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Content Coding for Contextualization of Care: Evaluating Physician Performance at Patient-Centered Decision Making

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Background and Objective. *Adapting best evidence to the care of the individual patient has been characterized as "contextualizing care" or "patient-centered decision making" (PCDM). PCDM incorporates clinically relevant, patient-specific circumstances and behaviors, that is, the patient's context, into formulating a contextually appropriate plan of care. The objective was to develop a method for analyzing physician-patient interactions to ascertain whether decision making is patient centered.* ***Methods.*** *Patients carried concealed audio recorders during encounters with their physicians. Recordings and medical records were reviewed for clues that contextual factors, such as an inability to pay for a medication or competing responsibilities, might undermine an otherwise appropriate care plan, rendering it ineffective. Iteratively, the team refined a coding process to achieve high interrater agreement in determining (a) whether the clinician explored the clues—termed "contextual red flags"—for possible underlying contextual factors affecting care, (b) whether the presence of contextual factors was confirmed and, if so, (c) whether they were addressed in the final care plan.* ***Results.*** *A medical record data extraction instrument was developed to identify contextual red flags such as missed appointments or loss of control of a treatable chronic condition which signal that contextual factors may be affecting care. Interrater agreement (Cohen's kappa) for coding whether the clinician explored contextual red flags, whether a contextual factor was identified, and whether the factors were addressed in the care plan was 88% (0.76, $P < 0.001$), 94% (0.88, $P < 0.001$), and 85% (0.69, $P < 0.001$) respectively.* ***Conclusions.*** *PCDM can be assessed with high interrater agreement using a protocol that examines whether essential contextual information (when present) is addressed in the plan of care.* ***Key words:*** *patient-centered care; performance assessment; clinical decision making.* ***(Med Decis Making 2014;34:97–106)***

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Clinical decision making has been described as the skills required to integrate 3 types of information: a patient's *clinical state and circumstances*, the relevant *research evidence* as it applies to that clinical state, and the patient's *preferences and actions* when the research evidence points to multiple treatment options.[1] An example is a patient whose clinical state and circumstances include atrial fibrillation and a history of gastrointestinal bleeding. The expert clinician incorporates research-informed information about the risks of bleeding and the benefits of stroke prevention with an informed patient's preferences.

For the third of these—preferences and actions—we have proposed a broader category of information to capture the full array of characteristics and circumstances at the level of the individual patient that have implications for planning care: *patient context*.[2] For instance, in the example above, obstacles to routine warfarin monitoring, such as a lack of transportation or competing responsibilities, are not explicitly

considered.[3] We have previously documented that the failure to incorporate patient context into care planning can result in an inappropriate plan of care as a result of what we have termed a *contextual error*.[2,4] We have also documented how contextual errors result in higher costs and less favorable health care outcomes.[5,6]

Patient context is defined as ''everything *expressed* outside of the boundaries of a patient's skin that is relevant to their care.''[7] Patients express their preferences, but that is just a part of the context of their illness. A useful typology divides patient context into 10 domains: access to care, social support, competing responsibilities, financial situation, relationship with health care providers, skills and abilities, emotional state, cultural beliefs, spiritual beliefs, and attitude toward illness.[2]

The term *expressed* is italicized for emphasis since not all of the domains originate in the patient's external environment. Although the first 4 do (e.g., financial situation), the latter 6 do not (e.g., attitude toward illness), yet they may have relevance to a particular clinical situation based on how each is expressed. For instance, a patient may present with deteriorating diabetes control that is due to progression of underlying dementia (domain: ''skills and abilities''). Although dementia is a biochemical ''under the skin'' process, its impact on the patient's behavior makes it a part of the context of the patient's diabetes. The clinician caring for such a patient must factor in the patient's diminishing skills and abilities when planning the diabetes care. Cultural and spiritual beliefs and attitude toward illness are all expressed in patient preferences and in the choices patients make. The clinician must be sensitive to the full range of context, not just preferences, to provide patient-centered care. Regardless of his or her preferences, a patient may not have the financial means for a particular treatment or may have job or caretaker responsibilities that interfere with an otherwise appropriate plan of care. Patient context captures all of these.

