**Appendix Table A. Exemplary Quotes from Focus Groups and Field Notes**

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| **Domain** | **Clinician** | **Exemplary Quote** | **Field Note Example(s)** |
| ***Diagnosis is a social phenomenon*** | Week 1:  Intern | *…it was also nice to talk to somebody who is also like an experienced senior resident, like whom I trust as well. I know he is very good clinically and diagnostically, I know he is good. And so being able to run it by him and then walk through it just to make sure that I'm not missing anything is extremely helpful.* | **Example 1:***Resident (reading again on UptoDate) to Intern-  “I’m reading about the symptoms of reactions to IVIG and it says that you can have generalized inflammatory reactions especially in patients with acute infections.”*  *Intern 1– “I don’t know why she would be harboring an infection. We haven’t checked for pelvic inflammatory disease but she’s not complaining about pain. But I guess it’s something to think about.”*  *Intern 2 – “She had an extensive negative work-up.*  *Resident – “Her last CT was without contrast so something might have been missed. Hold off until we touch base allergy. I want to see what their thought process is.”  Intern 1 – “Ok”*  *Resident – “I’m thinking we do pre and post labs for t inflammatory markers at her next IVIG injection then a steroid and then the CT.”*  **Example 2:**  *Intern [asks resident from other team] “How long was she on antibiotics when you guys treated her?”*  *Resident from other team - “2 days.”*  *Resident - “Oh, that’s it?”*  *Resident from other team - “What are you guys thinking it is?”*  *Resident “Attending thought of IVIG reaction”*  *Resident from other team – “Oh yeah, we totally thought of that.”*  *(Everyone laughs.)*  *Resident – “Or immune reconstitution syndrome. There’s 3 things I’m going to ask allergy. 1) Type of reaction, 2) Can we move the injection up and 3) Can we do the pre/post labs with steroid and CT.”* |
| Week 1:  Intern | *So I spoke to the medical student and the intern. We have a plan. I feel like my plan is reasonable. I want to make sure I'm not missing something so I take it to a colleague…and so we go through it and then, if I feel reassured after that and we both come to a consensus that like this is a reasonable plan…But if during that interaction, if I'm still unsure and I feel like there is something missing that doesn’t still make sense, then I would talk to the attending.* |
| Week 3:  Intern | *So, usually, if we have questions, we usually discuss them among ourselves first before trying to seek further help* |
| Week 4:  Intern | *I kind of like working in the team room because there’s a lot of people there, there’s a lot of people to bounce ideas off of.* |
| Week 4:  Resident | *…the maximum source of information is in the team room with the computer and with the other physicians and residents and interns. They are all there. It’s the best source to get as much knowledge as possible in the shortest amount of time. You can just pose a question to the group and whoever knows the most would answer it.* |
| ***Data necessary to make diagnoses are fragmented*** | Week 3:  Intern | *We try and get as much as we can from the patient - but, often, we need to rely on family that is there…Paramedics…ED staff is really helpful because they get an initial impression and can sometimes glean information that wasn’t passed to us. Chart review is also helpful. We try and go back to their previous encounters they have had with the hospital to see what situation or state they left in but we also get records from outside hospitals as well. So it’s a culmination of oral—rather, an amalgam of all these different resources, a lot of electronic records and a lot of, I guess, people that we try to get as much information from as possible.* | **Example 1:**  *Resident is showing the medical student how to find a patient’s primary care physician in the electronic medical record.*  *He is instructing the medical student where to find relevant information in the electronic medical record so as to compose an e-mail for the primary care physician.*  *Resident – “make sure that you include all the relevant lab and pathology details in the note from the various sections of the chart. It’s really hard to find it all so a good summary is essential.”  Medical Student – “[laughs] you don’t have to tell me that.”*  *Resident – “and lets ensure he has a follow-up appointment in one week with new labs. He has a good understanding of his symptoms so he will know when to call in.”* |
| Week 3A:  Intern | *Gaps we are not aware of, usually, after we are done rounding, we come back to the team room as a group and we will just start wherever or just check back to see if the labs came back or studies came back and, at that point, we might just update the team and attending saying, oh, I mentioned this; in reality, it’s this.* |  |
| Week 1:  Intern | *…check labs just kind of on the fly while we are there so we don’t always have to either just not know and check it later and be delayed, or run to a different computer to check it.* | **Example 1:**  *Attending – “They give contrast with venograms – were his labs okay before the study?*  *Intern —“Im not sure – I haven’t checked labs yet. They weren’t back in the morning?”*  *Attending: Just be careful. If you don’t know, find out. Remember, he’s starting an ACE inhibitor, aldactone and [now] getting IV contrast. No hurry in starting those meds and we don’t want to prolong his hospitalization because of renal failure.”* |
