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Communicative Practices Clinicians Use to Correct Patient Misconceptions in Primary Care Visits

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ABSTRACT
To investigate how clinicians correct patient misconceptions, we analyzed 23 video recordings of primary care visits. Analysis focused on operationalizing, identifying, and characterizing clinician corrections, integrating two inductive approaches: microanalysis of clinical interaction and conversation analysis. According to our definition, patient misconception-clinician correction episodes met three essential criteria: (1) the clinician refuted something the patient had said, (2) which the patient had presented without uncertainty, and (3) which contained a proposition that was factually incorrect. We identified 59 such episodes; the patient misconceptions most commonly related to medication issues; fewer than half had foreseeable implications for patients' future actions. We identified seven clinician correction practices: Three direct practices (displaying surprise, marking disagreement, contradicting the patient) and four indirect practices (presenting the correct proposition, providing explanations, invoking an outside authority, demonstrating with evidence). We found an almost equal distribution of these direct and indirect practices.

Patients need clear and accurate understanding of their medical diagnoses, prognoses, and treatment plans to participate effectively in medical decision-making and remain engaged in their care. However, patient misunderstandings or misconceptions are common; correcting them is important for both treatment adherence and patient safety (Kohn et al., 2000). Patients can have misconceptions about almost any aspect of their healthcare: the etiology of their illnesses, how to navigate the health care system, how to take their medicines, or what is going to happen next in their care. The purpose of this study was to investigate how clinicians correct misconceptions that patients reveal during the clinic visit.

While some patient misconceptions are relatively inconsequential – for example, a patient thinks his usual provider has graduated and no longer works in that clinic, but she has not yet done so – misconceptions can be harmful if they influence patients' future behavior in ways that affect their recovery or overall health. Previous research has shown that patient misconceptions can alter patient expectations, decrease patient satisfaction with care, and adversely affect patients' relationship with their clinicians (Franz et al., 2015). Patient misconceptions can contribute to patients not taking prescribed medication or to delayed or even missed care. For example, misconceptions can cause patients to disregard evidence-based treatments in favor of alternative or experimental ones (Bunzli et al., 2019), refuse to take medications due to negative beliefs about clinician motivations (Norful et al., 2020), or hold stigmatizing beliefs that challenge caretaking activities (Nwakasi et al., 2021). These and other misconceptions can pose significant health or safety risks (Kahan & Adesman, 2019). The ongoing COVID-19 pandemic presents an extreme example of how patient misconceptions about vaccine effectiveness have contributed to inadequate vaccination rates and subsequent excess hospitalizations and deaths (e.g., Schmidt et al., 2020; Thomas et al., 2021). Recognizing and correcting patient misconceptions are thus critically important for promoting patient safety, encouraging patient-centered care, and improving clinical outcomes. Due to their training and experience, clinicians are well positioned to identify and correct many patient misconceptions, particularly when they are related to physiology, pharmacology, treatment recommendations, and how the health system works. When deciding whether to point out a patient's error, clinicians must weigh the risk of threatening the patient's sense of being a "good," autonomous patient who manages their care effectively and safely (Parsons, 1951) with the benefit of providing accurate information that will support the patient's decisions and self-management. However, providing accurate information and ensuring that patients understand their care is one of clinicians' primary responsibilities to patients (Pilnick & Dingwall, 2011).

Despite the clinical and public health consequences of patient misconceptions, correcting misconceptions that patients reveal during clinic visits is not a simple matter. If done poorly, correcting someone can be perceived as a condescending, face threatening action (Goffman, 1967; Levinson, 2012; White, 2020a) and can even backfire (Brehm & Brehm, 1981) and further entrench the misconception in the bearer's mind (Lewandowsky et al., 2012).

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To elucidate corrections in practice in clinical settings, we turn to the classic conversation analysis phenomenon of *other-initiated repair*, that is, when someone other than the speaker initiates a repair of the trouble source (Schegloff et al., 1977). Whereas other-initiated repairs can differ in terms of the trouble being one of hearing, understanding, or acceptability (e.g., Svennevig, 2008), we were interested specifically in *other-correction*, which is when someone corrects a factual error in the speaker's utterance, pointing out and replacing the error with accurate information (e.g., Haakana & Kurhila, 2009; Jefferson, 1987). Research on

Example 1 [Patient_432, 15:55–16:13][1]

```
320    PAT:   I've been missing the ones for the thyroid.
321    DOC:   Why is that?
322    PAT:   'Cause it's supposed to give on an empty stomach and
323    DOC:   Yeah.
324    PAT:   Since I've been coughing so much I've been taking (0.2)
325           cough— candy cough dro[ps
326    DOC:                        [Oh: no no no. So empty stomach
327           like (0.2) jus- that you're not eating a meal.
328           You can still take it if you take medications.
```

corrections in everyday talk has revealed a preference for speakers to correct themselves rather than someone else (Schegloff et al., 1977). However, self-correction is not possible if the speaker (e.g., the patient) lacks the knowledge to recognize their own misconception. Other-correction is not as widely studied as other types of repair, perhaps because it is considered rare in ordinary talk (Kendrick, 2015; Schegloff et al., 1977).

In contrast to everyday conversations, the institutional context of patient-clinician interactions takes for granted that clinicians are experts on medical matters, which could ease the interactional aversion to correcting others (or being corrected). Identifying and characterizing the communicative practices clinicians use to correct patients is an essential first step toward giving clinicians the tools to navigate this delicate task and thereby improve patient understanding while also providing more empathetic care. However, while there is an established literature on interventions to promote patient behavior change and shift patient attitudes (Michie et al., 2013; Noordman et al., 2012), little is known about how clinicians correct patient misconceptions spontaneously during authentic clinical interactions.

The phenomenon of interest for this study encompassed both the patient misconception and the clinician's correction, which we termed a *patient misconception-clinician correction episode*. An example of this phenomenon from our data is shown below. The patient and clinician were reviewing the patient's medication list in the presence of the patient's companion, and after the patient states that she has not been taking her thyroid medication (line 320) the clinician follows up with "Why is that?." The patient's answer revealed a misconception about her medication instructions.

Here the patient straightforwardly accounts for skipping her thyroid medication by stating that it should only be taken on an empty stomach (line 322) and because she has been taking cough drops, she cannot take her medication (lines 324–5). This accounting indicates a misconception in how the patient has interpreted "empty stomach" in the pharmacy's instructions, which the clinician then corrects (lines 326–328).

The objective of this study was to characterize how clinicians correct patient misconceptions during clinical interactions. Our research questions were the following:

RQ1: How common are *patient misconception-clinician correction episodes* during the analyzed clinical interactions?

