APPENDIX A: Final Chart Review Tool

Record ID _____

Patient MRN: [mrn]

Patient Name: [name]

Admission Date: [admit_date]

Chart Reviewer Name

Chart Review Date/Time _____

As you proceed through this patient's chart, please keep the following definition in mind:

A diagnostic error is defined as a missed opportunity to make an accurate or timely diagnosis (a missed, incorrect, or delayed diagnosis) related to the acute care episode

You may get a clue about a diagnostic error based on the clinical impression of various care team members during the course of the hospital encounter.

Chart Review Process:

1. Go into the patient's chart, open the "Encounters" tab, and find the hospital encounter of interest.
2. Read through the entire Discharge Summary to get an overview of what happened.
3. Open the patient's inpatient chart for the selected encounter and read through the entire Admission H&P (CC, HPI, ED course, Assessment and Plan, etc.) to understand the initial thought process and treatment plan.
4. Review objective data (use Event Log to review vitals, orders, EMAR, lab results, timing of treatments, consults, procedures, etc.)
5. Review subjective notes (i.e., the floor course documented by primary team, consults, nursing notes, ancillary staff, etc.) to identify discrepancies and clues early during the hospital course.
6. Consider whether a diagnostic error may have occurred during the hospital encounter based on actual clinical documentation.
7. Proceed to the chart review tool (next page).

Case Information

Did this patient go through the Emergency Department?
- ◯ Yes
- ◯ No

Where did this patient come from?
- ◯ Home
- ◯ Ambulatory Clinic (direct admit or referred by PCP or specialist)
- ◯ Skilled Nursing Facility / Rehab
- ◯ Transfer from an Outside Hospital or ED
- ◯ Other

Describe other _____

Was this patient admitted between the hours of 7 pm and 7 am (i.e., by the overnight team)?
- ◯ Yes
- ◯ No

*Can use 'Care Timeline' for time stamps

Brief Case Summary

*Can take from Brief Summary and Discharge Summary, and edit as you see fit based on your clinical judgment

_____

Diagnostic Timeline

Chief Complaint upon admission?

*Identify from CC or HPI in Admission H&P

_____

Upon ADMISSION, what did the primary team consider to be the primary diagnosis?

*Typically first problem listed in A&P by admitting team

_____

AT DISCHARGE, what did the primary team consider to be the primary diagnosis?

*Typically first problem of 'Hospital Course' in Discharge Summary

_____

Were the primary diagnoses upon admission and discharge the same?

*Different severity, stability, or acuity could make these diagnoses different (e.g., stable vs. unstable angina, acute on chronic kidney injury vs. chronic kidney injury)

◯ Yes
◯ No

Is the discharge diagnosis on the differential diagnosis list at admission?

◯ Yes
◯ No

Do you think there was a secondary diagnosis that was not appropriately addressed during the encounter?

For example, this could include a diagnosis that led to decompensation (RRT, code), transfer to or from another service, or that was present based on objective data but was not acknowledged in clinical documentation (drop in Hb/Hct from prior ambulatory value)

◯ Yes
◯ No

Please list the secondary diagnosis that was not appropriately addressed

_____

Please select a diagnosis which you will review.

◯ Primary admission diagnosis
◯ Primary discharge diagnosis
◯ Secondary diagnosis

The Safer Dx Instrument: Items for Determining The Likelihood of Diagnostic Error during the Hospital Encounter

Rate the following items for the ENITRE EPISODE OF CARE under review (i.e., from admission through discharge), related to the primary admission or discharge diagnosis, or a secondary diagnosis.