| Week 2: Intern | *… and because every time more information is re-introduced, it causes you to stop, like rethink it, make sure that’s a consistent fact versus a fact that we need to reassess and readdress and bring up. And so by doing it in little stages like that, it allows you to kind of sift through the information, as opposed to be like overwhelmed without a road map of where you are going. That way, it becomes less overwhelming, more direct and focused.* |  |
| ***Distractions impair diagnosis*** | Week 2: Attending | *Our current paging system has lots of problems.* | **Example 1:**  *Observing in team room:*  *Intern receives a page, picks up the phone and calls the number back. There is no answer.*  *Intern -- “What is the point of sending a number if you’re never going to pick up?”*  *Other intern responds -- “Welcome to my life.”* |
| Week 1:  Intern | *Or even paging. It’s annoying. If I have to page on the fly, I have to pull out my phone, go to the website, enter in all their information, and that just takes more time than if, you know, you already had it up on the screen, you could just paste in [stuff] so* | **Example 2:**  *(Several pages and calls observed within a short period of time)*  *1:28PM Intern is paged about discharge plan for a patient. Leaves room to discuss with nurse on the floor as there are remaining issues or clarifications needed.*  *1:32PM resident paged by ED*  *1:34PM resident returns ED call about first admission*  *1:38PM resident ends call with ED*  *1:40PM resident returns another page from ED regarding a second admission*  *1:43 resident receives another page, tells intern about another admission they will take.*  *(Week 3, Day 1)* |
| Week 2:  Intern | *And I guess now that we are talking about that, the one thing that sort of interrupts our work when we are actually doing like our rounding is sometimes one of us will have to run to the nearest computer to look up something or run to the nearest phone—which is usually by the nearest computer—to call a different attending or a consult* |  |
| Week 4:  Resident | *I think one thing is when you’re too busy with other things going on, like during admitting day, either one of the new ones or one of your other patients is like very active, then you tend to devote less time to this new one and you start to, and when you start to rush things is when you make mistakes or you don’t look through enough of the notes or you just start, …* |  |
| Week 4:  Intern | *…yeah, interruptions are huge setbacks and I think the expectation is that, oh, you send a quick page; it’s nothing. But like every page that you get is very distracting….* |  |
| Week 3:  Resident | *there are some mornings where I am holding that admission pager and they are presenting the—we are doing the card flip, giving updates, and I, basically, miss all the updates because I am triaging all the pages from the ER, sit and try to determine who to accept, who not to accept, say who is stable, who is not stable, seeing—trying to go down to see a patient immediately or if they can wait so we start rounding. In those situations, I miss some of the conversations that these two are having with (attending).* |  |
| ***Time pressures interfere with diagnostic decision-making*** | Week 2:  Resident | *And if things don’t get done at certain times, patient care is affected so I don’t think there is like one time for me that I just think about everything. I literally have to do multiple things at one time but need more time to do them.* | **Example 2:**  *Intern is doing several tasks at once to discharge a patient – she is writing progress notes on the computer but also flicking back and forth and, writing orders. She is toggling back and forth between screens simultaneously working on 4 patient charts at a time. I sometimes see her going to the laboratory tab and looking up test results to find information. While doing these activities, her pages goes off and she is now answering pages… She then turns and says, “I forgot I have to go to morning report – I have no time to do the discharge papers now.”* |
|  | Week 3:  Intern | *we have minimized the number of conferences we go to just because of the work and how much there is to do.* |  |
|  | Week 4: Intern | *It’s stressful…because when we are admitting patients and then, sometimes, when we are the late team, we also get the cross cover so the interns have their own however many patients they have plus the other teams that are signing out so some maybe have less time to piece things together but, ultimately, before we end up leaving the hospital, we piece everything together because that’s the best thing for patient safety. So that just means that we stay there later to make sure that things are pieced together, that our work is completed, that we have thought through these things.* |  |
|  | Week 4:  Resident | *I think one thing is when you’re too busy with other things going on, like during admitting day, either one of the new ones or one of your other patients is like very active, then you tend to devote less time to this new one and you start to, and when you start to rush things is when you make mistakes or you don’t look through enough of the notes or you just start, …* |  |

