Exploring Clinical Lessons Learned by Experienced Hospitalists from Diagnostic Errors and Successes

Susrutha Kotwal, MD[1], *Mason Howell*[2], *Laura Zwaan, PhD*[3], *and Scott M. Wright, MD*[1,4]

[1]Department of Medicine, Division of Hospital Medicine, Johns Hopkins Bayview Medical Center, Johns Hopkins University School of Medicine, Baltimore, MD, USA; [2]Department of Biosciences, Rice University, Houston, TX, USA; [3]Erasmus Medical Center, Institute of Medical Education Research Rotterdam, Rotterdam, The Netherlands; [4]Department of Medicine, Division of General Internal Medicine, Johns Hopkins Bayview Medical Center, Johns Hopkins University School of Medicine, Baltimore, MD, USA

ABSTRACT

BACKGROUND: Diagnostic errors cause significant patient harm. The clinician's ultimate goal is to achieve diagnostic excellence in order to serve patients safely. This can be accomplished by learning from both errors and successes in patient care. However, the extent to which clinicians grow and navigate diagnostic errors and successes in patient care is poorly understood. Clinically experienced hospitalists, who have cared for numerous acutely ill patients, should have great insights from their successes and mistakes to inform others striving for excellence in patient care.

OBJECTIVE: To identify and characterize clinical lessons learned by experienced hospitalists from diagnostic errors and successes.

DESIGN: A semi-structured interview guide was used to collect qualitative data from hospitalists at five independently administered hospitals in the Mid-Atlantic area from February to June 2022.

PARTICIPANTS: 12 academic and 12 community-based hospitalists with ≥ 5 years of clinical experience.

APPROACH: A constructivist qualitative approach was used and "reflexive thematic analysis" of interview transcripts was conducted to identify themes and patterns of meaning across the dataset.

RESULTS: Five themes were generated from the data based on clinical lessons learned by hospitalists from diagnostic errors and successes. The ideas included appreciating excellence in clinical reasoning as a core skill, connecting with patients and other members of the health care team to be able to tap into their insights, reflecting on the diagnostic process, committing to growth, and prioritizing self-care.

CONCLUSIONS: The study identifies key lessons learned from the errors and successes encountered in patient care by clinically experienced hospitalists. These findings may prove helpful for individuals and groups that are authentically committed to moving along the continuum from diagnostic competence towards excellence.

KEY WORDS: hospital medicine; diagnostic errors; diagnostic excellence; qualitative study; clinical reasoning

Prior publications/abstract/posters: None.

Received October 23, 2023
Accepted January 9, 2024

Published online: 26 January 2024

J Gen Intern Med
DOI: 10.1007/s11606-024-08625-w
© The Author(s), under exclusive licence to Society of General Internal Medicine 2024

INTRODUCTION

Diagnostic errors stem from a wide variety of causes and can result in patient death.[1,2] The National Academy of Medicine has highlighted diagnostic errors as a major source of preventable harm.[1] In American hospitals, there are approximately 250,000 diagnostic errors yearly;[3] these errors account for approximately 10% of adverse events and 50% of harmful events — including death.[4] Hospitalized patients acknowledge that diagnostic errors concern them and decrease their trust in clinicians and the health system.[5] There is an ethos in medicine that is focused on perfectionism, and it positions the clinician as the all-knowing expert which may interfere with the opportunity to fully learn from errors.[1] Surveys of clinicians confirm that they frequently underreport diagnostic errors and are uncomfortable discussing them — even though they understand that doing so is critical for improving themselves and our health care systems.[6,7] Since the majority of hospitalized patients in the USA are cared for by hospitalists, a rapidly growing specialty with approximately 44,000–50,000 hospitalists working in the USA,[8,9] these clinicians play a key role in promoting patient safety and are well positioned to reduce diagnostic errors.[10]

Diagnostic excellence is defined as the process of attaining an accurate and precise explanation for a patient's health issues and concerns.[11] Diagnostic errors results from failures in meeting the standards of excellence.[11,12] As per the growth mindset framework, errors should represent opportunities for learning and improvement rather than instances wherein blame is to be assigned; abilities are acquired through embracing mistakes and persisting through setbacks.[13,14] Moreover, the pursuit of diagnostic excellence requires learning from both errors and successes in diagnostic performance;[1] this is also consistent with the "Safety-I and Safety-II approach."[15] Safety-I posits that we can identify the causes of errors and engage with interventions to prevent harm, whereas Safety-II focuses on successes and understanding how to replicate these best practices so as to optimize patient

safety.[15,16] Feedback, in the form of favorable or unfavorable information about a clinicians' reasoning or approach during patient care, improves calibration which is defined by the relationship between actual and perceived diagnostic performance.[17,18] Approximating diagnostic excellence requires clinicians to continuously mature from feedback on their clinical experience.[19] However, the lessons learned by clinicians from errors and successes in patient care have not been identified and described.