RQ2: To what kinds of *clinical topics* do corrected patient misconceptions relate?

RQ3: Do corrected patient misconceptions have foreseeable implications for patients' *future behaviour*?

RQ4: What *communicative practices* do clinicians use when correcting patient misconceptions?

Objective and research questions

We conducted a qualitative, observational study of video-recorded primary care visits to analyze how clinicians correct patient misconceptions. We examined a corpus of videos collected to study discussions about pain, because patients and clinicians frequently report that discussions about chronic pain are frustrating and unproductive (Henry & Matthias, 2018). Thus, clinicians may approach patient misconceptions about pain-related topics differently than they do misconceptions about other topics.

Data and method

Data were 23 video recordings of patient visits that were collected for a prior study about chronic pain (Henry et al., 2016) and corresponding transcripts. The examples shown in this study are representative of patterns found in the collection.

Recruitment of patients and clinicians

Clinicians were second- or third-year primary care resident physicians at the University of California Davis Medical

Center. Patients were established adult patients prescribed opioids (≥1 opioid dose per day for ≥90 days) for chronic musculoskeletal pain who reported at least moderate pain intensity (≥4 on a 0–10 scale) and indicated they were likely to discuss pain management at an upcoming visit. Patients were ineligible if they spoke a language other than English during visits, were getting active cancer treatment or palliative care, or were receiving an opioid prescription from someone other than their primary care physician. A video camera was placed in the exam room prior to the clinician's arrival, which allowed for filming with no additional person present.

Ethics

Written informed consent was obtained from all participants, and detailed study procedures have been previously described (Henry et al., 2016, 2018). This project was approved by the University of California Davis Institutional Review Board (#453824). The authors report there are no competing interests to declare.

Researcher approaches

We integrated multiple approaches for this study (Henry et al., 2020). One coauthor, JG, brought a background in microanalysis of clinical interaction (MCI) (Gerwing et al., 2023; Menichetti et al., 2021) which is an application of microanalysis of face-to-face dialogue (Bavelas et al., 2016) tailored to the arena of health care interactions (e.g., Gerwing & Li, 2019; Larsen et al., 2022). MCI provides an inductive analytical machinery for gathering a comprehensive collection of qualitative communication phenomena by identifying, defining, and characterizing every occurrence, leading to quantifiable results (Gerwing et al., 2023; Menichetti et al., 2021). Another coauthor, AECW, contributed a background in conversation analysis (CA), which examines recurring communicative practice for their sequential organization, design, and social action (Sidnell & Stivers, 2012; Tietbohl & White, 2022). CA is uniquely adept at analyzing interactionally difficult social actions (e.g., correcting), and thus has been used in a variety of studies focused on clinician-patient communication and interventions (Barnes et al., 2018; Ford et al., 2020; Heritage & Maynard, 2006; Montiegel & Robinson, 2021; White, 2020b, 2022; White et al., 2014; White & Stubbe, 2023). As a primary care physician, the third coauthor, SGH, provided the necessary clinical perspective underpinning the rationale of the study and interpretation of medical content and clinically relevant activities.

A few words regarding our different analytic approaches are needed, as some readers may find it unintuitive to incorporate the analytical lenses of conversation analysis and microanalysis. This is not an unprecedented collaboration (e.g., Gerwing & Dalby, 2014; Gerwing & Li, 2019; Henry et al., 2020; Svennevig et al., 2019), perhaps because some of the underlying assumptions from each method provide sufficient common ground. Both CA and MCI use the *particulars of interaction* to build up knowledge; they both focus on language as a *social action*, and analysts' interpretation of observed behaviors requires reference

to their *form* (e.g., the words and accompanying actions) and their *timing in sequence*. Whereas MCI explicitly aims for deriving implications for practice, CA strives toward discovering stable practices and underlying normative organizations of interaction (e.g., turn design, preference organization, conversational repair). The two approaches differ in how they accomplish reproducibility: MCI does so by documenting the rationale for analytical decisions in a coding manual; CA does so through training, tradition, and reference to universals reported in the conversation analytic literature base. While accumulating collections of a phenomena is central to both methods, in MCI, the collection is expected to be comprehensive, and in CA, it should reach saturation and contrast. Finally, the transcription conventions for both approaches require accuracy, but whereas in CA, they include precision in speech, overlap, pauses, gaps, intonation, and vocal quality, in MCI, accuracy is limited to speech and dysfluencies, with analysts expected to glean the rest directly, via observation of the video recording during analysis.

We have found none of the abovementioned differences need constitute a barrier to collaboration; indeed, working from different backgrounds offers several advantages. Discussions about how to interpret observations require analysts to be more explicit and take less for granted. Reaching consensus requires negotiation around differences in terminology and approach within an atmosphere of mutual respect and trust. We find the ensuing discussions both lively and fruitful, benefiting from each analyst's lens and familiarity with different bodies of literature. For example, the established universals from CA often provide a point of departure for interpreting some moments in interaction, but there is more openness to departing from such interpretations, if the context demands it. Or the need to use specific, set criteria for deciding whether what is observed fits the definition for the phenomenon requires a particular style of argumentation when striving for consensus, something that is at first unfamiliar to the CA trained analyst. While we find the process of analysis proceeds more slowly under these conditions, it is richer because of the deliberation required to resolve differences and satisfy the essence of each approach.

Video analysis and coding

Analysis began with developing an inductive, data-driven operational definition of *patient misconception-clinician correction episodes*, which was documented in a detailed coding manual. To develop our definition, we reviewed 9 clinic visits. We then expanded our analysis to include additional randomly sampled visits. The final sample comprised 23 visits, involving 23 patients and 20 clinicians. Ten of the visits involved patient companions; nine family members (e.g., partner) or friends and one with an unstated relationship. This sample size fits the purpose of the study (to identify and characterize clinician corrections of patient misconceptions), as it was limited enough to work iteratively with the material while developing qualitatively driven operational definitions and large enough to reach saturation and demonstrate the scope of the phenomenon (Corbin & Strauss, 2014).

Once we had identified all misconception-correction episodes, we used an established taxonomy and coding manual (Ofstad et al., 2016) to characterize episodes by the *clinical topic(s) of the misconception* (RQ2). We also noted whether the

misconception related to the topic of chronic pain management or not because having chronic pain was a requirement for patient inclusion in the original study (Ofstad, 2016). For RQ3, we used an inductive approach to distinguish between corrections that could foreseeably alter the patient's future behavior versus corrections that were limited to repairing the patient's conceptual knowledge. We then examined the how clinicians corrected each patient misconception to identify and characterize the *communicative practices* clinicians used to correct patients (RQ4). Finally, we explored whether specific correction practices were associated with the pain topic and/or patient's future behavioral implications.