	Strongly Agree	Agree	Slightly Agree	Slightly Disagree	Disagree	Strongly Disagree
1. The documented history was suggestive of an alternate diagnosis, which was not considered to be the presumed or working diagnosis or was considered late.	○	○	○	○	○	○
2. The documented physical exam was suggestive of an alternate diagnosis, which was not considered to be the presumed or working diagnosis or was considered late.	○	○	○	○	○	○
3. Diagnostic testing data (laboratory, radiology, pathology or other results) were suggestive of an alternate diagnosis, which was not considered to be the presumed or working diagnosis or was considered late.	○	○	○	○	○	○
4. Data gathering through history, physical exam, and review of prior documentation (including prior laboratory, radiology, pathology or other results) was incomplete, given the patient's medical history and clinical presentation.	○	○	○	○	○	○
5. The diagnostic process was affected by incomplete or incorrect clinical information given to the care team by the patient or their primary caregiver.	○	○	○	○	○	○

6. The clinical information (i.e., history, physical exam or diagnostic data) should have prompted additional or earlier diagnostic evaluation through tests or consults.	○	○	○	○	○	○
7. The diagnostic reasoning was not appropriate, given the patient's medical history and clinical presentation.	○	○	○	○	○	○
8. Alarm symptoms or "Red Flags" (i.e., features in the clinical presentation that are considered to predict serious disease) were not acted upon in a timely manner.	○	○	○	○	○	○
9. Diagnostic data (laboratory, radiology, pathology or other results) available or documented were misinterpreted in relation to the subsequent final diagnosis.	○	○	○	○	○	○
10. There was missed or delayed follow-up of available diagnostic data (laboratory, radiology, pathology or other results) in relation to the subsequent final diagnosis.	○	○	○	○	○	○
11. The differential diagnosis was either not documented, OR the differential diagnosis documented did not include the subsequent final diagnosis.	○	○	○	○	○	○
12. The final diagnosis was not an evolution of the care team's initial presumed diagnosis (or working diagnosis).	○	○	○	○	○	○
13. The clinical presentation at the initial presentation was mostly typical of the final diagnosis for the hospital encounter.	○	○	○	○	○	○

In conclusion, based on all the above questions, the episode of care under review had a diagnostic error.

Diagnostic Error: A missed opportunity to make an accurate or timely diagnosis based on the available information, independent of harm (i.e., a missed, incorrect, or delayed diagnosis)

- ○ Strongly Agree
- ○ Agree
- ○ Slightly Agree
- ○ Slightly Disagree
- ○ Disagree
- ○ Strongly Disgree

Please include any notes regarding your final diagnostic error decision or individual Safer Dx tool decisions. (Optional)	_____
Please describe the diagnostic error Please be specific. For example, "delay in considering alternative etiologies of hypoxia after 4 days of appropriate IV abx for presumed bacterial pneumonia diagnosed on admission."	_____
Where did this error take place (check all that apply):	☐ Prior to admission to general medicine (e.g., ED, prior to transfer to medicine) ☐ While on general medicine ☐ After being on general medicine (e.g., after transfer to another unit)

Adverse Outcomes Related to the Episode of Care

Did the diagnostic error cause actual harm?	◯ Definitely ◯ Probably ◯ Probably Not ◯ Definitely Not
What is your confidence that the diagnostic error had potential to cause patient harm?	◯ Little or no confidence ◯ Slight confidence ◯ Less than 50-50 but close call ◯ More than 50-50 but close call ◯ Strong confidence ◯ Virtually certain confidence
What is the most likely severity of the diagnostic error's potential harm?	◯ Minor (Patient outcome is symptomatic, symptoms are mild, loss of function or harm is minimal or intermediate but short term, and no or minimal intervention is required.) ◯ Moderate (Patient outcome is symptomatic, requiring intervention, an increased LOS, or causing permanent or long term harm or loss of function.) ◯ Major (Patient outcome is symptomatic, requiring life-saving intervention or major surgical/medical intervention, shortening life expectancy or causing major permanent or long term harm or loss of function.) ◯ Death (On balance of probabilities; death was caused or brought forward in the short term by the incident.)

