Appendix 2 – Sample of Coding Framework

August 19, 2019 – Consolidated coding framework

Type

Institutionally-sanctioned
Informally-created

Forms

successful
failed
ignored
double-barreled (eg., stigma vs. safety)
Left over

Purpose

Training (differentiate traces purposefully used for simulation training vs. traces used in actual clinical environments?)
Saving face
Avoiding conflict or discomfort
Promoting efficiency: • Getting someone to do something they might have missed or that needs to be done quickly • Anticipate the needs of the team • Manage team's flosw and efficiency • Directing attention to something that might be overlooked
Preventing mistakes: • Override another person's intentions • Signaling "I'm about to do something" or "I'm coming back" • Signaling how you want things to be done / how to proceed • Reminding not to forget something
Calling for attention (patients) or avoiding attention (trainees)

Social life of a trace:

Regardless of the form that the trace takes, the effect remains
Dilution
Timing

Interpretations and/or responses to traces: strategies

Features of a trace:

Inferring the other person is on the same page
Being explicit and visible
Timing and sequencing
Assumptions rooted in hierarchy can make a trace fail
Unsuccessful because the design is too similar to other objects
Traces can be undone

Suitable situations

High-stakes where multiple people are working simultaneously
No time for conversation
Low stakes where the core team is stable and few members rotate
Emotionally consuming
Asynchronous work [patient chart on OR bed, antenatal consults]
Handover

Potential applications of trace-based communication

Improving system situational awareness without interrupting flow
Navigating hierarchy
Overcoming barriers
Teamwork training

July 22, 2019 – Coding and analytical observations (8 coded out of 19)

Updated coding structure:

Effect

successful	The purple armband. It's violence flagging policy in the hospital where if a patient is deemed a violence risk, they're flagged physically by wearing a purple wristband. (112) [restrains left on the bed of a patient to indicate the patient might be violent or confused and might need to be restrained – from Jenny's interview (118)]
failed	The case of 'can't intubate, can't ventilate' of Elaine Bromiley, a well-known emergency in anaesthesia: *The standard procedure in such situations is a tracheostomy/cricothyrotomy followed by admission to ICU—yet the team of surgical and anaesthetic doctors managing the patient did not execute this option, despite the nursing staff identifying that it was the right thing to do and going as far as booking an ICU bed and* ***bringing the equipment tray into the OR*** [Bromiley 2015, BMJ Quality & Safety Viewpoint]
ignored	At our front desk in the NICU, there is a slot for antenatal consults. So, this is the obstetrician is asking us to come and do a consult for moms who are expected to have a baby with some kind of problem. And usually they are not urgent because the super urgent ones they will call us and say, you have got to come right now. But for the not urgent ones, they get put in this slot. But sometimes, especially if it's busy and people don't want to do the consults, they can get ignored or forgotten. (113)
double-barreled: stigma vs. safety	When someone is wearing a band at an appointment, how confidential it is what their history is based on that. It's lost the meaning that was intended because the symbol has become a symbol of stigma, and a symbol that triggers a feeling of helplessness amongst staff who feel like they're, for example, in mental health our patients are being unfairly stigmatised. [On the other hand], there are very small minority of people who have no problems with this because they believe as part of workplace safety legislation, anybody who presents with any sort of violence risk ever should be flagged with a hospital environment. That opinion isn't consistent with human rights legislation and best practice, but there is an interpretation of the purple armband as a necessary flag for workplace safety in a minority of people. (112)
undone	But sometimes, especially if it's busy and people don't want to do the consults, I have even seen them all get put back in the

	slot, so they had been laid out as a sign of, these need to get done, and the next thing I know they are back in the slot because they don't have time and they don't want them to get lost. So, that cue or that message that was supposed to be sent when they were laid out has just been undone and put back. (113)
Expiration (not sure it belongs here!)	I think that that particular trace [the purple armband], the way that it was implemented, may end, but that there will always be traces in terms of flags because there is a systematic way of flagging patients who might be at risk of violence. I think that general trace maybe won't go away. (112)