To conduct analysis, authors JG and AECW watched the videorecorded visits while using transcripts in Microsoft Excel for reference and for recording analytical decisions. These two authors conducted all stages of analysis together, initially coding individually, then meeting virtually bi-weekly to compare, discuss, and resolve disagreements and to refine definitions. These authors met regularly with SGH during the analytic process to review and refine the developing definitions.

Results

RQ1: Operationalization and frequency of misconception-correction episodes

To maximize the usefulness of the definition and make our analytical decision-making process transparent, we illustrate our application of these criteria in some detail, below. Note that this definition was based entirely on the interactive phenomenon of the clinician correcting something the patient had said. Other phenomena were not of interest for this study (e.g., uncorrected patient misconceptions or patients correcting clinician misconceptions). Each episode began with the patient's refuted statement (i.e., misconception) and ended after the clinician's correction. We developed a decision tree for the analytical process that is shown in Figure 1 and illustrated in the four examples that follow.

Positive examples that fulfill criteria 2 and 3

Prior to Example 2, the patient, his companion (partner), and the clinician had been discussing the patient's improved triglyceride levels. The clinician's utterances in lines 397, 401 and 403 alert that there is a possible misconception episode.
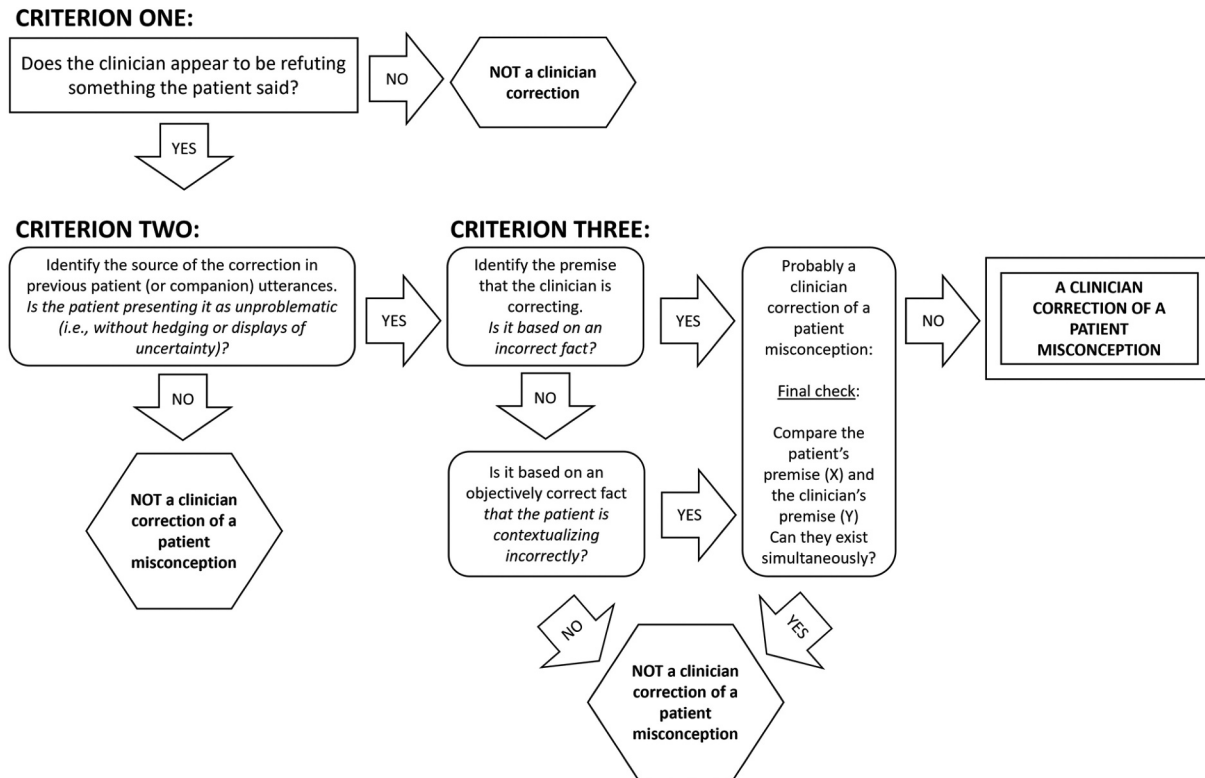
Figure 1. Decision tree for assessing whether a candidate clinician correction fits the definition.

Example 2 [Patient_412, 13:57-14:10]

```
396   COM:  It's that Lipitor I bet you.
397   DOC:  Actually no. It was (.) I think last time when I saw you (.)
398         we had (.) uhm (0.5) we
399   PAT:  It was doubled [or tripled.
400   DOC:                 [We-
401   DOC:  We (.) No. Not the Lipitor. The Tricor.
402   COM:  [Oh yeah.
403   DOC:  [We increased the Tri[cor and we also doubled your uhm fish oil.
404   COM:                       [Oh yeah.
```

To decide whether the clinician is correcting a misconception, we apply criterion 2 to the utterances that elicited it. The source of the correction is shared between the companion and the patient, who made statements implicating a specific medication (line 396) and its dosage (line 399). The way they formulated their statements suggests certainty and confidence, fulfilling criterion 2. The propositional content reveals a factual error, namely the name of the medication that was increased during a previous interaction, fulfilling criterion 3. Therefore, lines 396–403 meet our definition of a patient misconception-clinician correction episode.

Negative example with application of criteria 2

In Example 4, the patient is recounting to her clinician a conversation she recently had with her mental health provider about potentially changing the medication she is taking for her back contractions. In lines 239–240, the patient conjectures that the newly recommended medicine (lorazepam) may work better than what she's currently taking (diazepam) because it is stronger.

As criterion 2 dictates, the patient should be stating something with certainty to qualify as a misconception. This patient, however, displays uncertainty in line 240

Example 3 [Patient_412, 30:30-31:18]

```
892  DOC:  And the only thing is: uhm for being on the pain contract with us
893        you are up to date for your: uhm like the urine (0.2) [uhm test=
894  COM:                                                        [Right
895  DOC:  =okay?
896  COM:  Right

[intervening sequences omitted]

908  PAT:  Last time I was uh before that though I did (.) the urine test.
909  DOC:  Yea:h. The urine test that we were testing for at that time was
910        just for: (.) I was (.) uhm making sure that you: your kidneys
911        were okay uhm uhm with the diabetes.
912  COM:  Oh:. [Okay.
913  DOC:       [So that's why I was testing your urine.
914  PAT:  Yeah.
```

In Example, 3 the clinician informs the same patient that he needs to provide a urine test to fulfill being on the "pain contract," which stipulates that patients who are prescribed long-term opiates must agree to undergo routine urine analysis to confirm the presence of opiates. After some intervening talk, the patient responds at line 908 with the statement that he already did a urine test, which the clinician corrects in lines 909–911.

with the turn-initial hedge, "I guess" and then further downgrades her potential rationale that one medication is stronger than the other by adding "I don't know" at the end of her utterance. Thus, the patient's statement does not fulfill our essential criterion 2 and this would not be considered a patient misconception-clinician correction episode.

