



# Distributing Cognition

## How Hand-Off Communication Actually Works

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**Introduction:** Transitions between shifts in the intensive care unit (ICU) create potential gaps in the continuity of care<sup>1</sup> and practitioners necessarily rely on distributed cognition to prevent gap formation during work-cycle shift changes. The complexity and uncertainty of each ICU patient's condition require efficient communication between practitioners during transfers between departments or when cycling work through shifts.

**Methods:** This study observed twelve unit-level exchanges among six clinicians handing off a 33-bed PICU and step-down unit, then examined them using conversation analysis.<sup>2</sup>

**Results:** Our research<sup>3,4</sup> has shown that pediatric ICU fellows use sign-outs that demonstrate high context sensitivity, compact reference, gestures, and stylized expressions.<sup>5</sup> Clinicians use variations of monologue and dialogue to transfer information at a high level. Both forms demonstrate the same variable, emotion-laden, dynamic, and complex traits as the work domain that they are used to manage.<sup>6</sup> We find that sign outs account for both what is known and what is not known about a patient's condition, and to assess expectations for the oncoming shift. Uncertainty about patient condition influences handoff content and form. Clinicians change the amount time that they allocate to handoffs based on other aspects of work load, such as rounds or procedures. Clinicians apportion time to discuss individual patients according to the perceived severity and stability of each patient's condition.

**Discussion:** Expertise in hand-off communications depends on the ability to prioritize relevant information and transfer insights effectively. Relevant, efficient hand-offs significantly affect the ability of anesthesiologists and residents to provide care at the unit level, within and between departments, and across specialties such as intensivists, nurse anesthetists, and anesthesia technicians. Even though they affect patient care quality and continuity, sign outs are not taught but are instead learned on the job. Formal study of, and training in, the conduct of sign outs may benefit both care providers and patients alike.

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5. Grice, H.P. *Studies in the Way of Words*, Harvard 1991.
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## What We Did: Discourse Analysis

Our research analyzed between-shift hand-offs that were conducted among five intensivist fellows over one month in a major urban hospital pediatric intensive care unit (PICU), starting with transcripts of nine exchanges.

*H: first hour I was here she was having seizures every five to ten minutes And so we reloaded her with ten of Phenobarb again. Otherwise everything has been the same*  
*R: Okay*  
*H: And since that load*  
*R: Did you have to go up on the Propofol*  
*H: No*  
*R: Okay*  
*H: She didn't want to*

The research team reviewed transcripts to learn how clinicians use compact reference to manage quantity, use gestures to convey information efficiently, use stylized protocols and expressions to maximize accuracy, and protect truth through high sensitivity to the patient context.