Contextualization of Care/Patient-Centered Decision Making

We have previously described the process of incorporating patient context into care planning as *contextualizing care*[4] or, more recently, as *patient-centered decision making (PCDM)*.[6] The latter term was introduced to illustrate where contextualization of care fits into the lexicon on patient-centered care. Whereas the term *patient-centered care* is inclusive of all system and provider processes that put the patient at the center of care, *PCDM* refers specifically to decision-making that puts the patient at the center when formulating a care plan. It is the process of answering the question ''What is the best next thing for this patient at this time?''[2] It requires full attention to patient context. Hence, we use the terms interchangeably in this paper and abbreviate them respectively as ''contextualization'' and ''PCDM.''

Contextualization of care is a 3-step process of exploring patient context, recognizing its relevance to care, and planning accordingly.[6] First the clinician notices clues that contextual factors may be a key element in a patient's presenting problem. Clues may be obvious or subtle: A patient who has lost control of a chronic condition because he can no longer afford his medication may say to the physician, ''Boy, it's been tough since I've lost my job.'' If the contextual factor is diminished capacity for self-care, clues may include confusion about dosages, a change in personal attire, or missed appointments.

We have termed these clues *contextual red flags* because they warrant exploration, as ignoring them could cause a contextual error. We refer to them as contextual red flags rather than just as *clues* because the latter has been defined more generically as patients' ''direct or indirect comments about personal aspects of their lives or their emotions during conversations with their physicians.''[8] Such clues may or may not have implications for care planning. In contrast, contextual red flags are defined as such because they point to underlying contextual factors that are relevant to care planning.

A clinician who notices a contextual red flag and probes with a question has attended to 2 of the 3 steps in the process of contextualizing care. What follows depends upon the information that is revealed in response to the probe. For instance, a clinician may probe the contextual red flag ''It's been tough since I lost my job'' with ''Are you having trouble affording your medication?'' only to learn that the patient is on his wife's insurance plan and that the comment was not directly related to the patient's clinical state. Hence, although all contextual red flags should be probed, probing does not always turn up contextual factors relevant to the care plan. However, when probing does uncover a contextual factor—such as a patient's acknowledgement that he cannot afford an expensive brand name drug and has stopped taking it—the clinician attentive to context must complete the third step in contextualizing care, which is to adapt the care plan to the identified contextual factor (which in this example falls in the contextual domain of ''financial situation''). Engaging with

a patient to arrive at a solution that the patient embraces, such as switching to a low-cost generic alternative medication, represents a contextualized or patient-centered plan of care.

Measuring Contextualization/PCDM

There is empirical evidence that clinicians vary greatly in their attention to context, resulting in considerable variation in whether decision making is patient centered.[4,9] Using unannounced standardized patients in an experimental design, we have documented that physicians may stumble at each of the 3 stages of contextualizing care: they may overlook contextual red flags; they may acknowledge the flags but fail to probe; or they may unmask contextual factors but then fail to address those contextual factors in the care plan. Inattention at any of these junctures may result in a plan of care that is not patient centered.

In a recently published study we documented that physician performance at contextualization of care is associated with improved health care outcomes.[6] Intuitively, this may seem self-evident. After all, if a clinician overlooks a patient's inability to afford medication or her preferences for an alternative care plan and simply prescribes a higher dosage of a medication she cannot or does not want to take, it is evident that the clinical condition that is being treated will not likely improve. Evaluating physician performance at contextualization of care required developing a method to measure it.

In this paper we describe and demonstrate the system that we developed to assess physician performance at contextualization/PCDM that prospectively predicted health care outcomes in our recently published study tracking more than 400 patients. The method—which we have called *content coding for contextualization of care*, or *4C*—tracks the content of the interaction, with a specific focus on physician attention and responsiveness to patient context when planning care. We introduce 4C as a first tool for evaluating physician performance at contextualization of care/PCDM.