Example 4 [Patient 494, 11:58-12:11]

```
239  PAT:  They wanna give me lorazepam instead of diazepam. .hh And they-
240        I guess diazepam is: (.) stronger than lorazepam? I don't know.
241  DOC:  Uh:m (.) it's not really stronger, so: uh (.) lorazepam there-
242        it's uh () shorter acting.
```

While the patient is correct that he did a urine test previously, the patient is contextualizing this information incorrectly: His previous test was analyzed for a different purpose (his kidney function), and he still needs to undergo an additional urine test for his pain contract. Thus, according to our definition, this sequence fulfills the criteria for a misconception-correction sequence.

Negative example with application of criteria 3

In Example 5, line 51, the patient characterizes the clinician as wanting to get him off his plate, a depiction that the clinician refutes in lines 52–57.

The clinician's utterance is a strong refutation of what the patient had said in line 51, and if we examine that patient utterance, we can see that the patient makes his statement

Example 5 [Patient 319, 2:02]

```
51  PAT:  Uh I know you want to get me off your plate but I [could have
52  DOC:                                                    [Well that's not
53        the thing ((omitted patient's name)). I don't want to get you off
54        my plate. It's not that I-I it's not that I don't want to prescribe
55        opiates for you. It's not that I don't wanna manage your pain. .hh
56        What it is is that I don't think the regimen that you're on is
57        healthy for you. [That's what I really think
58  PAT:                   [Correct. ((patient nods his head))
```

about the clinician without any hedging or uncertainty; thus, fulfilling criterion 2. However, criterion 3 stipulates that the misconception needs to be based on an objective fact: Whether the clinician wants the patient off his plate or not pertains to the patient's impression of the clinician's attitude, rather than a fact. Therefore, this sequence of interaction would not fulfill our criteria for a patient misconception-clinician correction episode.

In the sample of 23 visits, we identified 59 patient misconception-clinician correction episodes (mean = 2.6 per visit; median = 2; range = 0–8).

RQ2: Topics of corrected patient misconceptions

Recall that we defined clinical topics of the misconceptions clinicians chose to correct using the taxonomy in the DICTUM coding system (Ofstad et al., 2016). The topics of all but two of the 59 patient-misconception-clinician correction episodes could be classified according to DICTUM's clinical topics: *drug-related issues* (n = 24/59, 41%), *gathering information* (n = 10/59, 17%), *contact with other parts of the health care system* (n = 9/59, 15%); and *defining the patient's condition* (n = 6/59, 10%). The remaining functions included *therapeutic procedures* (n = 4/59, 7%), *legal/insurance related* (n = 3/59, 5%), and *evaluating test results* (n = 1/59, 2%). DICTUM also includes definitions for clinical topics of advice and precaution, treatment goals, and deferring decisions, but we found no clinician corrections of patient misconceptions relating to these topics. Table 1 lists the clinical topics with definitions and examples.

We also analyzed whether misconceptions related to chronic pain (including use of opioids), which we defined as patients mentioning anything to do with the experience of pain, future concerns about pain, interventions undertaken to manage pain (e.g., medication), or investigations directed toward measuring opioid use. Example 3 (taking a urine test) illustrates a misconception related to chronic pain and opioids, because the urine test is undertaken to ensure that the patient is adhering to his pain contract. Fifteen of the 59 patient misconceptions (25%) pertained to chronic pain (including the discussion of opioid use), with 9 of them being classified as drug-related issues, 3 as legal or insurance related, 1 as gathering information, 1 as contact related, and 1 as other.

RQ3: Implications for future behaviour

When developing a definition for the implications for the patient's future behavior, we first considered what could happen if the clinician did not correct the misconception. In Examples 1 and 2, the clinicians were correcting misconceptions about medication. In the case of the conditions for taking medication safely (Example 1), if uncorrected, the patient might continue to not take her thyroid medication. In contrast, whether the patient accurately remembered which medication was increased in the previous appointment (Example 2) would not necessarily influence his behavior, as the patient would continue to receive the correct medications and dosage instructions from the pharmacy.

We then considered the content of the patient misconception and distinguished between clinician corrections that could potentially *influence the patient's future actions or modify what the patient has reported doing*, in contrast to those that fit solely within the domain of *repairing the patient's conceptual knowledge*. That is, while all clinician corrections arguably served the function of providing correct information in order to repair the patient's knowledge or understanding, a subset of these corrections would have clear implications for the patient's future behavior. Example 1 exemplifies the latter, as the clinician's correction is directed at modifying the patient's actions from not taking her thyroid medication to taking it. However, Example 2 is an example of the solely conceptual: sorting out which medication was increased at the last visit (Lipicor or Tricor) is not serving the function of influencing the patient's behavior, rather it is setting the record straight. Table 2 provides our operational definition and additional examples.

We found that 24 of the 59 correction episodes (41%) had foreseeable implications for the patients' future behavior.

RQ4: Correction practices

We identified seven communicative *practices* clinicians used to make corrections, which are defined in Table 3. These practices are not mutually exclusive; a clinician could use multiple practices in the same correction. Once we had identified the practices, we noted that some served the purpose of explicitly pointing out a patient error, while others only conveyed correct information, leaving the error itself implicit. We characterized these two groups as *direct* versus *indirect* practices (see Figure 2). Direct corrections were ones that included any of the three direct practices. So, for example, in Table 3, Examples 20 and 21 are considered direct corrections because they include the *marking* practice ("no" in lines 1030 and 635 respectively), in addition to *demonstrating* and *invoking*. On the other hand, Examples 18 and 19 are indirect corrections because they do not contain any explicit refutation of the patient misconception.

For each of the seven communicative practices, we identified the number of *patient misconception-clinician correction* episodes in which the clinician used that practice. The most frequent practice clinicians used to correct patient misconceptions was *presenting the alternative* (n = 49/59, 83%). The distribution of the other practices, in decreasing order was: *explaining* (n = 22/59, 37%), *contradicting* (n = 19/59, 32%); *marking* (n = 15/59, 25%), *demonstrating* (n = 12/59, 20%), *invoking* (n = 11/59, 19%), and *displaying surprise* (n = 8/59, 14%). Often episodes included multiple types of practices: Five practices (n = 1/59, 2%), four practices (n = 10/59, 17%), three practices (n = 9/59, 15%), two practices (n = 25/59, 42%), and only one practice (n = 14/59, 24%).