**Appendix B. Semi-Structured Interview (Attendings) and Focus Group Discussion Guide (Residents and Students)**

**Introduction:**

* Introduce project team and describe what their role will be.
* Explain the purpose of the focus group.
* Guarantee confidentiality from the research team and ask participants to also maintain confidentiality.
* Ask if anyone has any questions.
* Tell them when the recorders will be turned on.
* Review the information letter with each participant to make sure they are fully informed; answer any questions before beginning the focus group

**If you could tell us:**

* **Title/position**
* **How long have worked here**
* **Type of license (medical, trainee, other)**
* **Area of expertise**
* **Unit/Work location**
* **Years of experience**

1. **Can you please describe your role within your organization and give a brief description of what you do from day-today?**

***Interviewer Probes*:**

* 1. **How many years have you been in this position?**
  2. **What did you do before this position?**

***NOTE: if subject has recently participated in field observations than you may not need to spend much time on these intro questions.***

**Straight forward Diagnosis**

1. **Thinking about a patient you had this week that had a straight forward diagnosis:**

* What was the decision-making process through which a diagnosis was made?
  + What were the main sources of information?
  + What did you learn from the patient and family that helped in making the diagnosis?
  + What source of information had the greatest influence on decision-making, and why?
  + How much time did you have to think about this patient? When was the best time to think.
  + How was the diagnosis discussed within the team?
  + What were the roles of other health professionals that were involved in the diagnosis process (for example, nurses, radiologists, therapists)?

**Difficult Diagnosis**

1. **Can you tell us about a patient you had this week where the process of diagnosis was difficult?**

* What was the process through which a diagnosis was made?
  + Why was this case challenging?
  + Do you think certain aspects may have made this easier? If so, what?
  + What were the main sources of information?
  + What did you learn from the patient and family?
  + How was the diagnosis discussed within the team?
  + What were the roles of other health professionals that were involved in the diagnosis process (for example, nurses, radiologists, therapists)?
  + At what point(s) do you think a misdiagnosis might have happened?

**Error in Diagnosis**

1. **Can you tell us about a time where there was a delayed or missed diagnosis (not necessarily on this team)**

* What factors do you think contributed to the delayed or missed diagnosis?
* Was there a substantial period of time during which the diagnosis was uncertain?
* How was the misdiagnosis discovered?
* What happened after it was discovered
* Did anything within the team change after this happened

**Summary Questions**

1. **What are the parts of the diagnostic decision-making process that are most vulnerable to error? Why?**
2. **What can be done, in your opinion, to improve the process of diagnosis for interns/residents/attendings**
3. **Would having a set amount of time carved out each day to think through diagnoses for your patietns be helpful?**
4. **Are certain technology tools potentially barriers to making diagnosis?**
5. **What about technology tools that are facilitators? Do you use any of them?**
6. **What are your ideas on improving diagnostic accuracy?**

* Process through which diagnoses are made
* System factors (e.g., team communication, IT)
* Individual factors (e.g., training, attending behavior and skills)

1. **Now think about your patients that present with shortness of breath. What are some of the strategies you use when deciding on an appropriate diagnostic and care management and treatment plan? How do you come up with this strategy? What information sources may you use?**

***Interviewer Probes*:**

* 1. **additional symptoms,**
  2. **severity of illness,**
  3. **available time,**
  4. **prior antibiotic exposure,**
  5. **Laboratory tests**
  6. **Imaging studies**
  7. **Others?**

