence in which she asks another participant at the same facility (GEN MD) to "relay something?" (Line 8) to a colleague (GEN NP2) who typically attends sessions, but happens to be absent. Through this pre-sequence, she negotiates an extended turn at talk, which begins the update.

Extract 2A. Site 1 31119 Consultation 5. Speakership negotiation
1 SP MD: Yeah, I'd love to see it. GEN MD, I hear
2   GEN NP1 these are great cases. Thank you.
3 GEN NP1:   Uh-huh. Thanks.
4 SP MD: GEN MD, are you on the call, as well?
5 GEN MD: Yeah, sorry. We're having some IT issues.
6 SP MD: I'm sorry. So, is GEN NP2 with you?
7 GEN MD: No. Do you need her? I can go find her.
8 SP MD: No, I mean, if you could relay something?
9 GEN MD: Absolutely.

The update in Extract 2B has a discernable structure. First, SP MD identifies the patient (Lines 10-11) and immediately launches into a multi-unit announcement of abnormal findings detected through magnetic resonance imaging (MRI) (Lines 13-19). Findings showed a small, abnormal, and potentially cancerous, growth on the patient's pancreas (Lines 15-17), which might cause concern, as pancreatic cancer can be both aggressive and difficult to detect. Despite clinical guidelines that recommend another course of action (Lines 19-21), the SP MD was

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"bothered" by "the ductal dilation" (Line 23). Thus, SP MD informs GEN MD that she sent these findings to another specialist, a biliary endoscopist (Line 24), for secondary evaluation (Lines 24-33). Retrospectively, SP MD's update is composed of an announcement of potentially problematic findings and a referral to a specialist. Contextually, this news is update-worthy because it means the consultation that GEN NP2 presented the prior week is still ongoing, and SP MD wants to ensure she is aware of the incomplete status of this ongoing consultation. The update ends with an exchange (Lines 30-33) in which GEN MD asks SP MD about the method through which the absent GEN NP2 can learn about the consultation status.

Extract 2B. Site 1 31119 Consultation 5. Update sequence

10	SP MD:	There's a patient she presented last week,
11		a [NAME 0000]
12	GEN MD:	Okay.
13	SP MD:	The patient is HCV geno 1. MRI was done for the
14		sort of mild intrahepatic, extrahepatic ductal
15		dilatation. So, the MRI revealed a 1-cm side
16		branch IPMN – you know, those sort of cystic,
17		pancreatic neoplasms.
18	GEN MD:	Okay.
19	SP MD:	And, typically, we wait until they're about 2-cm
20		before we go in with an EGD and an endoscopic
21		ultrasound to better characterize the lesion.
22	GEN MD:	Okay.
23	SP MD:	But what bothered me was the ductal dilatation.
24		So, I had her biliary endoscopist – she's going
25		to review this guy's radiology records – and the
26		actual films, rather – and then leave a note as
27		to whether she wants to bring the patient in for
28		an endoscopic ultrasound, to better characterize
29		that lesion.
30	GEN MD:	Okay. And will they co-sign her on the note so
31		she knows, or –
32	SP MD:	Yeah, I co-signed her, so just have her log in.
33	GEN MD:	((nods))

Before the update ends, SP MD shifts from her role as specialty care provider supplying patient care to her role as specialty care educator by explicitly invoking the update as "a great opportunity" to discuss among the group (Lines 34-45), as primary care providers must routinely interpret MRI results and decide what next steps may be necessary shown in Extract 2C.

Extract 2C. Site 1 31119 Consultation 5. Educational post-mortem

34	I thought it would be a great opportunity to just
35	kind of bring up on the call. A lot of us, we do
36	get MRIs for our patients, and we do pick up these

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37	side branch IPMNs. And they are a matter of debate,
38	but, you know, some biliary endoscopists will want
39	to go in and take a look at the lesion once it gets
40	up to 2-cm. Others get more nervous if they start
41	to see concompetent biliary dilatation, which is what
42	this guy has, and will want to go in sooner. So, it
43	was just – I thought that was a great teaching point
44	for me – and I'm sure for any of you that have ever
45	ever encountered patients like this on your MRIs.
46	((shift to next activity))

This secondary framing of the update as an educational event underscores the tension between the business of conducting specialty patient care and the business of providing ongoing provider education during SCAN-ECHO sessions. Whereas full case consultations were typically framed as opportunities for practical patient care, updates were frequently treated as opportunities for reflection about generalist and specialist provider roles and for discussion about administrative routines and organizational procedures that did not occur during any other time.