Post hoc patterns

Once we had characterized the communicative practices clinicians used to correct patient misconceptions, we became curious about how the use of these practices were influenced by either whether patient misconceptions were related to

Table 1. Clinical topics to which patient misconception–clinician correction episodes relate.

Topic*	Definition	Illustrative examples of patient misconception–clinician correction episodes
Gathering additional information	Related to obtaining information from a source other than the patient interview, physical examination, or reading the patient's in-house chart.	Example 6 (Companion, who is the patient's partner, is present but not involved in this sequence) Patient_17, patient misconception is that he is able to observe the blood in his stools that could be present due to colon cancer. 848 DOC: If you don't wanna do the colonoscopy, (0.5) for whatever reason (.) 849 that's fi:ne, (0.5) uhm but (.) if we can check your stools to make sure that 850 you're not having any bleeding that you: 851 PAT: Well, I'm not. ((shakes head)) I guarantee you that. I'd be .hh 852 DOC: Yea:h. .h Well you know, it's obvious when you're bleeding .hh bright red 853 blood: (.) or you're hav- you know you can see the blood, .hh **but usually (.)** 854 **uhm (.) colon cancer causes (0.2) blood that you <u>can't</u> see with your eye.** 855 **They have to look at it underneath a microscope to see if there's blood in it.**
Evaluating test results	Related to simple assessments of clinical and paraclinical tests and examinations, either statements that findings are normal or statements about a pathological finding.	Example 7 (companion, who is the patient's partner, is present but not involved in this sequence) Patient_412, patient misconception is that he has diabetic ketoacidosis 995 DOC: Are you- do you feeling like you're having more 996 [acid reflux? 997 PAT: [Yea:h and I have acid key-uh:, what do they call 998 the: (0.2) uh:m, acid kedodosis, somethin' like that, 999 somethin' like that, (0.4) reflux acid problem. acid— 1000 DOC: Mm hm, 1001 PAT: Acid kedadosis, 1002 DOC: Okay, 1003 PAT: What is that, acid— 1004 DOC: **Oh:. No no no. You're talking about (0.2) the diabetic** 1005 **ketoacidosis.** 1006 PAT: Yeah. 1007 DOC: **Oh that's [completely different. ((waves hand))** 1008 PAT: [Yeah. 1009 PAT: I wonder if I'm having that because sometimes I yeah 1010 feel like I'm having those issues like that. 1011 DOC: **Oh:. Oh no no no. That (.) that occurs when your** 1012 sugars are like (0.4) over five hundred. 1013 PAT: Oh, I see.
Defining the problem	Related to complex assessments that define what the problem is and reflect a medically informed conclusion.	Example 8 (companion involved is the patient's partner) Patient_301, companion misconception is that the loss of extra weight after giving birth is the sole explanation for her reduction of pain 33 COM: Well I was explaining to him when I was pregnant, (0.4) 34 I got that. 35 DOC: Yeah. 36 COM: As soon as I had the baby (0.2) it went away. 37 DOC: Sure. 38 COM: So it was the extra weight pushing [down. 39 DOC: [Yeah **pregnancy has some** 40 **other things associated with it too. Your connective tissues** 41 **tend to laxen a little bit anyway when you're pregnant.** 42 **And then they (0.2) they firm up again (.) after you're not** 43 **and that's part hormonal thing.** 44 COM: Oh: I see.

(Continued)

Table 1. (Continued).

Topic*	Definition	Illustrative examples of patient misconception-clinician correction episodes
Drug-related	Related to starting, refraining from, stopping, altering, or maintaining a drug regimen, including both prescription drugs and over-the-counter drugs such as vitamin supplements and herbal medicine, including all modes of administration.	Example 9 Patient_80, patient misconception is that two weeks is enough time to evaluate this medicine's effectiveness 238 PAT: Yeah I tried 'em. ((referring to a medicine the doctor asked if she's 239 taking) It didn't work. 240 DOC: Okay. How long did you try it for? 241 PAT: Uh for two weeks. 242 DOC: Okay. Okay. **Some of these medicines can actually take up to like** 243 **six to eight weeks to really help,** 244 PAT: Mh hm.
Therapeutic procedure-related	Related to intervening upon a medical problem, planning, performing or refraining from therapeutic procedures of a medical nature, including surgery, wound care, interventional radiology, and radiation therapy.	Example 10 (companion, who has an unstated relationship with the patient, is present but not involved here) patient_413, patient misconception is that her adhesions ["it" in line 483] could be cut out and she would feel better as a result 482 PAT: I mean if it (.) if they sa:w that so:mething (.) 483 that possibly (.) it could be 484 DOC: Right 485 PAT: cu- they could be cut (.) out (.) and then it could be put 486 back together hh you know 487 DOC: Mm hm, 488 PAT: Then that could be (.) [decided on at another time. 489 DOC: [Yeah. 490 DOC: Yeah. **But if you (.) like I was say:ing** 491 PAT: Mm hm, 492 DOC: **if you: (.) remove if you go in** 493 PAT: Mm hm, 494 DOC: **and remove something that's (.) another surgery.** 495 PAT: Mm hm 496 DOC: **and that could (.) that in itself can cause more adhesions.** 497 PAT: Okay.
Legal and insurance-related	Related to concerns of the patient, based upon or restricted by legal regulations or financial arrangements.	Example 11 Patient_78, patient misconception is that he must come to the clinic every month to pick up his prescription 239 PAT: So I think it'd be smarter for me to pick up my medicine 240 right here when I come. (0.5) Uh:m because you see me once 241 a month for some reason or whatever. [But 242 DOC: [Well we can space it 243 out to three months. 244 (0.4) 245 PAT: Yeah but I have to come in and get that anyway. 246 DOC: **I can give- I can post date refills for you,** 247 PAT: Oh: yeah. You have been.
Contact-related	Related to admittance or discharge from hospital, scheduling of control and referral to other part of the health care system.	Example 12 (companion involved is the patient's partner) Patient_301, patient misconception is that she will receive a call to tell her when everything is scheduled 1125 PAT: And they'll call me and tell me when everything's scheduled 1126 and 1127 DOC: U:hm, (0.2) the: Yeah. **So we'll—they she'll actually** 1128 **be able to schedule you for the appointment next time,** 1129 **(0.2) And if you get the lab work do:ne (0.2) if it's an** 1130 **afternoon appointment that morning, or if you just get it** 1131 **done the day before or something like that.** 1132 (0.2) 1133 COM: Oh okay. 1134 DOC: You can just come here. The lab building up here. 1135 PAT: Okay.