Purpose

Training (differentiate traces purposefully used for simulation training vs. traces used in actual clinical environments?)	With learners for sure. So, you presume they've set everything up, they start to do some procedure, and you realize that they are missing a key component, or something that you think is important to be there. So, just while they're carrying on, you don't say, well, go and get it. You do it for them. Usually, the message is you forgot something. You should have had this there (106) In a lot of simulation, if I think about it, we spend our time creating traces. Let's say I want someone to learn about anaphylaxis. Well, I don't announce this is anaphylaxis. I create a case where I pick the three hallmark features of an anaphylactic reaction under anaesthesia, and I create that scenario. By the time you have one, two, or three of those traces, you ought to be down to a diagnosis and then enact a management plan. (106) Well, simulation is all about not overtly dumping a message. It's about subtly creating a clinical scenario, but has all the uncertainty of a clinical scenario and adding in traces to it that would help people sort that out, and seeing if they could do it. (106) Well, some of the stuff around the airway equipment. I won't tell them I'm doing this. I'll just throw the pieces of equipment onto the anaesthetic machine beside them. They'll see it there and usually, they'll go oh, yeah, I forgot to grab that. Yeah, you did. (106)
Saving face	So, if there is a team leader who is physician and I'm a non-physician, sometimes either as a face-saving thing, or a way of abbreviating communications so that you don't have to interrupt the team's flow, or a way of avoiding the patient seeing what I'm

	thinking because I'm not certain. Then I might hold a piece of equipment to signal to the physician that I think we're going to need this, and give the physician or the team leader the opportunity to think do we want to do this? A lot of times, they will look at you and say, excellent. I think it's a very good idea we perform that ultrasound. Or I think putting a pelvic binder on this patient is, in fact, a very good idea. Thank you for getting that started. You don't say anything. You just have to pick it up or shift it over into their view. That would be a form of communication that I think happens very often (110)
Avoiding conflict or discomfort	When families are uncomfortable with the situation. Let's say they know there may be bad news and they don't want to be around for that, I will find that they avoid us, so they are often not present, they are not there. (113) And sometimes our trainees may do the same thing, so if we find they don't really want to do a task because they are uncomfortable with it for whatever reason, there is a lack of a trace, like they are gone. They make themselves busy with something else, so they are not available to do the task that they don't want to do. And sometimes that task is talking to parents who are deemed as being difficult parents. (113)
Getting someone to do something they might have missed or that needs to be done quickly	When it's really busy and we have a patient to be discharged and the nurse really wants us to hurry up and get a patient discharged, you will see that there will be an ophthalmoscope by the bedside. And the reason for this is that we know that the ophthalmoscope to look into the eyes to make sure there are no problems is usually something we do upon discharge for a full physical exam before a baby is to be transferred out. And especially if we are tight for beds or they want to get the process going, they would have pre-emptively gotten the ophthalmoscope out. And if it's sitting there on the table beside the bed you know the nurse is saying, hurry up and do the physical exam because we have got to go. (113) But for the not urgent ones [antenatal consults], they get put in this slot. And sometimes if the unit is really busy, people forget to look in that slot and they build up. So, when they see a giant pile there, sometimes people don't want to do it because it's like, oh my goodness there are so many I have to do. Sometimes you will see people take them out of the slot and lay them out on the front desk, so they are all visible, and that's an indication of, look how many there are, everyone has got to do a few, pull your weight and do some. (113)

	I guess going back to the discussion around the attending paramedic and the assisting paramedic, the attending paramedic might decide that the patient needs a blood glucose collected. So, if they perceive that the assisting paramedic hasn't already perceived that, the attending might reach into the bag, pick up the blood glucometer, and just set it out beside the cardiac monitor as a sign that while you're collecting vitals, please also get a blood glucose. (110) And you see how they [pathology assistants] are very eager and sometimes they're moving the tray a little bit this way or whatever, and you know that they want to remind the resident, show the adrenals, that kind of thing. (109)
Override another person's intentions	A good example would be if the assisting paramedic were more senior and more intuitive about what the patient's needs were, and the junior paramedic was not quite as intuitive, the assisting paramedic would go out to the truck and bring in the extrication device they wanted to use. The best example of that is a chair. We have a chair that folds out, and you can carry people out on it. The senior paramedic might do that in order to override any thinking the junior partner might have that the patient would walk out of the house on their own, right? So, sometimes in order to force your partner's hand, you will take initiative and perform something on your own without communicating that. (110)
Anticipate the needs of the team	A lot of times, because of the shared understanding of tasks between both members of the crew because they will both occupy that role, they're able to anticipate the needs of the team… So, me unzipping my bag and starting to pull out I.V. supplies is a symbol to them that I am intending to start an I.V. and they will start performing tasks to facilitate that. They would pull out an I.V. bag, and they would hook up the I.V. tubing, and prepare that line for me. (110)
Signaling "I'm about to do something" or "I'm coming back"	A lot of times then I will need to leave the room with the intention of coming back. The reason for that is something like, my computer is out in the truck, or I need to go and get cleaned up, or need to assist my partner with something, or collect data from the defibrillator. In that circumstance there, I would often leave my clipboard with my information on it there as a sign that I'm coming back. (110) If I'm seeing a patient, and doing a consult on them, and get interrupted by a page, I might leave all my tools there at the bedside so that if the occupational therapist comes along, they'll