Update consultations have several discernable interactional and substantive features. Interactionally, either generalist or specialist participants can negotiate speakership to produce an update. The typical technique to negotiate speakership for an update is by extending a current speaking turn beyond its initial point of projectable completion. Substantively, updates enact ongoing medical business to provide information, news, and administrative action about specialty care issues discussed in previous sessions. However, Extract 2 demonstrates a two-part structure in which medical business for an individual case is first discussed, but is subsequently transformed into a generalizable teachable moment. Updates may help improve access to coordinated specialty care and may simultaneously provide opportunistic learning opportunities about routine specialty care practice.

The Summary Consultation

Summary consultations are characterized by the specialist giving a comprehensive presentation of a new patient case by listing all clinical features relevant to a specific specialty care problem, such as liver-related diagnostic findings, co-morbid diagnosis, behavioral and mental health history, and treatment history. Summary consultations were the least frequent consultation type, and the majority of cases were from Site 2 (see Table 2). Summaries are organized in three sequenced activities (see Figure 2): negotiating speakership for an extended turn, a summary presentation of the patient case, and a transition into the case discussion.

Specialists negotiate speakership for summary consultations by either continuing as current speaker to extend an ongoing speaking turn or by offering to summarize a patient case in place of a generalist, as shown in Extract 3A. This extract begins as the overall episode opening concludes, and the two specialists (SP MD1, SP MD2) facilitating the session get down to the business of the session (Line 1). Speakership negotiation begins with SP MD2 selects a particular generalist nurse practitioner's (GEN NP) patient case to be presented first (Line 4). SP MD2 identifies the patient by last name and number (Line 7), and invites GEN NP to "just give a one-

liner," (Lines 7-8), which at Site 2 is shorthand for an abbreviated case presentation or consultation question. Note, however, that SP MD2 mitigates the invitation by embedding it between a pre-posed optionality clause, "if you want" (Line 7), and a post-posed offer for him to give the presentation, "or I can do that." (Line 8). GEN NP defers with a literal go ahead (Line 9), abdicating her responsibility for enacting the presentation and simultaneously authorizing SP MD2 to summarize the patient case on her behalf. The specialist acknowledges with "okay" (Line 10, Extract 3B), and begins the summary (Lines 10-56).

Extract 3A. Site 2 40110 Consultation 1. Speakership negotiation
1 SP MD1:   All right. So, should we get started, then?
2 SP MD2:   Do you want me to start?
3 SP MD1:   Yes.
4 SP MD2:   GEN NP, your patient's going to be first,
5   just out of random assignment.
6 GEN NP: Okay.
7 SP MD2:   It's [PATIENT NAME 0000] – if you want to just
8   give a one-liner, or I can do that.
9 GEN NP: Go ahead.

Summary consultations typically include a comprehensive review of the clinical features related to the patient's specialty care problem, which, in this case, is a chronic hepatitis C infection. The summary includes a generic characterization of the patient (Lines 10-11), the hepatitis genotype and treatment history (Lines 11-16), co-morbid disease (Lines 16-20), behavioral and mental health status (Lines 21-24), known pharmacological treatment and complementary medicine use (Lines 24-28), physical characteristics and hepatitis C infection risk (Lines 28-32), and a detailed blood panel results related to liver function (Lines 32-51). The summary ends with an overall conclusion and identification of an "underlying cirrhosis due to his chronic hepatitis C, even though he's young." (Lines 52-56). Similar to the consultation question in the full case consultation, identifying a specific specialty care problem projects the end of the summary and suggests an imminent shift to the next activity. After presenting the case, SP MD2 continues as current speaker and transitions to the next activity, the case discussion, which he projects another multi-unit turn with, "So, I have a couple recommendations based on this summary." (Lines 56-57).