*Definitions from Ofstad et al. (2016). Three clinical topics from Ofstad et al. definitions were not found in corrected patient misconceptions: advice and precaution, treatment goal, and deferment.

Table 2. Levels of behavioral implications pertaining to patient misconceptions.

Behavioural implication	Definition	Illustrative examples of patient misconception-clinician correction episodes
Knowledge only	The patient's misconception has implications only for conceptual knowledge, such that the common ground the participants are accumulating and should be built on a foundation of correct information. If not corrected, it may create difficulties for subsequent discussions during the visit.	**Example 13** Patient_123, patient misconception is that the clinic and "internal medicine" are two different parts of the system. 413 PAT: I know you're only handling some and then internal 414 medici[ne's ((gestures to out of the room)) handling others and 415 DOC: [Right. 416 (0.5) 417 DOC: **Uh:m. (.) I think (.) internal, (.) so we're internal medicine** 418 **((gestures "here" with downward pointing)) and then infectious** 419 **disease ((gestures to out of room)) they-they handle so:[me.** 420 PAT: [I'm 421 sorry. Yeah. ((waves hand in throw away gesture))
Influencing future behavior	The misconception is related to predictable future actions. If not corrected, the patient could do something medically unadvisable (e.g., not take medication correctly) after the appointment.	**Example 14** Patient_427, patient misconception is that taking 900 mg of ibuprofen at a time is safe 803 PAT: Well I have ibuprofen like (.) I take a six 804 hundred milligram [.hh and break it in half and take it 805 DOC: [Mm hm, 806 (0.5) 807 DOC: Oka:y. 808 PAT: And I have a half of another one. 809 DOC: Okay, 810 PAT: So that's like (.) uh: s:o (0.2) it's, (1.0) nine 811 hundred milligram [half of one is six hundred. 812 DOC: [Oka:y, 813 DOC: Yea:h. 814 PAT: Then the other half is only three hundred so: 815 DOC: Yea:h. 816 (0.4) 817 DOC: **Probably wouldn't take more than eight hundred at a time.** 818 **[That's the ma:x.** 819 PAT: [((Alright)) 820 DOC: Oka:y? 821 DOC: **[Otherwise you may get yourself into trouble.** 822 PAT: [((Alright)) 823 PAT: Ooh:. 824 DOC: [Oka:y? 825 PAT: [That's what I heard. ((laughter))

chronic pain or whether the misconceptions had foreseeable implications about the patient's future behavior. To discern meaningful patterns in the data, we used the numbers derived from collapsing practices into direct and indirect approaches; Table 4 shows our results. Half of all episodes included at least one direct communicative practice and half did not. However, when patient misconceptions pertained to the topic of chronic pain, only one-third of the misconception-correction episodes included direct correction practices. (5/15; 33%). Of the five times they used direct practices, four were *contradicting* the patient, and only one correction marked the misconception with "no." It was notable that in the cases when clinicians displayed surprise when correcting, these misconceptions did not pertain to pain. In contrast, when correcting patient misconceptions not pertaining to chronic pain, clinicians utilized direct correction practices in more than half of their corrections (25/44; 57%).

Whether the correction could potentially influence the patient's future actions or was only focused on repairing knowledge did not seem to have an impact on clinicians' use of direct or indirect practices.

Discussion and conclusion

In our analysis of routine primary care visits, we found clinician corrections of patient misconceptions to be a common interactional phenomenon, with a median of two corrections per visit. Patients had misconceptions regarding a wide range of clinical topics, but issues related to medication were the most prevalent. Less than half of the clinician corrections were aimed at behavior change, that is, had foreseeable implications for the patients' actions after the consultation. We identified seven distinct communicative practices that clinicians used to correct patient misconceptions: besides merely presenting the correct proposition, clinicians used practices that highlighted the patient's error (displaying surprise, marking disagreement by saying "no", and directly contradicting the patient's proposition) and practices that supported the correct information presented (providing explanations, invoking an outside authority, or demonstrating with evidence for the patient to observe directly). Clinicians often deployed multiple practices during a single correction episode. We characterized these practices as being either direct or indirect and found an equal distribution between the two in our collection. However, when we focused on corrections that dealt

Table 3. Clinician correction practices.

Practice	Definition	Illustrative examples from patient misconception-clinician correction episodes (target practices areas are bolded)
Displaying surprise	The clinician displays a "change of state" with a turn-initial "Oh" discourse particle (Heritage, 1984). This "Oh" reveals that the clinician finds what the patient just said as unexpected or surprising. This also indicates that the clinician was unaware that the patient harbored this misconception.	Example 15 Patient_110, line 259 257 PAT: I thought about buying another one from Walgreens 258 but they didn't have anything with no- with no side supports. 259 DOC: **Oh** no. Please don't do tha:t.
Marking correction with disagreement	The clinician uses a negative expression that expresses disagreement but has no propositional content, marking what is coming next as a correction. These look like any variation of "no" (see Haakana & Kurhila, 2009).	Example 16 (companion, who is the patient's partner, is present but not involved here) Patient_432, line 326 324 PAT: Since I've been coughing so much I've been taking (0.2) 325 cough- candy cough dro[ps 326 DOC: [Oh: **no no no.**
Contradicting patient's incorrect proposition	Contradicting the patient's proposition is to deny the truth of what the patient has said by asserting the opposite, reversing the polarity of what the patient has said. Contradicting is otherwise content-free.	Example 17 (companion, who is the patient's partner, is present but not involved here) Patient_432, line 429 427 PAT: But it's not good to take medicine over uh: li- (.) medicine 428 [ov- 429 DOC: [No:. It's no- No no. **You can take over the counter medicine.**
Presenting correct proposition	The clinician presents an alternative (i.e., correct) proposition, which must be different enough from the patient's proposition that they cannot exist simultaneously. To count as presenting the correct proposition, there must be more information than a contradiction.	Example 18 Patient_277, line 124 115 DOC: Uh:m and so right now the things you're taking for your 116 lu:ngs I ha:ve uhm (.) the Albuterol as needed? 117 PAT: Mm hm. 118 DOC: An:d (0.4) the Flunisolide for your allergies, 119 PAT: Yes. 120 (1.0) 121 DOC: An:d () let's see. 122 PAT: Proair 123 DOC: The Ipratropium, the Atrovent, 124 Yea:h, **the Proair is the Albuterol.**((points to list of 125 medicines)) 126 PAT: Oh. Okay.

(Continued)

Table 3. (Continued).