METHODS

We set out to develop a method to evaluate clinician performance at PCDM that identifies whether there is evidence of relevant patient context (i.e., a contextual red flag) and, when there is, whether the clinician pursues the 3-step process of PCDM (probing for relevant patient context, recognizing its relevance to care when present, and planning accordingly) outlined above. Data collection involves both chart review and listening to audio recordings of encounters.

Internal medicine residents serving 2 VA outpatient continuity clinics volunteered to participate and were consented with the understanding that a minimum of 3 of their patients would covertly audio record encounters for a study analyzing PCDM. We concealed the audio recorders both because an informal survey of housestaff indicated that they preferred not to know when they were being recorded and because there is evidence of a Hawthorne effect when clinicians are aware they are being assessed.[10] Physicians were assured that participation was unconnected to residency training or to professional assessment and that performance data would be deidentified.

Patient registration clerks assented patient participants by asking whether they wished to learn more about an educational study their doctor was participating in. For those who assented, a research assistant (RA) described the study. During the informed consent process, the RA described a protocol for concealing a recorder and gained permission to access the patient's medical record. After the clinical encounter, the RA retrieved the recorder from the patient. The institutional review boards at the University of Illinois at Chicago and the Jesse Brown and Hines VA medical facilities approved the study.

At the start of the coding development process, the team developed definitions of 4 terms:

1. *Contextual Factor*: Factor expressed outside of the boundary of a patient's skin that is relevant to planning his or her care.
2. *Contextual Red Flag*: Anything a patient says or that is observed about his or her situation or behavior that suggests there are unaddressed contextual factors.
3. *Contextual Probe*: Any action of a provider that indicates he or she is aware of a contextual red flag and is exploring whether there are underlying contextual factors.
4. *Contextualized Plan of Care*: A plan of care that addresses the contextual factors contributing to problems with the patient's care.

With these terms, contextualization of care may be described as the process of identifying contextual factors through contextual probes of any observed contextual red flags in order to formulate a contextualized plan of care.

The team also agreed on 3 common patient behaviors that intrinsically meet criteria for a contextual red flag and can be extracted from the medical record with a high degree of specificity:

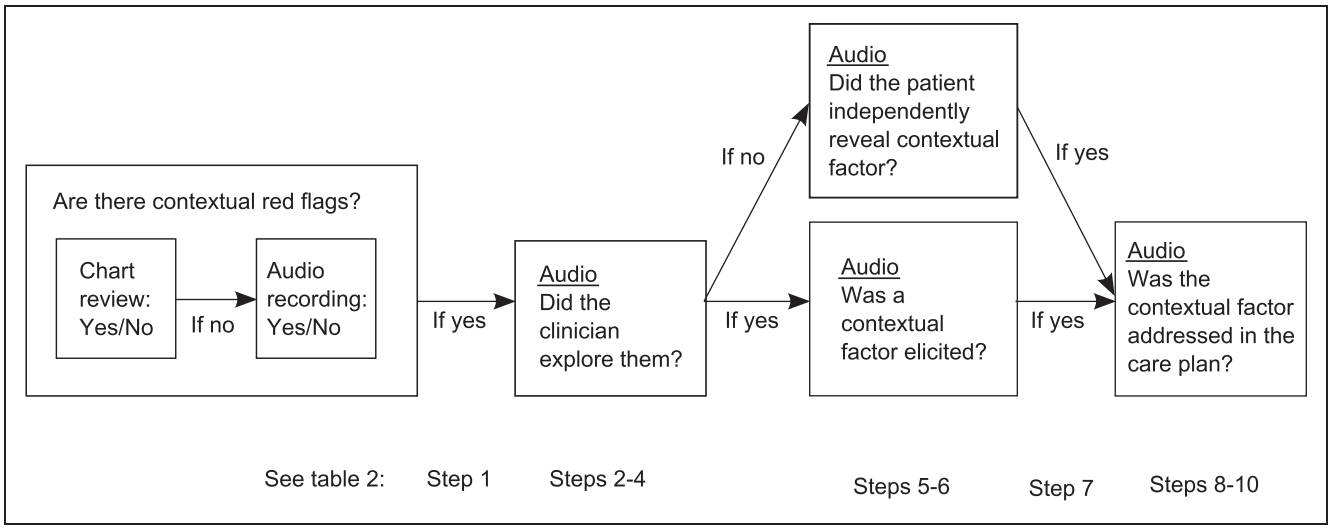

Figure 1 Schematic overview of the process of content coding for contextualization of care.