Research suggests that hospitalists early in their career have worse patient outcomes and quality of care metrics when compared with more experienced hospitalists.[20–22] Clinicians accumulate knowledge and skills over time with practice and this seems to be an important factor for providing higher quality of care for patients;[23] additionally, physicians gain complex social, behavioral, and intuitive wisdom with experience.[24] Since it has not been described how hospitalists learn from their clinical experiences over time (specifically the clinical insights attained from errors and successes in patient care), we conducted this study to identify and characterize clinical lessons learned by seasoned hospitalists from diagnostic errors and successes.

METHODS

Study Design

We performed a qualitative study using semi-structured interviews of hospitalist physicians working at five independently administered hospitals in and around the Baltimore–Washington metropolitan area. We used an interpretivist (constructivist) paradigm which holds reality as multiple, subjective, and related to how individuals understand and create their own meanings influenced by specific social contexts.[25,26] Based on this paradigm, we chose an interview guide approach to understand individual participant's perspectives, to deepen understanding of their lived experiences, and to generate rich, descriptive data.[27]

Setting and Subjects

We purposefully recruited hospitalists with ≥ 5 years of clinical work because they have had the lived experience of caring for numerous patients with multiple opportunities to have learned from mistakes and successes in patient care. Additionally, other studies evaluating patient outcomes and physician experience have studied physicians with approximately the same number of years of clinical experience.[28,29] We drew participants from 3 community hospitals and 2 academic medical centers. Out of ninety-one eligible hospitalists with 5 or more years of experience in the participating hospitals, thirty hospitalists were invited to participate[30] and twenty-four agreed. The study was approved by the Johns Hopkins Medicine Institutional Review Board.

Interview Guide Development

We developed a semi-structured interview guide based on review of the literature[1,5,15,31,32] and through expert input from co-authors — Dr. Zwaan who is a researcher focused on diagnostic reasoning and reducing diagnostic errors[10,33,34] and Dr. Wright who is a clinician researcher with medical education and qualitative expertise.[35–37] We presented preliminary versions of the guide at multiple division meetings in general internal and hospital medicine at our institute and made changes per the feedback we received. Furthermore, the first author (SK) pilot tested the interview guide on five hospitalists who were not part of the final sample. Pilot testing resulted in further refinements of the questions, clarifying ambiguity, and noting areas for additional probes to elicit more detailed responses. The final interview guide included 10 questions (Appendix); the first half focused on participants' experiences and reasoning with challenging diagnosis and the second half focused on diagnostic errors they made or encountered. Participants also elaborated on their clinical practices and lessons learned from both errors and successes.

Data Collection and Analysis

One author (SK) interviewed all hospitalists individually via Zoom using the semi-structured interview guide between February and June 2022. The interviews were recorded and lasted from 45 to 60 min; they were transcribed verbatim. After removing any identifying information, the transcriptions were uploaded to NVivo for data analysis.

Braun and Clarke's reflexive thematic analysis served as the primary analytic strategy.[38,39] Thematic analysis (TA) is a method to develop, analyze, and interpret patterns across a qualitative dataset by a systematic process of coding and developing themes.[39] The initial phase included data familiarization by reading the transcripts a few times. Coding was done using an inductive orientation and all transcripts were independently coded by two study team members (SK and MH) who met to review codes. After initial coding, the codes were grouped into potential themes. Themes were intended to both represent descriptive elements (what participants said) and interpretive elements (accounting for researcher subjectivity and other factors that may have influenced participants' perspectives were also considered). Ongoing analysis included moving back and forth among different phases, refining, naming each theme, and selecting extracts that related to hypotheses that were being generated. Multiple team meetings were held to discuss findings from the different phases and ultimately the relevance of the themes identified.[38,39] To assess for data sufficiency, we relied on information power and judged the sample to be adequate to answer the research questions.[40]

Reflexivity. We considered our subjectivity to be a resource while interviewing the hospitalists and analyzing the data. All study team members are interested in clinical excellence, medical education, and qualitative research. We had multiple team meetings to discuss how our own assumptions and background influenced data interpretation.

RESULTS

Twenty-four hospitalists (12 academic and 12 community) participated in the study. 10 (42%) were female, 13 (54%) were nonwhite, and the average age was 48 years (Table 1).