1. **What factors do you consider in ordering diagnostic tests for patients who present with shortness of breath?**

***Interviewer Probes*:**

* 1. **Risks/Benefits of the test**
  2. **Severity of illness**
  3. **Patient comorbidities**
  4. **Patient preferences**
  5. **Cost of the test**
  6. **Expected clinical or diagnostic yield**
  7. **How test results may influence decision making?**
  8. **Others?**

1. **What factors do you consider when deciding on medical treatment for patients who present with shortness of breath?**

***Interviewer Probes*:**

* 1. **Risks/Benefits of the treatment**
  2. **Severity of illness**
  3. **Patient comorbidities**
  4. **Patient preferences**
  5. **Cost of the treatment**
  6. **Expected clinical or diagnostic benefit of the treatment**
  7. **How treatment outcomes may influence decision making and care**
  8. **Others**

1. **What resources do you use to help with medical decision-making in patients who present with shortness of breath?**

***Interviewer Probes*:**

* 1. **Colleagues**
  2. **Specialists**
  3. **Previous similar cases**
  4. **Technology (please specify)**
  5. **Reference materials (please specify)**
  6. **Others**

1. **Please discuss instances where distractions, disruptions, policy or culture influenced your approach to caring for patients who present with shortness of breath?**

**[QUESTIONS 11 THRU 15 ABOVE WILL BE REPEATED FOR EACH OF THE FOLLOWING PATIENT TYPES:**

* **Patients who present with chest pain**
* **Patients who present with abdominal pain**
* **Patients who require antibiotic treatment for urinary tract infections**

**SUMMARY QUESTIONS:**

1. **Is there anything else that you would you like to tell us about caring for patients that present with common cardinal symptoms or patients that require antibiotic treatment for UTIs?**

That is the end of the questions that we have for you. Now do you have any questions for me or any other comments on anything that we have discussed today? Thank you very much for taking the time to participate in this interview/focus group.

**Appendix C. Elements for data collection during field observations**

*[One form was collected for each patient by each observer]*

***OBSERVER AND TEAM INFORMATION:***

Week \_\_\_, Day\_\_\_Name Of Observer:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time started:\_\_\_\_\_\_\_\_\_\_\_\_Time Ended:\_\_\_\_\_\_\_\_\_\_(For entire observe/shadow period)

AM Rounding/Afternoon Shadowing (circle one)

Team members present: Attending/Senior Resident/Intern 1/Intern 2/Other

Team member you are shadowing: Senior Resident/Intern 1/Intern 2/Other/NA

***PATIENT INFO/RELEVANT DATA:***

*1.*Who led discussion on rounds?\_\_\_\_\_\_\_\_\_Time start\_\_\_\_\_ Time stop\_\_\_\_\_\_

2. Patient Diagnosis: \_\_\_\_\_\_\_\_\_\_\_\_

3. Relevant History/exam findings discussed or reviewed: Y/N –

4. What was the focus of the discussion?

5. Were lab data, pathological data discussed? Y/N-

6. Were imaging studies or result of prior imaging discussed? Y/N –

7. Were consultant recommendations discussed or reviewed? Y/N –

8. Was a synthesis or summary statement of the patient presented? Y/N

9.Was/were potential diagnosis/diagnoses discussed? Y/N –

10.Was a differential diagnosis or list of other possibilities entertained: Y/N –

11. Were further tests planned to help make the diagnosis? Y/N-

12. Was a therapeutic plan made for the patient? Y/N-

13. Was the patient involved in determining the plan (performed at bedside)? Y/N/Unsure-

14. Anything else regarding diagnosis discussed or reviewed?

15. Where RN concerns discussed?

16. Was patient RN present?

**17. *DIAGNOSTIC IMPRESSION***

*Which* of the following categories best describes this patient:

1. Dx confirmed and testing completed; awaiting discharge
2. Dx fairly certain but some testing and confirmatory results are needed
3. Dx unknown, further testing and discussion required
4. Other: Explain