a. History of recent missed appointments
b. Poor control of a clinically manageable chronic condition such as hypertension or diabetes
c. Documentation of poor adherence to a care plan, including medication adherence, follow-through with planned laboratory tests or studies, and medication refills

With definitions and criteria established, one member of the team was assigned the role of chart coder, responsible for identifying the predetermined contextual red flags. Once an encounter was identified as having a contextual red flag, 2 other members of the team listened to the audio recordings to code for the presence or absence of contextual probing, contextual factors, and a contextualized plan of care.

In addition to developing a process for evaluating whether a clinician has contextualized care, the team sought to optimize the performance of the coding system in 3 areas:

1. Comprehensiveness—The system identifies as many contextual red flags as possible: A limitation of screening for contextual red flags based only on chart review is that it does not capture those that emerge during the actual encounter. Hence the team arrived at a method of identifying the contextual red flags on the audio recordings as well as from the medical record.
2. Reliability—Different raters using the same method come to the same conclusions: Agreement of at least 80% is achieved for all 3 components of the audio coding process once a contextual red flag is identified: presence of contextual probes, contextual factors, and contextual plans of care.
3. Efficiency—The system minimizes the time required to code each encounter: A coding process is used that can be accomplished in approximately 1.5 times the time it takes to listen to an encounter.

The 5-member project team convened at first weekly and then biweekly to review progress in developing a protocol to achieve these aims. Multiple coding strategies were tested in mini-experiments involving typically 20 or 30 encounters.

RESULTS

Arriving at a contextualization/PCDM performance measure that was comprehensive, reliable, and efficient was achieved through an iterative process of coding and recoding 170 audio recorded encounters. The team continued to apply 4C to an additional 431 recordings, identifying a total of 548 contextual red flags and assessing the PCDM performance of the patients' providers. The process, which requires that the team answer 4 sequential questions, is outlined schematically in Figure 1 and described below. A detailed coding manual is archived online at http://dvn.iq.harvard.edu/dvn/dv/4C.

Question 1: Are There Contextual Red Flags?

Identifying contextual red flags begins with a structured chart review for evidence of predetermined patient behaviors or clinical changes that are attributable to patient contextual factors. These include missed appointments; nonadherence with

Table 1 Criteria and Function for 4 Categories of Contextual Red Flags

Contextual Red Flags	How Identified	Function	Distribution by Level (n = 548)
Level 1	• Identified by chart screener • Medical record review • Using a chart extraction tool • Meet severity criteria	• Highly significant if physician disregards • Standardized: can be used for performance comparison across physicians • Outcome of physician interventions can be quantified	172 (31.4%)
Level 2	• Identified by chart screener • Medical record review • Chart extraction tool • Do not meet Level 1 severity criteria	• Standardized: can be used for performance comparison across physicians • Less significant than Level 1 • Outcome of physician intervention is dichotomous (any improvement v. no improvement in red flag)	132 (24.1%)
Level 3	• Identified by audio screener • Screened for only if no Level 1 or 2. • Audio recording review not medical record • Not from a predetermined list • Audio screener stops listening after identifying one Level 3 red flag	• Not standardized: meets criteria if a second coder confirms impression of audio screener • Outcome same as Level 2 (any improvement v. no improvement in Red Flag)	99 (18.0%)
Level 4	• Identified by audio coders • Screened for on all encounters during audio coding of encounters with a Level 1, 2, or 3 red flag • Anytime both audio coders hear a red flag other than an already identified Level 3 red flag	• Not standardized; meets criteria if a second coder independently identifies same red flag • Outcome same as Level 2 and 3 (any improvement v. no improvement in Red Flag)	145 (26.5%)