Five themes were generated from the data about the clinical lessons learned by hospitalists from diagnostic errors and successes. The themes and exemplar quotes are presented below.

Appreciating Excellence in Clinical Reasoning as a Core Skill

Excellence in clinical reasoning can be defined as making an accurate diagnosis and developing a therapeutic plan that fits the unique needs of the patient. With respect to making decisions about patient care, hospitalists described the importance of foundational clinical skills including securing histories, performing physical exams, utilizing tests judiciously, navigating uncertainty, having humility, and seeking a breadth of clinical experience.

Table 1 Descriptive Information Pertaining to the Hospitalist Physician Informants

Physician characteristics	Academic $n=12$	Community $n=12$	All $n=24$
Male gender, *n* (%)	8 (67)	6 (50)	14 (58)
Race, *n* (%)			
White	7 (58)	4 (33)	11 (46)
African American	1 (8)	0 (0)	1 (4)
Asian	4 (33)	8 (67)	12 (50)
Age, *n* (%)*			
Mean (SD)	47 (5.7)	49 (8.4)	48 (7.2)
Years as hospitalist at their local hospital, *n* (%)			
5–10 years	3 (25)	6 (50)	9 (38)
11–15 years	6 (50)	0 (0)	6 (25)
16+	3 (25)	6 (50)	9 (38)
International medical graduate, *n* (%)	3 (25)	4 (33)	7 (29)
Percent clinical			
1–50%	7 (58)	3 (25)	10 (42)
51–75%	3 (25)	4 (33)	7 (29)
76–100%	2 (17)	5 (42)	7 (29)
Academic rank			
Clinical associate	1 (8)	10 (83)	11 (46)
Instructor	0 (0)	2 (17)	2 (8)
Assistant professor	7 (58)	0 (0)	7 (29)
Associate professor	3 (25)	0 (0)	3 (13)
Professor	1 (8)	0 (0)	1 (4)
Hold leadership position at their institution, *n* (%)†			
Directorship/executive roles	5 (42)	8 (67)	13 (54)
Educational roles	2 (17)	0 (0)	2 (8)
Research roles	1 (8)	0 (0)	1 (4)
Quality and safety roles	3 (25)	3 (25)	6 (25)

Information collected through a survey except as otherwise stated

*Two respondents did not provide their age

†Two respondents did not provide this information

The importance of history-taking is described:

> A young man came in with shortness of breath (in the middle of the COVID pandemic) and he had ground-glass opacities in both lungs. He had gone to two hospitals and had repeatedly tested negative for COVID… There are several different diagnoses which present as ground-glass opacities. I asked the patient additional questions to help clarify the history and found out that he was regularly vaping. Based on this information, EVALI was high on the differential. We did a thorough workup and the final diagnosis actually turned out to be EVALI – e-cigarette or vaping-use associated lung injury… I rely a lot on the history… If a diagnosis isn't clear, I spend a tremendous amount of time listening to the patient's story. (Participant 12).

A hospitalist described a diagnostic miss due to a lack of the bedside exam:

> A patient was in the hospital …, an abdominal exam on day five showed a ginormous mass. … It was not a subtle finding. Nobody had done a basic … abdominal exam. … She had a big, horrible tumor and ended up going to hospice. … We are so worried that we're going to miss a subtle Zebra of a diagnosis, and we miss those too, but sometimes we just really miss the easy stuff. (Participant 13).

Humility gained from clinical experience is highlighted:

> One of the things about practicing medicine is it can be humbling. … Sometimes when you've just finished a rigorous residency program you … have a sense of overconfidence. It takes being out and practicing clinical medicine for a while to realize that there's always going to be things you don't know; no matter how smart you are, no matter how well educated you are, and learning will need to continue. And you will make mistakes. (Participant 5).

Effect of uncertainty on test ordering is described by another hospitalist:

> … All the tests had already been ordered before we got to see the patient. I think it's just discomfort with uncertainty. It's so much easier to order that Echo or CAT scan than it is to do a detailed history/physical exam. People in our field are very young and they have not seen enough patients to develop that comfort with uncertainty. Diagnostic testing can help mitigate some of that uncertainty but that can come with financial

costs and downstream effects of additional testing. (Participant 10).

Connecting with Patients and Other Members of the Health Care Team to Tap into Their Insights

Respect, listening, and trust are fundamental elements of strong relationships. Our informants explained that genuine and deep connections with others was advantageous to making accurate diagnoses.

A 42-year-old hospitalist on how building a relationship led to critical questions that helped in making the diagnosis of testicular cancer:

> One of the things that happened was there was enough space and time … for discussing private parts. … It was because we had … built that trust. We were able to get into some sensitive matters that aren't commonly discussed. (Participant 3).