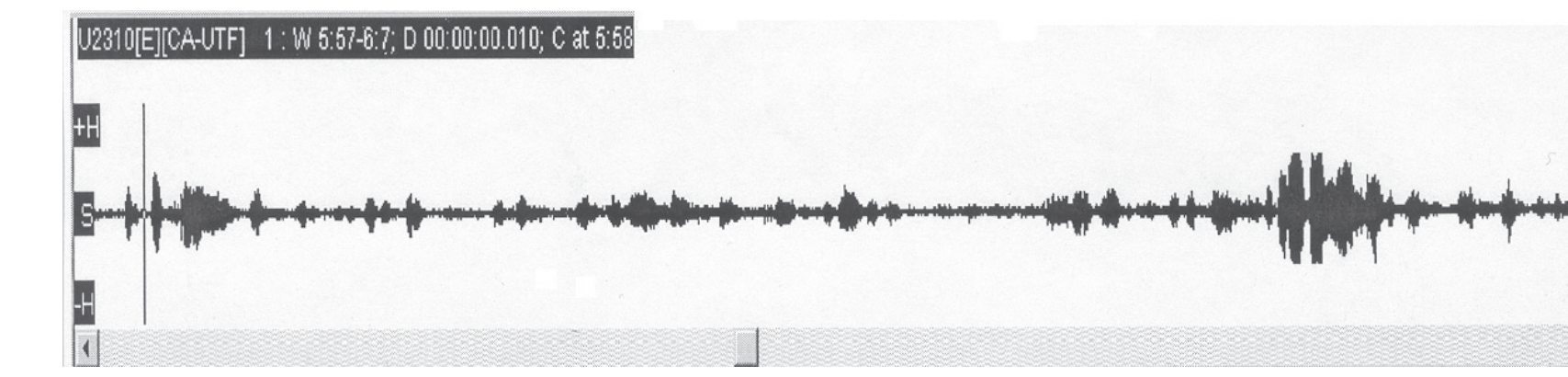
**Gestures to two patients**  
R: a wandering pacemaker and this or that  
M: oh really, vital signs stable?  
R: before I forget, this kid needs an echo, this kid needs an echo [pointing to kid across the room], when J. asks. Vital signs are stable, everything is ok, I did an EKG  
M: why do they need echo's? did something happen or just?  
\*\*\*\*\*  
M: looks like she is on  
R: her name is T., she was fine until midnight, she was only on continuous  
M: was she in stepdown and came here?  
R: I think she came from [name of another hospital]  
M: ok  
R: T. sent her, now she is on Heliox, terbutaline at .4, and she is hanging in there  
M: ok  
R: she may get worse, I did not have to do BISAP  
M: ok  
R: ok her, before I forget, everything went well in the OR, she came back  
M: what time did she come back?  
R: hm?  
\*\*\*\*\*  
R: we just discussed it, I don't know if Randy wrote it or not ok. Then he wanted another set of LFT's, I told her already ok so.. big picture.. uhhh, good liver, good anastomosis, the platelets are low, but we are not going to give platelets obviously, liver transplant kids we do not like to transfuse alot of platelets or bloodproducts. hemoglobin stable, JP's are not draining that much urine output was kind of slowing down a little, I don't know for this morning, the last couple hours, [turns to RN] "what was her urine output 8.7 for the last couple hours?"  
RN: it's dwindled down to 30 an hour  
R: but it's there, if it goes any lower it may be an issue for you, she was on a lasix drip before she went to the OR, her last creatinin was 2.1, 2.2 before she went to the OR, so you may have to look into that  
M: ok  
R: uhhh  
\*\*\*\*\*

**Gestures to other hospital unit**  
M: well I think in the first couple days of life you still have pulmonary uhhh  
R: so whatever it is, keep an eye on it  
M: [pointing to empty bed space] was he still here when you where here?  
R: ya, uhhh, it was so morbid, I had to take the bolt out, the neurosurgery resident didn't want to come in to take the bolt out, which I understand, he was dead already and the nurse did not want to do it, so I had to do it  
M: you had to do what?  
R: take the bolt out, no big deal, it's not a big deal but, when I saw him he was like dead then I had to take it out at three in the morning  
M: [unintelligible]  
R: she seized like four small seizures at like 5 in the morning, I said call M., I don't know what to do. Him  
M: oh, yeah  
R: his X-ray you should see this morning it's interesting. it's always been unequal, K. said again, think about foreign body  
M: right right  
R: but there could be an effusion on the left cause you see a line, so I told K. we should do an ultrasound and she agreed so, do an ultrasound  
\*\*\*

**Gestures to nurse**  
R: 2 year old has a skull fracture with a very small epidural  
M: [unintelligible]  
R: from ER, J. started acting out, no access, so I put in a central like  
M: she did this a couple days ago, then got better so that's fine  
R: so the other things I have done, decrease her rate so to give her more time  
M: yeah  
R: because the other night it helped  
RN: did you see the last gas at five?  
Riya, so if it's that much on the venous, I'm sure the arterial is better, which i/s not bad for her, umh but. versed drip, terbutaline drip, magnesium, she was really bad  
M: ok  
R: ok, she looks much better compared to last night. [turning to RN] "do you agree I.?" "does she look better?"  
RN: oh yeah  
Other RN: did she get a chest X-ray?  
R: sedation is the issue here, I think she got really ticked off, and we should go really really slow when we wear her sedation, because this is the second time on my call night I have to do all this

## What We Did: Conversation Analysis

Conversation analysis software produced graphic representations of voice recordings that revealed duration, overlaps, and pauses.