medications, tests, and laboratory results; and/or preventable deterioration of a chronic condition, such as poor diabetes or blood pressure control. When identified, these contextual red flags were classified as Level 1 or Level 2, based on the evidence of severity (Table 1). For instance, a Level 1 red flag for appointment nonadherence requires documentation of at least 16 appointments in the prior 12 months with at least 4 no-shows. Level 2 red flags require documentation of only 2 or more missed appointments in the last 4 months. These categories are useful both for rating physician performance and for tracking outcomes. For instance, overlooking a Level 1 red flag represents a more significant performance deficit than overlooking a Level 2 red flag. Meaningful outcomes of interventions are more significant for Level 1 red flags. Whereas simply showing up for the next appointment counts as a good outcome following an encounter with a Level 2 red flag for appointment nonadherence, classification as a good outcome for a Level 1 red flag requires an improvement in the return visit adherence (RVA) rate, which is calculated by dividing the number of attended appointments by the total number of appointments scheduled. All chart coding was conducted by a designated ''chart coder'' assigned to identify all Level 1 and Level 2 red flags.

As noted in the first box in Figure 1, if the medical record is unrevealing, then a second member of the team—an audio screener—listened to the audio recording until hearing any statement indicative of an underlying contextual issue essential to their care. For instance, if the encounter was a first-time visit and the patient presented with a poorly controlled chronic condition, or there were signs that the patient was confused about the care plan, the screener coded a Level 3 red flag. Once the audio screener coded a Level 3 red flag, he or she ceased to listen further. Another member of the team would then confirm the presence of the Level 3 red flag. In

Table 2 4C Coding Algorithm with Examples and Interrater Agreement across Coders (Red Flag: High A1c 9.1)

	Coding Steps	Examples	Notes	Interrater Agreement
1	Coder formulates a model probe to red flag	*Why are your blood sugars out of control?*	A model probe is a direct question about the red flag.	
2	Probe heard	*Your A1c is really high; what's happening?*		
3	Was it a contextual probe?	Yes		
4	Is it close enough to the model probe to be credited?	Yes		88%; Cohen's kappa 0.76, $P < 0.001$
5	Contextual factor revealed in response to probe	*Patient has vision problems and can't read the small numbers on his insulin syringe.*		
6	Contextual factor revealed by patient without specific probing by provider	Not applicable	Not applicable here. See example below.	94%; Cohen's kappa 0.88, $P < 0.001$
7	Coder formulates a model contextual plan of care (POC)	*Find another method for patient to get his insulin.*	A model POC is any plausible work-around to address the contextual issue that is getting in the way of the patient's care.	
8	POC heard	*I'll have you meet with the pharmacist after your visit so you can get the pen; it is much easier to read.*		
9	Was it contextual?	Yes		
10	Is it close enough to the ideal POC to be credited?	Yes		85%; Cohen's kappa 0.69, $P < 0.001$

contrast to Level 1 and 2 red flags, Level 3 red flags are not identifiable from a chart review, nor are they selected from a predetermined list.

Any encounters with Levels 1–3 red flags were subsequently coded for clinician performance at contextualizing care, a process conducted on our team by 2 designated audio coders. During the coding process, the audio coders sometimes heard additional red flags when listening to the audio in its entirety. If both coders independently noted the additional red flag, it was classified as a Level 4 red flag. Table 1 summarizes the criteria and functions of each of 4 levels of red flags and includes a breakdown of the proportion at each level.

Question 2: Did the Clinician Explore the Red Flags?

Once provided with the list of contextual red flags, the audio coder's principal task is to systematically track clinicians' responses to the identified contextual red flags following the coding algorithm. The coding algorithm consists of a series of questions each coder asks him- or herself to identify the presence or absence of a contextual probe, a contextual factor, and a contextual plan of care. Table 2 provides the 10-step algorithm in the first column and illustrates the process with an example in the second column. We also indicate in Figure 1 where each of these steps occurs in the coding schema.

The first step in the algorithm for the coder, upon reviewing the contextual red flag and before listening to the audio, is to formulate an unambiguous model contextual probe. A model contextual probe is the most direct and open-ended form of the question that the clinician should ask upon noticing a contextual red flag. For instance, if the patient presents with an unexpected deterioration in diabetes control (the contextual red flag), a model contextual probe would be "I notice your diabetes has gotten out of control recently. Can you tell me why this might be occurring?"