A hospitalist with 9 years of experience described how knowing a patient beyond her illness led to timely diagnosis of acute chest syndrome in sickle cell disease:

> I learned that this was a woman who was very well educated, had good insight about her disease, and had tried to manage it at home. … That kind of told me that something was definitely off. … It always helps me spending a little extra time and getting to know them beyond their presenting symptoms. (Participant 8).

The value of having a detailed conversation with a colleague is elaborated:

> A diabetic patient had a sore on his toe. It didn't look infected to me and I dismissed it. The wound care nurse was more concerned and explained to me that it's a deep tissue infection. The patient ended up getting an MRI and he was diagnosed with osteomyelitis… Having detailed conversations about diagnosis with colleagues helps you get better; picking their brains about challenging cases is an important skill. (Participant 17).

Reflecting on the Diagnostic Process

Many informant hospitalists described how they mull over the diagnostic process in various ways such as slowing down to think deeply and reconsidering their assumptions repeatedly.

A hospitalist reflected on a delayed diagnosis:

> We had a patient who presented with a focal demyelination in their brain. … Our neurologist (suggested) giving them steroids, and doing plasmapheresis. Five days later the patient didn't get better. … That patient got discharged and at a different hospital was diagnosed with CNS lymphoma. It should have been on the differential and we missed that. We deferred to the neurologist's expertise as it seemed outside our scope. However, as general internal medicine doctors, we ought to have been asking more questions. This kind of self-reflection is very important – Am I missing anything? Do I need to be open to other possibilities? (Participant 19).

Another hospitalist told of caring for a patient with intracerebral hemorrhage and how revisiting things that seemed odd and questioning helped to determine the cause of the patient's obtundation:

> She went to the ICU, they stopped Eliquis, gave her (a reversal agent). The next day she came to the floor, she was completely obtunded. … My first question was why is she on Eliquis – this was not documented … I was able to discern that she had a history of spontaneous cerebral venous thrombosis… so unfortunately when they had stopped Eliquis, she had completely clotted off her entire venous system in her brain. … I've learned over time if something doesn't make sense to just take a minute and pause and ask why. (Participant 20).

Several hospitalists described getting to the correct diagnosis involves "slowing down and asking questions" and not to "take everything that's handed to you for granted."

One physician explained: "I think a lot of internal medicine is not that you are a genius or you're smarter than the others. It's really doing that work. … Asking questions repeatedly, that's all!" (Participant 22).

Committing to Growth

Adopting a growth mindset was a consistent trait among those learning from clinical errors and successes. Hospitalists described creating systems of feedback, seeking a clinical coach to aid with improvement, and embracing mistakes as opportunities for learning. Some of these ideas can be seen in the quotes below.

A hospitalist mentioned how he keeps track of his patients:

> When I hand off patients to others, I always go back and look at these charts because I was part of treatment for these patients (to) see if … I missed anything. (Participant 11).

Another hospitalist described the importance of having a clinical coach:

> Everybody makes errors, and we have … blind spots in our practice. The only way for us to be made aware of these blind spots; whether it's in diagnosis, or in management, is if somebody points it out & gives us feedback about it. … Having a coach who gives you feedback over time is tremendously important … if you want to get better at anything. (Participant 15).

Growing from mistakes is highlighted below:

> Unless you've never seen a patient, you've probably made a mistake… However, what you can do is learn from them and move forward. That's the growth mindset – you're going to need to put in work consistently to improve every day. (Participant 23).

Prioritizing Self-care

Hospitalists shared their understandings about well-being and balance, as well as the impact that these have on their clinical performance. Activities such as exercise, sleep, healthy eating, and meditation or practicing mindfulness were believed to be important. A hospitalist contended:

> I think that to be a better clinician you have to be a better human …, continuing to maintain whatever it is that keeps you happy—so whether it's hobbies, spending time with family. (Participant 4).

A hospitalist described the importance of reading fiction to help with developing diagnostic skills:

> I enjoy reading fiction … It allows me to get into the mind of somebody (from a) different place or time. It helps to develop empathy and listening skills. … Putting yourself in someone else's shoes helps because so much of diagnosis is listening to patients; what's bothering them, and if you can learn to do that, it gets you going in a better direction from the very beginning. (Participant 7).