Extract 3B. Site 2 40110 Consultation 1. Summary case presentation and discussion
10 SP MD2:   Okay. So, [PATIENT NAME]'s a 53-year-old
11   gentleman with chronic hepatitis C, genotype III,
12   who [PHYSICIAN NAME] had previously treated, but
13   only for a very abbreviated course, because he
14   developed symptomatic cholelithiasis, coincident
15   to treatment. So, he was only treated from DATE
16   1 to DATE 2. His past medical history's notable
17   for hypertension. There's a reference to COPD,
18   but I couldn't find pulmonary function tests.
19   His past medical history – again, he had his lap

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20	cholecystectomy in May, after his symptomatic bout.
21	His risk factors for hepatitis C are probably his
22	past history of IV drug use. He also has a history
23	of past alcohol use, although it's reported to be
24	extremely rare at present. He's a nonsmoker. His
25	current meds are only hydrochlorothiazide and
26	lisinopril for his hypertension, the albuterol
27	inhaler that was recently started. And note is
28	made that he takes several herbal remedies. So,
29	his physical exam in DATE was notable
30	for a weight of 229.5, a BMI of 36, and he has
31	multiple tattoos; that also may be a risk factor
32	for his hepatitis C. His ferritin at that
33	time was greater than 1,000. He was HIV negative,
34	surface antibody negative, and hepatitis A
36	serology was negative. He's subsequently been
36	vaccinated at the time of his initiation of
37	treatment. His laboratories before treatment in
38	DATE were essentially normal. His INR was 0.9,
39	had a normal alpha-fetoprotein, and his iron
40	saturation was somewhat elevated. Then, most
41	recently, this year, his AST, consistent with
42	his chronic hepatitis C since he didn't have a
43	virologic response – obviously, due to an
44	abbreviated course of hepatitis C treatment –
45	his transaminases are minimally elevated, his
46	bilirubin's normal, albumin normal, creatinine
47	is 1.1. And his platelet count, notably, is
48	104,000. And then on repeat serology, his
49	ferritin is still greater than 1,000. Saturation
50	is just slightly above 45 percent. His ANA's
51	negative, and he's got a normal SPEP.
52	So, in summary, this 53-year-old gentleman
53	with chronic hepatitis C, genotype III, I'm
54	concerned that he may also have underlying
55	cirrhosis due to his chronic hepatitis C,
56	even though he's young. So, I have a couple
57	recommendations based on his summary.
58	((case discussion continues))

Summary consultations have several interactional and substantive features. Interactionally, specialists are the primary speaker, as they negotiate an extended turn at talk, summarize a patient's case, and finally, facilitate the case discussion. Similar to full cases, summaries are substantively concerned with new patient cases. Whereas full cases emphasize generalist-led case

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presentations, summaries emphasize specialist-led presentations for a comprehensive review of clinical features relevant to the specialty care problem. While summary consultations may help socialize generalists to a case presentation style more typical between specialists, this consultation type may also be mobilized for particularly complex patient cases in which generalists may likely not have enough expertise to present on their own. However, it is possible that specialists sometimes use this consultation type to expedite patient cases during a session to ensure more cases can be presented and discussed. Through repeated exposure to the elements specialists present and the way in which they describe those elements, summary consultations may socialize generalists into framing patients' complex specialty care problems that are routine in specialist daily practice.

DISCUSSION

This article analyzes 32 video recordings to describe the overall structural organization of SCAN-ECHO sessions and to characterize activities of the case consultation between generalist and specialist providers managing patients with complex chronic illness at sites in the USA. To our knowledge, this study is the first to analyze SCAN-ECHO or Project ECHO sessions empirically. Our findings suggest several items for discussion about the organization and activity composition of SCAN-ECHO sessions.

First, SCAN-ECHO sessions appear to be composed of four distinct phases. This overall structural organization provides a general framework within which video consultations between generalists and specialists to conduct the business of patient care and workplace learning. Each phase has an internal organization and interactional opportunities. Similar to prior literature documenting institutional talk environments, SCAN-ECHO session opening and closing are activity-dense and provide broad social, professional, and organizational context. The case consultation is the most interactive phase in which generalist and specialist exchange knowledge about patient care and their respective practice expertise. The didactic segment phase was dedicated to formal delivery of specialist knowledge, typically in the style of a research presentation. As a result, this phase was the least interactive because generalist participation was incorporated as a question-and-answer segment after the end of formal didactic content. Out the four phases, the didactic segment may provide the most opportunity for innovation, as this phase might also include interactive exercises, real-time feedback, and open-ended questions to facilitate collaboration between specialist and generalist providers.