What was the severity of the diagnostic error's clinical impact?	◯ Minor (Patient outcome is symptomatic, symptoms are mild, loss of function or harm is minimal or intermediate but short term, and no or minimal intervention is required.) ◯ Moderate (Patient outcome is symptomatic, requiring intervention, an increased LOS, or causing permanent or long term harm or loss of function.) ◯ Major (Patient outcome is symptomatic, requiring life-saving intervention or major surgical/medical intervention, shortening life expectancy or causing major permanent or long term harm or loss of function.) ◯ Death (On balance of probabilities; death was caused or brought forward in the short term by the incident.)
Describe the actual clinical impact of the diagnostic error	_____
Describe the potential future clinical impact of the diagnostic error	_____
What is the likelihood that this clinical impact was preventable?	◯ Definitely not preventable ◯ Probably not preventable ◯ Probably preventable ◯ Definitely preventable
What is the likelihood that this clinical impact was ameliorable (i.e., whether the duration or severity of the harm could have been reduced or mitigated.)	◯ Definitely not ameliorable ◯ Probably not ameliorable ◯ Probably ameliorable ◯ Definitely ameliorable

Modified DEER Taxonomy Tool adapted for acute care

Please check any of the following DIAGNOSTIC PROCESS FAILURES that were present/occurred during the episode of care under review. Also, please identify those that had significant impact in causing the diagnostic error by checking "Significant".

Access/Presentation

	Present/Occurred	Significant
A. Failure or delay in patient seeking care	☐	☐
B. Failure or denial of access to care	☐	☐
C. Failure of triage or admission to wrong service	☐	☐

History

	Present/Occurred	Significant
A. Failure or delay in providing or eliciting a piece of history data	☐	☐
B. Inaccurate or misinterpreted piece of history data	☐	☐
C. Suboptimal weighing of a piece of history data	☐	☐
D. Failure or delay in acting on or following-up on a piece of history data	☐	☐

Physical Exam

	Present/Occurred	Significant
A. Failure or delay in eliciting critical physical examination finding	☐	☐
B. Inaccurate or misinterpreted physical examination finding	☐	☐
C. Suboptimal weighing of a physical examination finding	☐	☐
D. Failure or delay in acting on or following-up on a physical examination finding	☐	☐

Assessment

	Present/Occurred	Significant
Failure or delay in considering correct diagnosis	☐	☐
Suboptimal weighing or prioritizing of primary and/or secondary diagnose	☐	☐
Too much weight to lower probability/priority diagnosis	☐	☐

Diagnostic Test Ordering, Performance, and Interpretation

	Present/Occurred	Significant
A. Failure or delay in ordering needed test(s)	☐	☐
B. Failure or delay in performing needed test(s)	☐	☐
C. Suboptimal test sequencing	☐	☐

D. Failure to order correct test(s) (e.g., ordered head CT for suspected cerebellar stroke)	☐	☐
E. Failure to order test(s) in correct way	☐	☐
F. Identification failure (e.g., sample mix-up, mislabeled specimen, or test performed on the wrong patient)	☐	☐
G. Technical or processing error (equipment problem, poor processing of specimen/test, or skill issue)	☐	☐
H. Specimen delivery problem (e.g., specimen never sent, delayed delivery, or lost specimen)	☐	☐
I. Erroneous reading of test (lab/radiology)	☐	☐
J. Erroneous clinician interpretation of test	☐	☐

Diagnostic Information and Patient Follow-up

	Present/Occurred	Significant
A. Failure or delay in acting on or following-up on test result (including results not communicated to the patient)	☐	☐
B. Failure or delay to re-test (e.g., follow-up lactate, INR)	☐	☐
C. Failure or delay in monitoring (e.g., failure to routinely check vital signs, failure to apply monitor, technical issue)	☐	☐
D. Missed physiologic monitoring finding (e.g., persistent hypoxia, oxygen requirement)	☐	☐
E. Failure or delay in recognizing or acting upon urgent condition or complications	☐	☐
F. Failure to refer the patient to appropriate setting or for appropriate monitoring	☐	☐