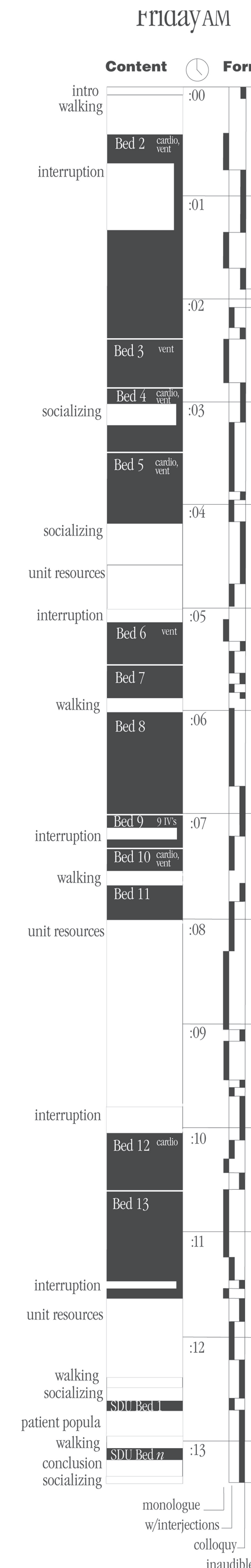


Transcripts were then converted to reflect these features.

*H: first hour I was here she was having seizures every five (to ten) minutes And so we reloaded her with ten of Phenobarb again (1.0) Otherwise everything has been [the same]*  
*R: [Okay ]*  
*H: [And since that load ]*  
*R: [Did you have to go up o]n the Propofol*  
*H: No*  
*R: [Okay ]*  
*H: [She d]idn't want to*

Results of conversation analysis were converted to time line diagrams, as shown at right. Hand-offs were described by the *content* of what was discussed (including patients as well as six other topics) and by the *form* of the talk (shown by the series of narrower bars at right).

The presumed, or canonical, form of a hand-off is the geographic strategy, in which clinicians begin their patient discussion at Bed One. They then proceed around the unit in a precise order, moving from bed to bed in a methodic manner. Each patient is discussed in turn as the clinicians stand at the bedside of that patient. The clinicians can see the next bed and anticipate what is to follow. The total progress can be assessed by their physical location in the unit. By knowing what has been completed and what lies ahead, the hand-off pace can be altered as needed. The key feature of this geographic hand-off strategy is a soft time constraint. Other strategies we discovered demonstrate a) ability to edit hand-offs to accommodate time constraints (such as the start of rounds), and prioritizing (when a single patient's condition demands attention to reduce uncertainty about what do do on the oncoming shift).



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## What We Learned

**Content** The proportion of time spent on patients compared to other content varies among the hand-offs. Some hand-offs are almost exclusively patient-related while others incorporate considerable amounts of other topics. The percentage of a hand-off spent on discussion of individual patients ranges from just over half of the sign-out (56%) to nearly all of it (97%). Our conversation analysis accounted for six additional types of content: introduction, walking, interruption, unit resources, patient population, and socializing.

**Form** Subjects employed three forms of talk. two types of soliloquies and one type of colloquy. In a *soliloquy*, one person does all of the speaking as in a monologue. A *colloquy* is a reciprocal transfer of information involving two or more persons, as in a dialogue. Colloquy includes question-answer series, testing-confirmation series, exchange of ideas, and problem-solving.

**Strategies and Patterns** Hand-offs demonstrate different strategies, content, and form that the intensivists employed to fit constraints such as available time

## What This Means

The conventional view holds that hand-offs are data focused, simply structured, uniform in content, and follow a single form.

By contrast, our data show that hand-offs focus on what is uncertain, that they are complex and flexible in their structure, necessarily variable in their content, and take multiple forms. This is because patient progress is not a direct course of improvement, is complex, and is unpredictable.

## How This Affects Patient Care

Formulaic approaches to handling sign outs are a poor match to deal with the uncertainty and complexity of the critical care environment

Clinicians create hand-offs that are unique in content and form in order to manage PICU circumstances  
Attempts to improve continuity of care must reflect this.

Development of training programs for residents can improve their ability to perform this vital task.

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