	know that now would not be a good time to take them away. (103)
Manage team's flow and efficiency	If you're not the team leader, then a lot of times you don't want to interrupt the communication patterns of the team. If you have a critical observation, but I think a lot of times, people because of hierarchy are afraid to even communicate critical findings so even then they won't do things. The Elaine Bromiley Case. It happened with an elective procedure down in Australia where multiple people attempted intubations on what should have been a straightforward intubation, but it wasn't. She died of a hypoxic brain injury. Meanwhile, people who were standing around were not explicitly saying there was a safety hazard, but implicitly suggesting it by oh, I'm going to move this into this room. (110) But maybe there are some circumstances where that's either impractical or actually slows things down, in which case, I think we should probably be thoughtful about what is our indirect signalling actually doing? An old school example used to be when we didn't use electronic charts and you used paper charts. Every time an order was written, you'd put the chart in sideways and pull a little tab on it so that the nurse would be able to see that a new order had been written since last time, and they would see the chart. Any time a chart would appear with a new order then you knew they were going to process it rather than just putting the chart back in and having it be possible that someone wouldn't notice it for hours. (103)
Directing attention to something that might be overlooked	If there is a dangerous family, the nurse often wears the panic alarm clip. So, if we see a nurse with it, it looks like a little button, with a green button on it, and if we see a nurse wearing that on her, usually it's very visible on her lanyard or something like that, then we know that she has probably been assigned to a patient with parents who are difficult. (113) This is a big thing because in medicine, we're all trained to be leaders. We're all expected to be leaders, but how often are you actually in a leadership role? One of the ways that we deal with our situational awareness during a resuscitation is to try and process it in such a way that we anticipate the leader's needs, the team's needs, and prepare for it. That has the double benefit of either increasing the team's efficiency by just getting things prepared for when the leader orders it or drawing the leader's attention to something that they might be overlooking. (110)

	So, a patient has a head trauma, and a team member goes and gets a cervical collar to communicate to the leader that there might be a cervical injury rather than explicitly saying I'm concerned about this potential cervical injury. Or if in a resuscitation the team is concerned that the leader is missing the potential for a pneumothorax or a pericardial tamponade, going and getting the ultrasound machine and putting it adjacent to the chest before going and getting a chest tube and preparing it. Those would be ways that a team would communicate to a leader that I think we need to do one of these things, and maybe you need to consider that a little bit more readily. (110)
Signaling how you want things to be done / how to proceed	One example would be if there is a twin pregnancy and one baby has died, so one twin has died, they usually put a butterfly, like a little magnet or a sticker or butterfly either on the chart or on the door. And whenever we see a butterfly we recognise that there is basically some kind of loss there. And everyone walking by would know to be sensitive that there has been some loss experienced. (113) The purple armband. It's violence flagging policy in the hospital where if a patient is deemed a violence risk, they're flagged physically by wearing a purple wristband. So, yeah, that is a physical example of something that's a trigger for action because it's supposed to be a visual indicator to protect people by being aware that a patient might be a risk. (112) There's usually a little table where the nurse has the prep and some towels, so I'll pick out the tourniquet and lay it on the table. So, I'm signalling this is the one I want you to use. I don't tell them. Then, sometimes I'll pick out the clamps for the table or the equipment for the table and I'll lay it down next to the table as, these are the ones we're going to use. But, I don't tell anybody. (111)