Second, the case consultation phase appears to be the focal activity of the SCAN-ECHO session, as our data documented three distinct consultation types. Interactionally, speakership negotiation is shared across consult types. Participants bid for and produce speaking turns as a result of speakership negotiation processes, and each consult type had limited relatively participant-specific speakership patterns. Substantively, each consultation type is composed of diverse activities that provide educational possibilities. Full case consultations composed the super majority of cases, and both sites had nearly equal numbers of full case consultations. This consultation type is may be the gold standard. Differences in the roles and responsibilities when presenting full cases may suggest differences in pedagogical emphasis. At Site 1, generalists are empowered to present patient cases relatively uninterrupted. This open-ended structure may give generalist providers the opportunity to articulate what they know about the patient's general medical condition

to better identify what they do not know about the patient's specialty care issues. Full case consultations empower generalists to reflect on their own clinical observations and experiences to formulate consultation questions, to connect general medical knowledge with specialty care knowledge, and to identify relevant specialty care knowledge domains. At Site 2, generalists are encouraged to present cases relatively concisely. This may give them an opportunity to formulate a specific consultation question or to identify a general specialty care problem in a brief format so that the specialist can present the case comprehensively. This two-part structure may be a technique to encourage generalists to learn to "speak like a specialist." This suggests that each approach may provide distinct learning opportunities. Whereas having more time to present patient cases at Site 1 may facilitate application of general medical knowledge to specialty care problems, listening to specialists' comprehensive case presentation at Site 2 may socialize generalists into learning how to "speak like a specialist" when presenting a specialty care problem. While these emphases may reflect differences in specialists' pedagogical objectives, they may also be the result of organizational or administrative needs that may not be discernable from video data alone. Similar arguments might be made for update and summary consultations as well. Update consultations enable generalists to experience ongoing clinical management of specialty care problems through observation of treatment victories and failures, administrative challenges, and lived experience of patient social situations. Specialists help provide larger medical, policy, and organizational context to help generalists understand the practice environment for ongoing insight into specialty care issues. In each case, specialist mentors help to balance patient co-management with workplace education, but each site used each consultation format in slightly different ways to achieve this balance.

Our findings show that updates were primarily found at Site 1 and summaries were primarily found at Site 2. One possible explanation for a nearly complementary distribution of these consultations types is that they may be emergent adaptations of the ECHO model implementation to fit the needs of specialist mentors who facilitate sessions according to generalist attendance patterns. For example, whereas Site 1 participants were a small group of generalists who attended video consultations often, Site 2 participants were a large group of generalists who video consultations only once or twice during data collection. Update consultations may be the result of repeated and continuous participation by the same generalists over time, which may facilitate knowledge depth about complex specialty care. Whereas updates may emphasize longitudinal coordination of care across provider teams, summary consultations may be the result of infrequent or discontinuous participation by generalists and may facilitate knowledge breath about specialty care issues. Thus, summaries may emphasize specialty care knowledge depth to provide generalists medical knowledge that may also socialize generalists into "speaking like a specialist."

Considering the data as a whole, each consultation type provides affordances for learning, which are taken-for-granted by participants immersed in the situation. Analyzing these activities can facilitate more systematic reflection about the relative advantages and disadvantages of each consultation types according to the patient care and learning outcome goals. For example, full case consultations may facilitate generalists to ask broad questions they may be unable to ask elsewhere or to present moderately complex patient cases. Update consultations, on the other hand, may encourage both generalist and specialist participants to be attentive to longitudinal aspects of patient care, as complex chronic illnesses are fundamentally episodic in nature and change in severity and acuteness over time. Finally, summary consultations may enable special-

ists to present highly complex or nuanced patient cases in a more didactic manner as a didactic case study for the benefit of community-based generalists. Awareness of the affordances for each consultation type might help deliberately tailor video consultations according to generalist provider needs and workplace learning goals for specialty care problems.