Practice	Definition	Illustrative examples from patient misconception-clinician correction episodes (target practices areas are bolded)
Providing an explanation	The clinician provides supporting evidence for the correct proposition. These are noticeable as phrases starting with "because," "cuz" any variation on "the way it works is …"	Example 19 (companion involved is the patient's partner) Patient_17, line 810 797 COM: No. You don't start in January. It's a year from the day that 798 you had it. (0.4) It- whatever that day being, October, a 799 [year later, right, 800 DOC: [So: 801 PAT: Oh:. 802 DOC: You get one every sea:son. 803 (1.0) 804 COM: Yeah. 805 DOC: So even if you got it (.) let's say you didn't get it and you 806 it get today, (0.5) next season we'd want you to get it in 807 October or November. 808 (2.0) 809 COM: I see. 810 DOC: **Because every year the flu is a little bit different.** 811 COM: Yea:h. Oh: yeah.
Invoking an outside authority	The clinician appeals to an authority to support their correction. This occurs most often by invoking something in the patient's record on the computer. Unlike demonstrating, invoking does not invite patients to see for themselves.	Example 20 (companion, who has an unstated relationship with the patient, is present but not involved here) Patient_413, clinician invokes what is displayed on the computer (i.e., "here") in line 1030 1023 PAT: I just- I just remember seeing the [bottle happen when= 1024 DOC: [Mm hm, 1025 PAT: =I called in the refill .hh 1026 DOC: Mm hm, 1027 PAT: That it had one le:ft. 1028 DOC: Mm hm, 1029 PAT: So: 1030 DOC: Yeah. No. **E-everything here has either: (0.2) six, three,** 1031 **five, five. (0.2)** Yeah. 1032 PAT: Okay. Real good. Okay.

(Continued)

Table 3. (Continued).

| Practice	Definition	Illustrative examples from patient misconception-clinician correction episodes (target practices areas are bolded)
Demonstrating or showing evidence for the patient to observe directly	The clinician produces evidence for the correct proposition, allowing the patient to verify for themselves what is correct (e.g., information on the computer, papers, something on the patient's or other's body). (Note that what begins as invoking can become demonstrating IF the clinician invites the patient to look at the monitor as well. Distinguishing between invoking and demonstrating requires looking at the video to see what the clinician is doing.)	Example 21 (companion involved is the patient's friend) Patient_153, clinician uses a mirror to show the patient what the fungus on her tongue looks like starting in line 652 634 PAT: She has acid [reflux also. ((referring to her companion)) 635 DOC2: [No. You're- you- you- you look like- this looks 636 like normal bacteria. ((looking into companion's mouth)) 637 COM: Okay. 638 PAT: Okay. 639 DOC2: But it doesn't look— so this is a normal [biofilm. 640 COM: [((You scared me)) 641 DOC: Uh huh. Okay. ((also looking into companion's mouth)) 642 DOC2: Okay I think I'm gonna- 643 COM: You scared me. ((laughter)) 644 DOC2: This is a normal— Come here. We're gonna [go to the= 645 PAT: [No:. 646 DOC2: =mirror. If you want to. You don't have to. 647 (1.0) 648 PAT: I want to. ((patient stands up with difficulty)) [omitted unrelated talk] [clinician and patient are now standing in front of mirror and patient is looking into her own mouth] 652 DOC2: **See this is normal bacteria.** 653 (1.0) 654 PAT: Yeah. 655 DOC2: **Stick your tongue out.** 656 (0.2) 657 **Okay. See [how it's patchy and white [and kind of:** 658 PAT: [Oh: yea:h. [Uh huh, 659 DOC2: **Uh (.) very thick and it looks like it's stringy? (.) 'Kay,** 660 PAT: Ye:ah. 661 DOC2: **That's fungus.** 662 PAT: O:kay. ((is walking back to her chair)) 663 (3.0) 664 PAT: I didn't know.
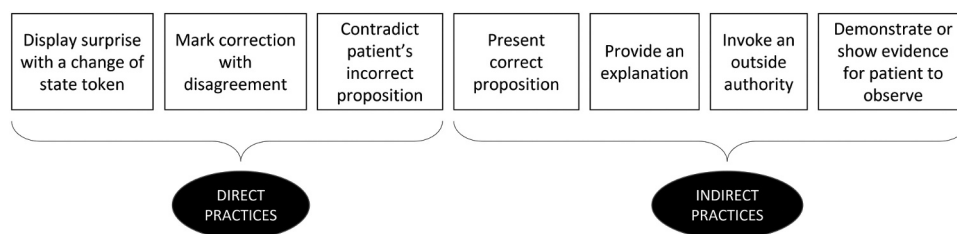
Figure 2. Direct and indirect clinician practices when correcting patient misconceptions.

Table 4. Distribution of direct vs. indirect practices.

Variables	Total corrections	Direct corrections* n (n/total)	Indirect corrections** n (n/total)
Pain-related			
Yes	15	5 (33%)	10 (67%)
No	44	25 (57%)	19 (43%)
Implications for future behavior			
Only Repairing knowledge	35	19 (54%)	16 (46%)
Influencing future actions	24	11 (46%)	13 (54%)
Total	59	30 (51%)	29 (49%)

*Direct corrections include at least one of the three practices: displaying, marking, or contradicting.
**Indirect corrections do not include any of the three direct practices: displaying, marking, or contradicting.

specifically with patients' misconceptions pertaining to chronic pain, we found that clinicians used indirect practices in 67% of these corrections, compared to only 43% when correcting misconceptions not pertaining to pain.

Choosing to correct the patient

Early work by Korsch et al. (1968) revealed that clinicians spent very little time exploring and listening to patients' feelings and, when they did, tended to correct patients on technical aspects of medical science like medical terminology. These behaviors resulted in patients becoming defensive and dissatisfied with care (Korsch et al., 1968). Defensive and dissatisfied patients cannot process correct information, may stop listening to (or discount) new information, or may merely indicate token agreement even though the patient has no plan to change their future behavior (Berger & Villaume, 2016). Half of the corrected patient misconceptions in our material had implications for the patient's future behavior, suggesting that clinicians directed at least these corrections toward behavior change. Motivational interviewing, a widely used and effective technique for changing patients' behavior, recommends that clinicians should refrain from correcting patients' behavior as their first response and should instead begin by discerning patients' "sense making" of the situation (Berger & Villaume, 2016; Rollnick et al., 2008). Berger and Viillaume (2016) further support this recommendation by stating that "without understanding how patient's construct their ideas … clinicians really cannot know what information or education might be useful or meaningful to the patient" (p. 3).