DISCUSSION

The focus of this qualitative study was to explore insights on the experiences of academic and community hospitalists and the lessons they learned from diagnostic errors and successes in patient care. Importantly, we found that the lessons learned from both errors and successes in diagnosis are often linked to appreciating excellence in clinical reasoning as a core skill, connecting authentically with patients and other team members, reflecting on the diagnostic process as a clinician, committing to growth, and prioritizing self-care. The findings from this study contribute to the growing literature on "diagnosis education" which is an interdisciplinary and emerging field involved with improving the diagnostic processes.[41] Clinicians and educators might use insights from our study to promote diagnostic excellence which includes a cultural shift towards the growth mindset.[13,42]

A qualitative study of clinicians from a variety of specialties explored their perceptions of learning from errors and provided insights into factors that could promote or impede learning.[31] In that study, there were numerous stories of medical errors experienced as residents. The authors conclude that participants may have only "shared their errors as residents to preserve their reputations as faculty."[31] Another study described patients' perspectives of diagnostic errors and listed "inadequate clinical assessment" as a cause for errors.[5] In comparison to the above studies, our participants have shared valuable insights about clinical assessment and all the errors recounted were made by practicing attending physicians. The aforementioned studies also focused exclusively on diagnostic errors, whereas our study also explored the appreciative side that included growing from successes. While clinicians undoubtedly learn from errors in medicine, effective learning is ideally achieved by reflecting on both successful and unsuccessful experiences. This is consistent with learning theories such as Kolb's learning cycle[43] and Ericsson's deliberate practice model.[44] Our study further contributes to this literature by exploring and providing examples on the clinical lessons learned by clinicians from both diagnostic errors and successes in patient care.

The National Academy of Medicine's *Improving Diagnosis in Health Care* report recommends that health care organizations and professional societies should identify opportunities to improve the diagnostic process and reduce errors by promoting a nonpunitive culture that values feedback on diagnostic performance.[1] Yet, there has been little done to make improving diagnosis a systemic priority.[12] This may be because the diagnostic process is complex and full of challenges — as described by our participants. A 5-point action plan for health care organizations to pursue diagnostic excellence describes engaging frontline clinicians in improving diagnosis.[12] The proposal describes initiatives to improve clinical reasoning and training strategies for clinicians such as managing uncertainty and improving feedback.[12] Our informants reiterated and provided substantive details on some of these ideas. E.g., the theme appreciating excellence in clinical reasoning as a core skill delves on the lessons learned from foundational clinical skills' contribution to diagnostic errors or successes. Our results are consistent with what has been reported in the literature, i.e., most commonly errors are related to problems with clinical reasoning,[45,46] and it is imperative to focus on improving basic clinical skills (gathering history, performing physical exams, synthesizing data), even in this day and age of "increasing reliance on technology."[45] Furthermore, the rich data we collected and analyzed from experienced hospitalists' describing their lived experiences caring for acutely ill patients, day in and day out, adds credibility and specificity to the dimensions of quality embraced by diagnostic excellence: appreciating that excellence in clinical reasoning is foundational for safe and effective care, partnering with patients and health care team members to provide patient-centered care, reflecting on the diagnostic process and genuinely committing to growth to provide care that is timely and efficient, and prioritizing self-care for the development of empathy and trust to provide care that is equitable.[11]

Several limitations of this study should be considered. First, while the sample size was adequate for a qualitative study, we only recruited hospitalists from the Mid-Atlantic area — albeit five different hospitals. It is possible that their perspectives may be different for those practicing elsewhere. However, given the description of the context, participants, settings, and circumstances in our study, clinicians in general can make a judgement about "transferability" of the analysis to their own practice.[39] Second, we specifically and purposefully recruited clinically experienced hospitalists. Their lived experience is expected to be different from that of junior clinicians. Third, as with all qualitative studies, the results generate but do not test specific hypotheses. Future research with quantitative methods may be done to discern the most impactful strategies for augmenting diagnostic skills. Finally, the participants mostly described lessons they learned from complex and difficult to diagnose cases. Therefore, these lessons may not be applicable for the more straightforward cases.

In conclusion, we identified key lessons learned while dealing with errors and successes in patient care by clinically experienced academic and community hospitalists from five different hospitals. Our findings could serve as a road map to develop priorities for continuous learning for individual clinicians as well as health care organizations and societies. Striving for diagnostic excellence is an imperative to reduce preventable harms for all in medicine.

APPENDIX

Core of Interview Guide

1. In your time as a hospitalist, please tell me of a time when you were excited or proud because you successfully made a diagnosis that was difficult / challenging?

PROBE:- What do you think led to making that successful diagnosis?

- Why did that happen?
- What was it about you, the patient, the context that allowed you to nail the diagnosis?