After formulating a model probe, each audio coder then independently listens to the audio recording to determine whether the clinician asked a question

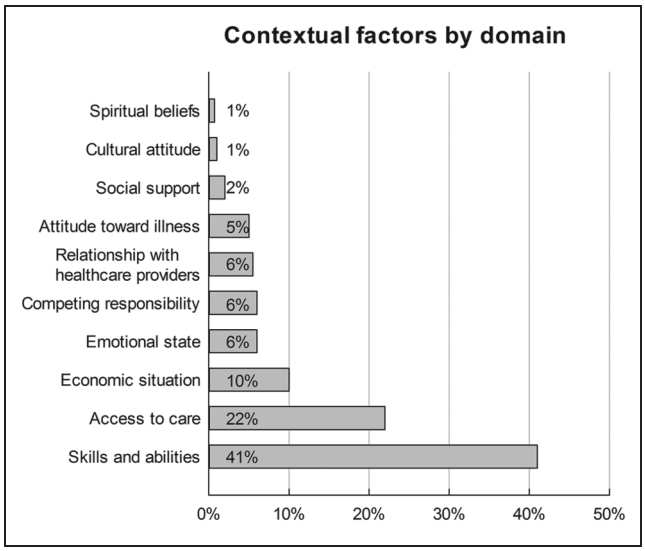

Figure 2 Distribution of 208 contextual factors across 10 domains of context.

(step 2) that substantively approximates the model probe (step 3), indicating that the clinician considered contextual factors while evaluating the patient's worsening diabetes. If the audio coder hears a clinician probe that substantively matches the model probe (step 4), the physician receives credit for noticing and responding to the contextual red flag.

Question 3: Are There Contextual Factors (Elicited or Revealed)?

Note that when a clinician probes a red flag, the patient may or may not reveal contextual factors that are relevant to her care. The coder makes this determination (step 5). For instance, a patient who asks about her deteriorating diabetes control may reveal factors in one of several of the 10 domains of context, such as competing responsibilities that are newly interfering with medication adherence, cognitive decline that is affecting self-care, or a loss of social support that has changed eating habits. Alternatively, the worsening diabetes may be due to progression of the underlying disease rather than to contextual factors.

As indicated in step 6 of the algorithm, on occasion a patient volunteers information about a contextual factor without the physician probing. For instance, consider a variant of the example provided, in which the clinician instructs the patient to increase his insulin dosage and does not probe for contextual issues related to the elevated hemoglobin A1c. Were the patient to volunteer ''but doctor, ever since I've been on the night shift I've been afraid to take as much insulin because I'm not eating the way I used to during the day,'' the coder would record that a contextual factor was revealed without specific probing by the provider. The provider would not get credit for probing but would have an opportunity to get credit, or fail to get credit, for developing a contextualized plan of care that addressed the contextual factor of competing responsibilities.

When a coder documents a contextual factor, it is assigned to one of the 10 domains of context. Across the 548 contextual red flags identified during the 4C coding process of the 431 encounters studied, 208 contextual factors were either elicited or revealed. Their distribution across the 10 domains of context is shown in Figure 2.

Question 4: Was the Contextual Factor Addressed in the Care Plan?

If the patient reveals an underlying contextual factor, or problem, such as a change in employment that interferes with medication adherence, the clinician is assessed for whether the care plan was adapted accordingly. The coders begin by formulating a model contextual care plan (step 7). A model contextual plan is any plan that plausibly addresses the underlying contextual factor that accounts for the contextual red flag. The coder then listens to determine whether the care plan heard (step 8) is contextualized (step 9) and substantively addresses the identified contextual factor (step 10). Table 3 provides examples from each of the 10 contextual domains of contextual factors that were addressed in a care plan.