We posit that unearthing patient misconceptions may play a vital role in understanding patients' sense-making process. If clinicians do the interactional work of asking patients about their own ideas and understandings, when errors need to be corrected, clinicians can tailor the new information to the patient's needs. For instance, in Example 1, when the patient shared that she had not been

taking her thyroid medication, the clinician asked, "Why is that?", which led to the patient revealing the misconception that had been driving her decision. The clinician's curiosity about her reasoning unearthed that the patient had actually been following the pharmacy instructions precisely (the medication must be taken on an empty stomach) and was not taking her thyroid medication because of her incorrect understanding of what "empty stomach" meant. While correcting patients risks causing them to lose face (Goffman, 1967; Levinson, 2012), doing so in the context of treating patients as sensible and reasonable could preempt such feelings. This more empathetic approach could help patients to perceive these moments of interaction as an extension of their clinician's care rather than as a display of clinical expertise. We note that still half of the corrected misconceptions pertained to errors in the patient's conceptual knowledge, with no immediately obvious implications for their future behaviors. However, rather than being pedantic, we argue that these may have been important corrections. Firstly, these corrections set the record straight, ensuring accurate common ground between the patient and clinician. Secondly, just as with the corrections aimed at changing behavior, the more conceptual ones could be construed as clinicians treating patients as rational individuals who have the right to accurate information. Thus, it is in these moments of interaction that we can see clinicians empowering their patients, which in turn allows patients to become more engaged in their care.

Displaying surprise

In our material, we found that one direct practice clinicians used was saying "oh" directly following a patient utterance that displayed a misconception. This "oh", in a turn-initial position, indicates that the clinician has undergone a change in current awareness or knowledge, as it displays that what the patient has just said was unexpected (Heritage, 1984). Despite

our finding that clinicians used this practice eight times (18%) in our material, previous research on clinician-patient interaction claims that clinicians almost never utilize "oh" in this manner; indeed, this phenomenon is one of the distinctions between institutional and ordinary talk (Heritage & Clayman, 2010). The existence of this direct practice in our material may simply reflect the participating clinicians' status as resident physicians, who may not yet be fully socialized into the norms of clinician talk. However, we speculate that clinicians may find interactional benefit in displaying to patients that they were unaware that the patient harbored a mistaken belief.

Notably, none of the clinicians displayed surprise when the patient's misconception pertained to chronic pain and opioids. More generally, we found that the clinicians showed a preference for indirect corrections of patient misconceptions about chronic pain. These findings are in line with previous studies indicating that both patients and clinicians experienced visits addressing chronic pain as difficult (Henry & Matthias, 2018). Chronic pain is a particularly difficult topic because not only does it carry stigma, but medical consensus about the relative risks and benefits of opioids and the role of opioids in treating chronic pain has undergone significant revision in recent years (Dowell et al., 2022). Indirect corrections of misconceptions that emerge on this topic may mitigate difficulties and avoid conflict, but such practices potentially frame the correction as a negotiation between two legitimate points of view. By not correcting a patient directly, clinicians may be prioritizing conflict avoidance at the expense of not making it clear that the patient is mistaken about something. However, whether this tradeoff functions as we speculate is an open question.

The study's limitations and strengths

This study took place at two clinics in a single academic health center and the participating clinicians were resident physicians, limiting generalizability to other settings. In addition, our unit of analysis was each misconception-correction episode. Thus, our quantification of each correction practice noted only its presence or absence in each episode, regardless of how many times the clinician used it (e.g., if the clinician provided multiple explanations during a single episode, we only accounted for the presence of the practice of explaining). Finally, this study did not examine patient misconceptions that clinicians did not correct, which were also potentially consequential.

The strengths of this study include direct observation of authentic clinical visits using videorecordings. Further, we used mixed methods for analysis, integrating inductive approaches (microanalysis of clinical interaction and conversation analysis) and an established coding scheme to derive clinical topics (DICTUM). Finally, we aimed for consistency and transparency in our analytical decision making: we developed detailed operational definitions (with a coding manual available from the first author) and have provided numerous examples of the phenomena. We also provided details regarding how we applied the definitional criteria to sequences of interaction to demonstrate precisely what fit our criteria for a misconception-correction episode. In this way, we hope to encourage both reproducibility and further research on this topic. Lastly, while our analysis focused solely on medical interactions, we believe the list of correction practices and our classification of them (direct versus indirect) are generalizable to the social action of corrections being done in any setting (both in ordinary and institutional talk) and can serve as a contribution to the larger study of other-initiations of repair in the conversation analytic literature.

Future directions

This was an exploratory study in which we identified practices clinicians used to correct patient misconceptions that emerged during clinic visits. The process of conducting this analysis raised several points of curiosity for us. First, all but two of the corrected misconceptions could be classified as pertaining to clinical topics, suggesting that clinicians corrected patient misconceptions that fell within their traditional medical epistemic domain (e.g., how to evaluate test results, diagnose the patient's condition, how a particular medication works). Clinicians are assessing in real time whether a patient misconception they have noticed is worth correcting. Our material suggests a preference for clinical topics; however, it was outside of the design of this study and scope of our analysis to examine this broader phenomenon further. Second, during analysis we observed that some consultations included many related misconception-correction sequences on similar topics, and these may have reflected an underlying, more fundamental misconception that was never fully exposed. For example, in one visit, the patient had numerous misconceptions that were superficially different, but on a deeper level appeared to be related to conflating inflammation with the experience of pain. However, our observation is only speculative, and learning whether these reflected an underlying misconception would require gathering the patient's views on that particular issue. Third, our post hoc analysis indicated that clinicians tended to use indirect correction practices when the patients' misconceptions were about pain and opioids. However, the sample we had analyzed for this study was too small to test this trend for statistical significance. Fourth, the "oh" prefaced corrections are specifically worthy of closer examination, including whether this phenomenon is particular to resident physicians and disappears as clinicians become socialized to the norms of practice and whether it holds in other clinical settings. Finally, it was beyond our purposes to explore how patients responded to being corrected. Future work could aim to elucidate practices that are more or less acceptable to patients and effective at changing beliefs. Such research would contribute to a normative model aimed directly at improving clinical communication practice.

Conclusion

We posited that characterizing how clinicians correct patient misconceptions is an essential first step toward identifying best practices for correction strategies. We used an inductive

approach with authentic clinic visits to reveal practices the clinicians used to correct patient misconceptions. As this was an explorative study, our findings were descriptive, and we aimed to provide methodological groundwork for informing future interventions or training programs. Ultimately, a cohesive body of research could contribute to practices for reducing clinical harms by training clinicians to unearth patient misconceptions and tailor corrections there and then, during the clinic visit.

Note

1. For transcript conventions, see Jefferson (2004).

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