2. Can you describe some important lessons that you learned from that episode of clinical or diagnostic reasoning?

3. What do you do to try to improve your diagnostic acumen?

4. How do you think we can help hospitalists become better diagnosticians?

5. Now switching gears I'd like to discuss about diagnostic errors. Diagnostic errors as defined by the National Academy of Medicine is "The failure to establish an accurate and timely explanation of the patient's health problem(s)."

- In your time as a hospitalist, can you please tell me about a time you made or encountered a diagnostic error?

PROBE: - What do you think led to the diagnostic error?

- Why did the error happen?
- Could anything have been done to prevent the error?

6. Can you describe some important lessons you learned from that diagnostic error?

7. If you were to list the most important causes of diagnostic errors occurring in hospitalized patients, what would they be and why?

8. What would you suggest as possible solutions if there was a commitment to reduce diagnostic errors in hospital medicine?

9. Is there anything you do outside of medicine that helps you become a better diagnostician?

10. Is there anything else you'd like to tell me about diagnostic successes or errors that we haven't talked about?

Acknowledgements: *Dr. Wright is the Anne Gaines and G. Thomas Miller Professor of Medicine supported through the Johns Hopkins Center for Innovative Medicine and he is the Mary & David Gallo Scholar for Hopkins' Initiative to Humanize Medicine.*

Corresponding Author: *Susrutha Kotwal, MD; Department of Medicine, Division of Hospital Medicine, Johns Hopkins Bayview Medical Center, Johns Hopkins University School of Medicine, 5200 Eastern Avenue, MFL Building East Tower, 2nd Floor CIMS Suite, Baltimore, MD, 21224, USA (e-mail: Skotwal1@jhmi.edu).*

Funding *This project was funded in part by the Rajiv Thakkar memorial scholarship (internal division funds). Dr. Zwaan is funded by a ZonMW Vidi grant (number, 09150172210015).*

Data Availability *The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.*

Declarations:

Ethical Approval: *The Johns Hopkins Medicine Institutional Review Board (JHM IRB). Number: NA_00079315. IRB Committee: IRB-X.*

Conflict of Interest: *The authors declare that they do not have a conflict of interest.*

REFERENCES

1. **Balogh EP, Miller BT, Ball JR.** Improving Diagnosis in Health Care. Improv Diagnosis Heal Care. January 2015:1–472. https://doi.org/10.17226/21794
2. **Makary MA, Daniel M.** Medical error—the third leading cause of death in the US. BMJ. May 2016:i2139. https://doi.org/10.1136/bmj.i2139
3. **Gunderson CG, Bilan VP, Holleck JL, et al.** Prevalence of harmful diagnostic errors in hospitalised adults: a systematic review and meta-analysis. *BMJ Qual Saf.* 2020;29(12):1008-1018. https://doi.org/10.1136/bmjqs-2019-010822
4. **Raffel KE, Kantor MA, Barish P, et al.** Prevalence and characterisation of diagnostic error among 7-day all-cause hospital medicine readmissions: a retrospective cohort study. BMJ Qual Saf. 2020;29(12):971 LP - 979. https://doi.org/10.1136/bmjqs-2020-010896
5. **Sacco AY, Self QR, Worswick EL, et al.** Patients' Perspectives of Diagnostic Error: A Qualitative Study. *J Patient Saf.* 2021;17(8):e1759-e1764. https://doi.org/10.1097/PTS.0000000000000642