Interrater Reliability

By using 2 independent coders, we were able to compare their assessments at each stage in the content coding algorithm (Table 2): In their analyses of clinician performance in addressing 548 contextual red flags, the 2 coders agreed 88% of the time on whether the clinician probed (Cohen's kappa 0.76, $P < 0.001$), 94% on whether a contextual factor was identified or revealed (0.88, $P < 0.001$), and 85% on whether the care plan was contextualized (0.69, $P < 0.001$). When a discrepancy occurred, the coding supervisor would listen to the encounter, review her findings with the team leader, and then serve as a tie breaker.

Table 3 Examples of Contextual Factors and Care Plans in Each of the 10 Contextual Domains

Competing Responsibility:
Contextual Factor: Patient's shoulder injury is not healing because she is a single mother with a quadriplegic son she has to lift.
Contextualized Care Plan: Assistance arranged for care of patient's child.
Social Support:
Contextual Factor: Daughter helps elderly patient with his medications but states she can't be there every day and he often takes too much of his medication or doesn't take it at all.
Contextualized Care Plan: Clinician works out plan involving prefilled daily pill boxes.
Access to Care:
Contextual Factor: Patient doesn't get mailed medication refills because they get stolen from his mailbox.
Contextualized Care Plan: Clinician arranges for patient to pick up medications from the on-site pharmacy.
Economic Situation:
Contextual Factor: Patient is not taking medications because he has been unemployed and cannot afford them.
Contextualized Care Plan: Clinician substitutes alternative medications covered by the VA formulary. For uncovered medications, switch to lower cost generic where feasible.
Skills and Abilities:
Contextual Factor: Patient with high A1c with impaired vision has a hard time reading insulin syringe.
Contextualized Care Plan: Clinician prescribes an insulin pen designed for visually impaired people.
Emotional State:
Contextual Factor: Patient with loss of blood pressure control revealed that he stopped taking his medications regularly after a close relative died and other personal problems emerged that distracted him.
Contextualized Care Plan: Clinicians screens for, diagnoses, and treats depression.
Cultural Attitude:
Contextual Factor: Patient with diabetes states he is from a Sicilian family and it is hard not to eat pasta.
Contextualized Care Plan: Patient referred to nutritionist who is informed about patient's culturally based taste preferences.
Spiritual Beliefs:
Contextual Factor: Patient with depression doesn't want help from mental health services, states he uses his Christianity to help him with ''that stuff.''
Contextualized Care Plan: Patient is asked about whether he has a spiritual advisor at his church. He is advised to meet with his spiritual advisor to discuss and then return for follow-up.

(continued)

Table 3 (continued)

Attitude toward Illness:
Contextual Factor: Elderly patient with severe kidney problems indicates he does not want dialysis but would prefer to allow disease to run its course. No evidence of depression.
Contextualized Care Plan: After ensuring that the patient understands the implications of his decision, physician does not press for dialysis.
Relationship with Health Care Provider:
Contextual Factor: Patient doesn't want to go back to pain clinic because she did not like her doctor there. She gives examples of what she perceives as insensitive care.
Contextualized Care Plan: Clinician refers her to another provider.

Data Recording and Coding Time

Each coder uses an Individual Coder Spreadsheet (online Appendix 1) that includes prompts to facilitate completing each phase of the coding process while listening to the audio recording. Based on the reported experience of the coders, the length of the task may vary from the length of the audio recorded visit to approximately 1.5 times the visit, depending on whether the coder needs to relisten to sections of the recording for confirmation of findings.

DISCUSSION

Current performance measures evaluate adherence to guidelines and best practices, irrespective of the patient's individual circumstances and behaviors or the context. For instance, the VA's External Peer Review Program (EPRP) samples patient records to document adherence to a set of quality indicators.[11] There has not been a systematic process for assessing whether such evidence based practices are applied judiciously to the care of individual patients.[12,13] Content coding for contextualization of care (4C) provides a reliable method for assessing physician performance at adapting research evidence to patient context. Whereas ''best evidence'' may point to initiating insulin in a type 2 diabetic patient who is no longer controlled with oral medication, recognition of the relevance of his failing vision to developing a safe and effective care plan is essential to the conscientious and judicious application of that best evidence. 4C is a tool to complement current measures of guideline adherence to assess this critical patient-centered dimension of decision making.