G. Failure or delay in timely follow-up or re-examination of the patient	☐	☐

Subspecialty Consultation/Referral

	Present/Occurred	Significant
A. Failure or delay in ordering a referral or consult	☐	☐
B. Failure or delay in obtaining or scheduling an ordered referral or consult	☐	☐
C. Failure or delay of the consulting team to see the patient	☐	☐
D. Suboptimal consultation (e.g., error in diagnostic consultation performance) or follow-up of consultation	☐	☐
E. Inappropriate or unneeded referral or consultation	☐	☐

Healthcare Team Communication & Collaboration

	Present/Occurred	Significant
A. Failure or delay in communication of clinical assessment at initial and subsequent encounters between healthcare team members	☐	☐
B. Failure or delay in transmission or communication of lab/test result(s) to healthcare providers	☐	☐
C. Failure or delay in communication of critical information between pathologists, radiologists, or technologists and the primary team	☐	☐
D. Failure or delay in communication between consultants and the patient's primary team	☐	☐

E. Failure or delay in communication of critical information within the patient's primary team (e.g., a missed hand-off between the night and day teams or a lack of communication during rounds.) May include the patient's nurse, pharmacist, therapist, social worker, physician, etc.	☐	☐

Patient Experience

	Present/Occurred	Significant
A. Failure to communicate an accurate and timely explanation of the patient's health problem(s) to the patient/caregiver	☐	☐
B. Failure or delay in communicating lab or test results, assessment or consultant findings to the patient/caregiver	☐	☐
C. Failure to identify or address patient or caregiver concerns, preferences, or non-adherence	☐	☐

Please describe any significant "failure points" in relation to the patient's treatment/management. (e.g., patient was given wrong dose of __ medication, __ medication was delayed by 2 hours, medication wasn't available because of a shortage, patient did not receive PT because of lack of staff, etc.) You may also use this space to clarify any of your failure point choices, if applicable (e.g., if a failure point occurred multiple times, if you believe one failure point led to multiple diagnostic or treatment/management errors, etc.)	_____

If there was uncertainty about the diagnosis at discharge (e.g., no clear explanation for abdominal pain, altered mental status, etc.); OR 2) multiple diagnostic process failures were selected; OR 3) there was uncertainty about whether a diagnostic error may have occurred in this case, please review subsequent events (e.g., ambulatory visits, subspecialty visits, urgent care or ED visits, readmissions, major procedures or surgeries, expiration notes, autopsy findings), describe whether you think it could have been related to a missed opportunity to make an accurate and timely diagnosis during this hospital encounter.	_____
Please record here (in minutes) how long it took you to complete this chart review.	_____

APPENDIX B. Description of case, diagnoses, diagnostic error, harm, and process failures by risk cohort