6. **Grubenhoff JA, Ziniel SI, Cifra CL, Singhal G, McClead RE, Singh H.** Pediatric Clinician Comfort Discussing Diagnostic Errors for Improving Patient Safety: A Survey. *Pediatr Qual Saf*. 2020;5(2):e259. https://doi.org/10.1097/pq9.0000000000000259
7. **Rashid Z, Khan HT, Rehman F, Ahmad S, Niazi S, Sarwar MZ.** Attitudes and practice of surgeons in reporting medical errors at a tertiary care hospital. *J Pak Med Assoc*. 2021;71(3):1051-1054. https://doi.org/10.47391/JPMA.427
8. **Wachter RM, Goldman L.** Zero to 50,000 — The 20th Anniversary of the Hospitalist. *N Engl J Med*. 2016;375(11):1009-1011. https://doi.org/10.1056/NEJMp1607958
9. **Lapps J, Flansbaum B, Leykum LK, Bischoff H, Howell E.** Growth trends of the adult hospitalist workforce between 2012 and 2019. *J Hosp Med*. 2022;17(11):888-892. https://doi.org/10.1002/jhm.12954
10. **Singh H, Zwaan L.** Web Exclusives. Annals for Hospitalists Inpatient Notes - Reducing Diagnostic Error-A New Horizon of Opportunities for Hospital Medicine. *Ann Intern Med*. 2016;165(8):HO2-HO4. https://doi.org/10.7326/M16-2042
11. **Yang D, Fineberg HV, Cosby K.** Diagnostic Excellence. *JAMA*. 2021;326(19):1905-1906. https://doi.org/10.1001/jama.2021.19493
12. **Singh H, Upadhyay DK, Torretti D.** Developing Health Care Organizations That Pursue Learning and Exploration of Diagnostic Excellence: An Action Plan. *Acad Med*. 2020;95(8):1172-1178. https://doi.org/10.1097/ACM.0000000000003062
13. **Klein J, Delany C, Fischer MD, Smallwood D, Trumble S.** A growth mindset approach to preparing trainees for medical error. *BMJ Qual Saf*. 2017;26(9):771-774. https://doi.org/10.1136/bmjqs-2016-006416
14. **Dweck CS, Chiu C, Hong Y.** Implicit Theories and Their Role in Judgments and Reactions: A Word From Two Perspectives. *Psychol Inq*. 1995;6(4):267-285. https://doi.org/10.1207/s15327965pli0604_1
15. **Hollnagel E, Wears R, Braithwaite J.** From Safety-I to Safety-II: A White Paper. The Resilient Health Care Net: Published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia.
16. **Thomas EJ.** The harms of promoting "Zero Harm". *BMJ Qual Saf*. 2020;29(1):4-6. https://doi.org/10.1136/bmjqs-2019-009703
17. **Croskerry P.** The feedback sanction. *Acad Emerg Med*. 2000;7(11):1232-1238. https://doi.org/10.1111/J.1553-2712.2000.TB00468.X
18. **Omron R, Kotwal S, Garibaldi BT, Newman-Toker DE.** The Diagnostic Performance Feedback "Calibration Gap": Why Clinical Experience Alone Is Not Enough to Prevent Serious Diagnostic Errors. Promes S, ed. *AEM Educ Train*. 2018;2(4):339-342. https://doi.org/10.1002/aet2.10119
19. **Meyer AND, Singh H.** The Path to Diagnostic Excellence Includes Feedback to Calibrate How Clinicians Think. *JAMA - J Am Med Assoc*. 2019;321(8):737-738. https://doi.org/10.1001/jama.2019.0113
20. **Goodwin JS, Salameh H, Zhou J, Singh S, Kuo YF, Nattinger AB.** Association of Hospitalist Years of Experience With Mortality in the Hospitalized Medicare Population. *JAMA Intern Med*. 2018;178(2):196-203. https://doi.org/10.1001/JAMAINTERNMED.2017.7049
21. **Meltzer D, Manning WG, Morrison J, et al.** Effects of physician experience on costs and outcomes on an academic general medicine service: results of a trial of hospitalists. *Ann Intern Med*. 2002;137(11):866-874. https://doi.org/10.7326/0003-4819-137-11-200212030-00007
22. **Auerbach AD, Wachter RM, Katz P, Showstack J, Baron RB, Goldman L.** Implementation of a voluntary hospitalist service at a community teaching hospital: improved clinical efficiency and patient outcomes. *Ann Intern Med*. 2002;137(11):859-865. https://doi.org/10.7326/0003-4819-137-11-200212030-00006
23. **Ajmi SC, Aase K.** Physicians' clinical experience and its association with healthcare quality: a systematised review. BMJ Open Qual. 2021;10(4). https://doi.org/10.1136/bmjoq-2021-001545
24. **Elstad EA, Lutfey KE, Marceau LD, Campbell SM, von dem Knesebeck O, McKinlay JB.** What do physicians gain (and lose) with experience? Qualitative results from a cross-national study of diabetes. *Soc Sci Med*. 2010;70(11):1728-1736. https://doi.org/10.1016/j.socscimed.2010.02.014
25. **Rees CE, Crampton PES, Monrouxe LV.** Re-visioning Academic Medicine Through a Constructionist Lens. *Acad Med*. 2020;95(6):846-850. https://doi.org/10.1097/ACM.0000000000003109