Finally, these findings provide empirical evidence in support of the theorized "learning loop." Early ECHO model literature (Arora et al., 2007, 2010) affirmed that video consultations between generalists and specialists created a social situation in which participants longitudinally co-managed patients with specialty care problems, exchanged knowledge among a virtual provider community, and engaged in learning on relevant topics. However, this early literature did not explicitly specify either the overall structural organization or the interactionally negotiated activities within the ECHO model contributed to these goals. The name "learning loop" implies an activity that is both recursive and repetitive. Our analysis provides empirical evidence for what is repeated — the serial presentation of patient cases into distinct consultation types each with their own organization and activity structures. Participants describe and discuss patients with specialty care problems, transforming them into "teachable moments" using different consultation types, each with their own affordances and learning opportunities. Our empirical work helps bridge the gap between theory and practice through combining ethnographic and interactional analysis by showing how the ECHO model might achieve the documented health outcomes (Arora et al., 2010, 2011; Frank et al., 2015; Katzman et al., 2014). One significant implication of the learning loop is that it may cumulatively create a multi-pronged multiplier effect where generalist participants apply specialty care knowledge to patients beyond the individual patient discussed during a videoconference session. Through participation in regular sessions, generalists have the potential to disseminate knowledge acquired during sessions directly to other providers in their local practice or community and, potentially, to become local experts within their practice communities who can help non-participating generalists address specialty care questions (Ho et al., 2013; Kirsh, Ho, & Aron, 2014; Kirsh, Su, Sales, & Jain, 2015). Our empirical work may help articulate the interactional basis for this multi-pronged multiplier and provide the intellectual groundwork for interventions to improve the efficacy of disseminating specialty care workplace learning through the ECHO model more generally.

Limitations and Future Research

This research has several limitations. First, the data are collected from two sites known to sponsor a high number of SCAN-ECHO sessions. These sites may not be representative of all SCAN-ECHO clinics for hepatitis and liver disease. Inclusion of additional SCAN-ECHO clinic sites for the same specialty care domain may reveal additional variation in the conduct and content of sessions. Second, we analyzed 32 SCAN-ECHO sessions over a nine-month for one specialty care domain, specifically, liver disease and hepatitis C infection. Our description of the overall structural and activity organization of the SCAN-ECHO session cannot necessarily be generalized to other specialty care areas. However, our empirical description enables a meaningful comparison between other specialty care areas with the overall structure and activity organization for SCAN-ECHO sessions more generally. Third, the large volume of video recorded data limited our ability to provide a detailed interactional analysis in favor of an analysis focusing on the overall structural and activity organization of SCAN-ECHO sessions. While overall structural

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organization is a major domain for investigating social interaction, it has not been widely used, and few empirical examples exist. This analysis can help guide more focused interactional analyses on several questions. For example, case discussions are rich interactional occasions in which specialists and generalist actively engage in talk about specialty care problems within the context of primary care. One as-yet unexplored question includes how case discussions balance specialty care learning opportunities with collaborative co-management for patients with complex specialty care needs and how generalist and specialist providers exchange knowledge bi-laterally about patient care during SCAN-ECHO and Project ECHO sessions. Further, while full case consultations are the most prevalent consultation type across sites, update and summary consultation types have unrealized potential for supplementing learning about different facets of specialty care and cross-provider communication, including coordination of care and integration of biopsychosocial expertises of each provider group. Investigating these questions may help to generate more precise recommendations for how to improve SCAN-ECHO and Project ECHO sessions according to the informational and practice needs of generalist providers.

Conclusion

This qualitative study begins to open the black box of provider-to-provider communication by investigating the process and content of interactive video consultations when managing a complex chronic illness. The ECHO model uses videoconferencing health information technology to bridge the gap between generalist and specialist provider knowledge of specialty care problems in order to augment access to care for complex chronic illnesses. To our knowledge, our study is the first to empirically describe the overall structural organization and interactional activity that compose SCAN-ECHO or Project ECHO sessions. In this era of multidisciplinary and team-based case, effective provider-to-provider communication is increasingly important, but relatively unexplored and under-researched. Our study suggests that video consultations provide a novel opportunity to study generalist-specialist communication about specialty care needs at the interstices of primary and specialty care settings. Meaningful use of videoconferencing and health information technology has the potential not only to improve complex chronic illness management, but also to ensure equitable and high quality care for people with specialty care needs in domestically and internationally.

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