ICU transfer 24 hours or more after admission		
Case: A 70+ year-old male with HTN, CKD, and HFrEF (40%) was admitted for evaluation of failure to thrive and weight loss. Upon arrival to the ED, his exam was notable for hypotension, 2+ lower extremity edema, and cool extremities. The NT-proBNP was elevated, troponins were rising, and lactate and creatinine were elevated. Intravenous fluids and antibiotics were initiated for presumed infection. Initial cardiology consultation suggested that hypotension was not cardiogenic, commenting "he is hypotensive though remains well-perfused". He was admitted to general medicine with a working diagnosis of sepsis and was continued on broad spectrum antibiotics. His blood cultures remained negative, and no clear infectious source was identified. Four days into hospitalization, he had a PEA arrest and was transferred to the ICU. TTE showed a severely depressed EF of 15%. He continued to deteriorate, requiring maximum inotropic and vasopressor support for mixed shock (cardiogenic +/- distributive), and expired.		
Diagnoses Primary Dx (Admission): Failure to thrive, weight-loss Primary Dx (Discharge): Mixed shock (cardiogenic +/- distributive) Secondary Dx: Hypotension	**Diagnostic Error:** Delay in diagnosing decompensated heart failure and cardiogenic shock upon admission despite compelling history, physical exam, and laboratory data. The primary team anchored on the initial cardiology consultant's assessment, placing too much weight on infectious and sub-optimally weighing a cardiac etiology. **Harm:** The patient experienced a cardiac arrest, was transferred to the ICU, continued to deteriorate, and ultimately expired. • Severity: Death • Definitely Preventable	**Diagnostic Domains & Specific Failures** • *Assessment:* failure or delay in considering the correct diagnosis; suboptimal weighing or prioritizing of primary or secondary diagnoses; too much weight to lower probability/priority diagnosis • *Access:* failure of triage and admission to wrong service • *Diagnostic Testing:* delay in ordering needed test(s); erroneous clinician interpretation of test • *Subspecialty Consultation:* suboptimal consultation or follow-up of consultation • *Other: History, Physical exam; Diagnostic Information and Patient Follow-up*
Death within 90 days of admission		
Case: A 40+ year-old female with biopsy-proven cirrhosis, optic glioma s/p resection, central hypothyroidism, anemia and thrombocytopenia, was admitted for evaluation of oliguric AKI. She underwent a thorough evaluation for decompensated cirrhosis and hepatorenal syndrome, including imaging, gastrointestinal and renal consultations, paracentesis, and endoscopy. She was placed on oxygen during the hospitalization. Towards the end of the hospital encounter, a CXR was obtained for concern of increased work-of-breathing by the night team. The official report commented on a small to moderate left pleural effusion, but this finding was never acknowledged by primary team members in their documentation. She remained on oxygen and was given a presumptive diagnosis of obstructive sleep apnea and obesity hypoventilation. Home oxygen was arranged. Three days after discharge, she was hospitalized for acute respiratory failure requiring intubation at which time she was diagnosed with left hepatic hydrothorax and pulmonary edema. She improved after a therapeutic thoracentesis. After subsequent hospitalizations related to end-stage cirrhosis, she was transitioned to hospice and expired peacefully at home.		
Diagnoses Primary Dx (Admission): Acute kidney injury, oliguria Primary Dx (Discharge): Acute kidney injury, oliguria Secondary Dx: Pleural effusion, hypoxia	**Diagnostic Error:** Missed opportunity to evaluate a unilateral pleural effusion in context of shortness of breath and worsening hypoxia. The overnight chest x-ray findings were not acknowledged in clinical documentation despite the final radiology report. **Harm:** The patient was readmitted within 24 hours at another hospital for pulmonary edema and hepatic hydrothorax which resolved after thoracentesis. • Severity: Major • Definitely Preventable	**Diagnostic Domains & Specific Failures** • *Assessment*: failure or delay in considering the correct diagnosis • *Diagnostic Testing*: failure or delay in ordering needed test(s); failure or delay in performing needed test(s); erroneous clinician interpretation of test • *Diagnostic Information and Patient Follow-Up*: failure or delay in acting on or following-up on test result (or results not communicated to the patient); missed physiologic monitoring finding (e.g., persistent hypoxia); failure or delay in recognizing or acting upon an urgent condition or complication • *Healthcare Team Communication and Collaboration:* failure or delay in communication between consultants and the patient's primary team
Complex clinical events including clinical deterioration (persistent fevers), acute kidney injury, multiple consultants		
Case: A 55+ year-old male with HLD presented to an outside hospital emergency room with pain in the right buttock and groin, was treated and discharged. He re-presented 2 days later with fever, chills, and acute urinary retention. He was referred to our ED for concern for spinal compression and potential intervention. In our ED, the MRI spine was unremarkable. On admission to general medicine, blood cultures returned positive for MSSA, however the source of bacteremia of remained uncertain. Infectious disease was consulted and initially suggested that the source was "from inoculation in a cold sore or through a blood draw or PIV placement when he first presented to the OSH". Fevers and bacteremia persisted despite appropriate, broad-spectrum antibiotics. A TEE was negative, and no other sources were pursued. The patient complained of persistent right buttock and groin pain for 4 days until repeat imaging was considered. A dedicated pelvic MRI obtained on hospital day 7 demonstrated right sacroiliac arthritis with multiple rim enhancing collections and edema in the surrounding musculature. The patient underwent wash-out by orthopedics. Subsequent hospital course was complicated by rash, eosinophilia, and AKI which was thought to be AIN from cefazolin per nephrology consultation. The patient was transitioned to daptomycin and discharged.		
Diagnoses Primary Dx (Admission): Sepsis	**Diagnostic Error:** Delay in diagnosing pelvic abscesses as source of bacteremia due to overweighing a lower probability source. There was a delay in obtaining dedicated pelvic MRI. Additionally, the infectious disease consultant did not consider alternative sources of persistent bacteremia despite appropriate antibiotic for several days.	**Diagnostic Domains & Specific Failures** • *Assessment:* failure or delay in considering the correct diagnosis; suboptimal weighing or prioritizing of primary or secondary diagnoses; too much weight to lower probability/priority diagnosis