We are not aware of any prior attempts to characterize or measure contextualization of care. Characterizing it requires acknowledging the critical cognitive task for the provider of attending to patient context when planning care. Measuring it requires operationalizing the task as a sequence of observable steps in the physician-patient interaction that result in a patient-centered care plan. Despite a vast literature on patient-centered care, the terms *contextualization of care* and *patient-centered decision making* are not a part of that literature, although we believe the process is fundamental to patient-centered care.

Although contextualization/PCDM has not been previously measured, there have been considerable attempts to define and measure ''patient-centered communication'' (PCC).[14,15] There is little evidence, however, that PCC is associated with improved patient outcomes, other than improved patient satisfaction.[16] One explanation for the lack of a relationship between PCC and patient outcomes is that the tools for measuring PCC do not capture those elements of the interaction that determine whether the actual care plan is patient centered. We documented this problem when we employed a widely used tool for measuring patient-centered communication—the Roter Interaction Analysis System (RIAS)—to measure PCC across 400 physician encounters with unannounced standardized patients trained to present with scripts designed to assess physician attention to context.[17] RIAS measures of PCC showed no correlation with whether the physician identified contextual factors and incorporated them into the care plan.

RIAS is not a tool for measuring PCDM because it does not consider the substance, or logic, of an interaction but rather classifies individual utterances in isolation from their context into mutually exclusive categories. For instance, a physician who responds to the comment ''Boy, it's been tough since I lost my job'' with ''I'm sorry to hear that'' gets points for PCC because the response is sympathetic even though it brings premature closure, resulting in a missed opportunity to identify contextual factors essential to developing a patient centered plan of care. The RIAS approach to evaluating the physician's performance based on responsiveness to patients' emotions, without consideration for whether those responses facilitate planning effective care, is consistent with other work on patient-centered communication. In studies of empathic communication, for instance, physicians are assessed on their responsiveness to clues from patients indicating underlying emotion.[8,18] They are not assessed on whether their responsiveness enhances decision making by taking into account those emotions (or any other patient contextual factors) when planning care.

Although 4C has been developed as a physician performance measurement tool, it generates information useful at the systems level as well. For instance, as detailed above (Figure 2), tracking domains of context generates a record of the proportions of contextual factors in a particular clinical setting that are due to patients' unaddressed financial needs, competing responsibilities, and social support. Such information facilitates tailoring services to address a particular population's needs. For instance, in the VA population in this study, 4C coding revealed that patient deficits in skills and abilities accounted for 41% of contextual factors. This finding suggests that for this particular population, services that focus on patient education and on accommodating skill deficits related to self-care are badly needed.

4C is also useful for evaluating interventions to improve physician performance at contextualization care. These may include medical education interventions,[19] initiatives to better activate patients to share their concerns during encounters,[20] or incentives designed to influence clinicians' behavior.[21] 4C has recently been adopted at 2 VA hospitals to assess a quality improvement initiative and plans are underway at several other sites (unpublished data).

A central limitation of 4C is that it has not yet been widely used, so that its scalability is unknown and its reliability has not been reassessed with new coders. 4C is relatively resource intensive, requiring at least the time it takes to listen to an audio recorded encounter, typically longer. Given how much information critical to contextualized decision making is exchanged verbally but never documented, analysis of the audio recording is essential.

If the high level of interrater agreement achieved in this study is replicated, the coding process can become less resource intensive as periodic interrater agreement checks replace dual coding of each encounter. Another potential time saver is prescreening patients for evidence of contextual red flags before audio recording encounters so that every encounter analyzed has at least one red flag that a physician should address. In our recently published study we had to discard 33% of audio recordings because there were no red flags. This inefficiency can be avoided in quality improvement initiatives where it is not a HIPAA violation to prescreen patients' medical records for evidence of contextual red flags. With such adaptations, a sole 4C coder could efficiently conduct audits of purposely

selected encounters to assess clinician performance at managing contextually complicated presentations. To the extent that assessment drives performance, such a process has the potential to improve physician performance at adapting care to patients' context.

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