Interpretations and/or responses to traces – additional code

Strategies	It [parents' absence] signals to me that if they are feeling like this about it we have to give them the news in small chunks that they might feel really overwhelmed by everything that is happening. We may need to employ more of a multidisciplinary team, so just to make sure even for conversations where normally I would have one on one with the parents, that we invite a social worker to be there. If they have a nurse that they are more comfortable with, invite her to be there to try to make the environment a bit more conducive. I would try to call them

	and say, at your convenience, when do you want to sit down and have a chat? And schedule it, maybe if it's scheduled they don't feel like they're just caught. (113)

Features of a successful trace

Inferring the other person is on the same page	I think traces depend on you being on the same page to begin with, like, you're inferring that the partner knows what's going on. Often, if you don't infer that, then you're going to be very explicit in your communication about what the plan is. (110)

Suitable situations

High-stakes where multiple people are working simultaneously	I think we use them all the time but we don't know, we have never explicitly called it, these are traces. If you were to ask me to label it, not knowing anything about your study, I would say this is just part of the teamwork, part of the way we communicate collaboratively and unspoken ways that we have a common understanding of. Especially in the high intensity situations. (113) If we're talking about high stakes, then a cardiac arrest resuscitation or a traumatic arrest resuscitation would be the perfect example or pre-arrest circumstances. Very rarely on those teams do you see a whole lot of communication going back and forth because they're able to just create a stepwise pattern of objectives in their mind and just leapfrog over one another to get the task done. (110)
No time for conversation	I think the implicit communication is really quite common. Between crews, there are a series of tasks that need to be done over the course of, say, 10 minutes on a call. (110) You presume they've [trainees] set everything up, they start to do some procedure, and you realize that they are missing a key component, or something that you think is important to be there. So, just while they're carrying on, you don't say, well, go and get it. You do it for them. (106)
Low stakes where the core team is stable and few members rotate	[the geriatric unit in Parkwood vs. geriatric ACE unit – quote from Jenny (118)]
Emotionally consuming	So, when you want to go and talk to them [parents] they have left. They come in very briefly to drop off milk, for example, but they know what time you are there for rounds and they are purposely not there. So, it is a lack of a trace, and that often

	implies to us that they really don't want to talk to us, they don't want an update because they feel anxious about it. (113) But maybe there are some circumstances where that's either impractical or actually slows things down, in which case, I think we should probably be thoughtful about what is our indirect signalling actually doing? An old school example used to be when we didn't use electronic charts and you used paper charts. Every time an order was written, you'd put the chart in sideways and pull a little tab on it so that the nurse would be able to see that a new order had been written since last time, and they would see the chart. Any time a chart would appear with a new order then you knew they were going to process it rather than just putting the chart back in and having it be possible that someone wouldn't notice it for hours. (103)

Potential applications of indirect communication – additional code

Improving team situational awareness without interrupting flow	Or if in a resuscitation the team is concerned that the leader is missing the potential for a pneumothorax or a pericardial tamponade, going and getting the ultrasound machine and putting it adjacent to the chest before going and getting a chest tube and preparing it. Those would be ways that a team would communicate to a leader that I think we need to do one of these things, and maybe you need to consider that a little bit more readily. (110)
Overcoming hierarchy	To manage flow and efficiency because communication requires a lot of energy and takes a lot of time, and it cannot be undone. If I move the ultrasound over and it never gets used, then it just gets up back, and that optimizes the use of my time because I'm no longer standing waiting to be told to do something. I'm going we might need this. I think there is an 80% chance we're going to need this so I'm going to move it over, drop, and then have the duplicate purpose of improving efficiency. But also overcoming hierarchy and suggesting to the team leader either because of toxic hierarchy or just cognitive burden on the leader that we probably need to consider this. (110)
Overcoming barriers	I think there are probably a lot here, especially with the stigmergy, where you're going to see people using it as a means to overcome barriers, like, cultural barriers. (110)
Teamwork training	And I was wondering if, for training purposes, making this kind of phenomenon explicit would help people to understand how to work in teams or to do something about working in teams. Especially if you are new to the team and you come from a different culture. If you come from a culture, for example, where

	the physician is the boss, it's all about the physician, completely patriarchal hierarchical system, then you might lose out on some of these unspoken, tacit communications that we have as a team. (113)