Primary Dx (Discharge): Sepsis due to pelvic abscess Secondary Dx: MSSA bacteremia	**Harm:** The length of stay was prolonged and the hospital course was complicated. The patient was symptomatic for several days and required a major surgical intervention. The pelvic MRI showed evidence of complicated infection and destruction of surrounding tissues. The patient experienced complications related to his treatment. • Severity: Major Harm • Definitely Preventable	• *Diagnostic Testing*: failure or delay in ordering needed test(s); erroneous reading of test (lab/radiology); erroneous clinician interpretation of test • *Subspecialty Consultation:* suboptimal consultation or follow-up of consultation • *Other: History; Physical Exam; Diagnostic Information and Patient Follow-Up;*
None of the above criteria		
Case: A 70+ year-old female with Lewy-body dementia, prior right-sided MCA stroke, HTN and HLD was hospitalized for evaluation of AMS and a possible syncopal episode. She was hospitalized 1 month prior for cognitive decline, felt due to progressive dementia. Prior to this admission, her family reported that she lost consciousness for 1-3 minutes and her eyes were “rolling in the back of her head”. On presentation she was alert and oriented to name but had no focal deficits. Initial head CT and laboratory studies were unremarkable except for an abnormal urinalysis (pyuria, positive leukocyte esterase). On admission, the working diagnosis for AMS was an infectious etiology (UTI vs meningoencephalitis). The initial differential for syncope included vasovagal episode vs orthostatic episode vs arrythmia. Neurology was consulted and recommended routine EEG which was reported as having no epileptiform activity. She was treated for a UTI and discharged. The day after discharge the patient re-presented to the ED after the patient’s spouse expressed concerns about not being able to care for the patient at home given her mental status and lack of a clear diagnosis. A clinician documented "spoke with spouse who was verbalizing they sent patient home too early." Neurology re-evaluated the EEG from index hospitalization, felt it was more consistent with seizure activity and recommended anti-epileptic drug therapy.		
Diagnoses Primary Dx (Admission): Altered mental status Primary Dx (Discharge): Altered mental status Secondary Dx: Syncope, Lewy-body dementia	**Diagnostic Error:** Missed diagnosis of seizure as cause of acute change in mental status due to misinterpretation of EEG results at the time of discharge. The team under-weighed the possibility of seizures in the initial because of confounding of clinical features. **Harm:** The patient was readmitted within 24 hours and neurology confirmed seizure activity and started AEDs. • Severity: Moderate • Probably Preventable	**Diagnostic Domains & Specific Failures** • Assessment: suboptimal weighing or prioritizing of primary or secondary diagnoses • *History:* suboptimal weighing of a piece of history data • *Diagnostic Testing:* erroneous clinician interpretation of test; failure or delay in performing needed test • *Healthcare Team Communication and Collaboration*: failure or delay in communication between consultants and the patient’s primary team • *Patient Experience:* failure to communicate an accurate and timely explanation of the patient’s health problem(s) • *Other: Physical Exam; Subspecialty Consultation*