26. **Kiger ME, Varpio L.** Thematic analysis of qualitative data: AMEE Guide No. 131. *Med Teach*. 2020;42(8):846-854. https://doi.org/10.1080/0142159X.2020.1755030
27. **Rossman GB, Rallis SF.** *An Introduction to Qualitative Research: Learning in the Field*. 4th ed. Los Angeles, CA: SAGE Publications, Inc.; 2017.
28. **McAlister FA, Youngson E, Bakal JA, Holroyd-Leduc J, Kassam N.** Physician experience and outcomes among patients admitted to general internal medicine teaching wards. *CMAJ*. 2015;187(14):1041-1048. https://doi.org/10.1503/cmaj.150316
29. **Tsugawa Y, Newhouse JP, Zaslavsky AM, Blumenthal DM, Jena AB.** Physician age and outcomes in elderly patients in hospital in the US: observational study. *BMJ*. 2017;357:j1797. https://doi.org/10.1136/bmj.j1797
30. **Creswell JW, Poth CN.** *Qualitative Inquiry & Research Design: Choosing among Five Approaches*. Fourth edi. Los Angeles SE - xxv, 459 pages: illustrations; 24cm.: SAGE Los Angeles; 2018. LK - https://worldcat.org/title/954104455
31. **Shepherd L, LaDonna KA, Cristancho SM, Chahine S.** How Medical Error Shapes Physicians' Perceptions of Learning: An Exploratory Study. *Acad Med*. 2019;94(8):1157-1163. https://doi.org/10.1097/ACM.0000000000002752
32. **Schechter C, Sykes I, Rosenfeld J.** Learning from Success: A Leverage for Transforming Schools Into Learning Communities. *Plan Chang*. 2004;35(3-4):154.
33. **Zwaan L, El-Kareh R, Meyer AND, Hooftman J, Singh H.** Advancing Diagnostic Safety Research: Results of a Systematic Research Priority Setting Exercise. *J Gen Intern Med*. 2021;36(10):2943-2951. https://doi.org/10.1007/s11606-020-06428-3
34. **Zwaan L, Singh H.** Diagnostic error in hospitals: finding forests not just the big trees. *BMJ Qual Saf*. 2020;29(12):961-964. https://doi.org/10.1136/bmjqs-2020-011099
35. **Wright SM, Wolfe L, Stewart R, et al.** Ethical concerns related to grateful patient philanthropy: the physician's perspective. *J Gen Intern Med*. 2013;28(5):645-651. https://doi.org/10.1007/s11606-012-2246-7
36. **Christmas C, Kravet SJ, Durso SC, Wright SM.** Clinical Excellence in Academia: Perspectives From Masterful Academic Clinicians. *Mayo Clin Proc*. 2008;83(9):989-994. https://doi.org/10.4065/83.9.989
37. **Kotwal S, Peña I, Howell E, Wright S.** Defining Clinical Excellence in Hospital Medicine: A Qualitative Study. J Contin Educ Health Prof. 2017;37(1). https://doi.org/10.1097/CEH.0000000000000145
38. **Braun V, Clarke V.** Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77-101. https://doi.org/10.1191/1478088706QP063OA
39. **Braun V, Clarke V.** Thematic Analysis: A Practical Guide. SAGE Publications; 2021. https://books.google.com/books?id=mToqEAAAQBAJ.
40. **Malterud K, Siersma VD, Guassora AD.** Sample Size in Qualitative Interview Studies: Guided by Information Power. *Qual Health Res*. 2016;26(13):1753-1760. https://doi.org/10.1177/1049732315617444
41. **Olson APJ, Singhal G, Dhaliwal G.** Diagnosis education – an emerging field. *Diagnosis*. 2019;6(2):75-77. https://doi.org/10.1515/dx-2019-0029
42. **Puri A, Memari M, Sottile EM, et al.** Changing the Assessment Paradigm: Promoting a Growth Mindset Across the Medical Education Continuum. *Am J Med*. 2023;136(2):207-212. https://doi.org/10.1016/j.amjmed.2022.10.004
43. **Kolb AY, Kolb DA.** Learning Styles and Learning Spaces: Enhancing Experiential Learning in Higher Education. *Acad Manag Learn Educ*. 2005;4(2):193-212. https://doi.org/10.5465/amle.2005.17268566
44. **Ericsson K, Hoffman R, Kozbelt A, Williams A.** The Cambridge Handbook of Expertise and Expert Performance (Cambridge Handbooks in Psychology). Cambridge: Cambridge University Press. 2018. https://doi.org/10.1017/9781316480748
45. **Singh H, Giardina TD, Meyer AND, Forjuoh SN, Reis MD, Thomas EJ.** Types and Origins of Diagnostic Errors in Primary Care Settings. *JAMA Intern Med*. 2013;173(6):418. https://doi.org/10.1001/jamainternmed.2013.2777
46. **Newman-Toker DE, Schaffer AC, Yu-Moe CW, et al.** Serious misdiagnosis-related harms in malpractice claims: The "Big Three" – vascular events, infections, and cancers. *Diagnosis*. 2019;6(3):227-240. https://doi.org/10.1515/dx-2019-0019

Publisher's Note *Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.*

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.