

# **Additional Readings on Diagnostic Error**

- (1) Bishop TF, Ryan AK, Casalino LP. Paid malpractice claims for adverse events in inpatient and outpatient settings. *JAMA* 2011;305:2427-2431.
- (2) Bordage G. Why did I miss the diagnosis? Some cognitive explanations and educational implications. *Acad Med* 1999;74:S138-S143.
- (3) Callen JL, Westbrook JI, Georgiou A, Li J. Failure to Follow-Up Test Results for Ambulatory Patients: A Systematic Review. *J Gen Intern Med* 2011;27:1334-1348.
- (4) Casalino LP, Dunham D, Chin MH et al. Frequency of failure to inform patients of clinically significant outpatient test results. *Arch Intern Med* 2009;169:1123-1129.
- (5) Coderre S, Mandin H, Harasym PH, Fick GH. Diagnostic reasoning strategies and diagnostic success. *Medical Education* 2003;37:695-703.
- (6) Croskerry P. The cognitive imperative: thinking about how we think. *Acad Emerg Med* 2000;7:1223-1231.
- (7) Croskerry P. Cognitive forcing strategies in clinical decisionmaking. *Ann Emerg Med* 2003;41:110-120.
- (8) Croskerry P. The importance of cognitive errors in diagnosis and strategies to minimize them. *Acad Med* 2003;78:775-780.
- (9) Croskerry P. Diagnostic failure: A cognitive and affective approach. *AHRQ* [serial online] 2005; Accessed January 10, 2007.
- (10) Croskerry P. From mindless to mindful practice--cognitive bias and clinical decision making. *N Engl J Med* 2013;368:2445-2448.
- (11) Croskerry P, Wears RL, Binder LS. Setting the educational agenda and curriculum for error prevention in emergency medicine. *Acad Emerg Med* 2000;7:1194-1200.
- (12) Dovey SM, Meyers DS, Phillips RL, Jr. et al. A preliminary taxonomy of medical errors in family practice. *Qual Saf Health Care* 2002;11:233-238.
- (13) Elder NC, Dovey SM. Classification of medical errors and preventable adverse events in primary care: a synthesis of the literature. *J Fam Pract* 2002;51:927-932.
- (14) Elstein AS. Clinical reasoning in medicine. In: Higgs J, Jones MA, eds. *Clinical Reasoning in the Health Professions*. Woburn, MA: Butterworth-Heinemann; 1995;49-59.
- (15) Elstein AS. Heuristics and biases: selected errors in clinical reasoning. *Acad Med* 1999;74:791-794.
- (16) Elstein AS, Schwarz A. Evidence base of clinical diagnosis: Clinical problem solving and diagnostic decision making: selective review of the cognitive literature. *BMJ* 2002;324:729-732.
- (17) Elstein AS, Shulman LS, Sprafka SA. *Medical Problem Solving: An Analysis of Clinical Reasoning*. Cambridge Massachusetts: Harvard University Press, 1978.
- (18) Ely JW, Graber ML, Croskerry P. Checklists to reduce diagnostic errors. *Acad Med* 2011;86:307-313.
- (19) Ely JW, Kaldjian LC, D'Alessandro DM. Diagnostic Errors in Primary Care: Lessons Learned. *J Am Board Fam Pract* 2012;25:87-97.

- (20) Eva KW, Link CL, Lutfey KE, McKinlay JB. Swapping Horses Midstream: Factors Related to Physicians' Changing Their Minds About a Diagnosis. *Academic Medicine* 2010;85.
- (21) Fischhoff B. Hindsight not equal to foresight: the effect of outcome knowledge on judgment under uncertainty \*. *Qual Saf Health Care* 2003;12:304-311.
- (22) Gandhi TK. Fumbled handoffs: one dropped ball after another. *Ann Intern Med* 2005;142:352-358.
- (23) Gandhi TK, Kachalia A., Thomas EJ et al. Missed and delayed diagnoses in the ambulatory setting: A study of closed malpractice claims. *Ann Intern Med* 2006;145:488-496.
- (24) Gandhi TK, Sittig DF, Franklin M, Sussman AJ, Fairchild DG, Bates DW. Communication breakdown in the outpatient referral process. *J Gen Intern Med* 2000;15:626-631.
- (25) Graber M. Metacognitive training to reduce diagnostic errors: ready for prime time? *Acad Med* 2003;78:781.
- (26) Graber M. Diagnostic errors in medicine: a case of neglect. *Jt Comm J Qual Patient Saf* 2005;31:106-113.
- (27) Graber M, Gordon R, Franklin N. Reducing diagnostic errors in medicine: what's the goal? *Acad Med* 2002;77:981-992.
- (28) Graber ML, Franklin N, Gordon R. Diagnostic error in internal medicine. *Arch Intern Med* 2005;165:1493-1499.
- (29) Graber ML, Trowbridge RL, Myers JS, Umscheid CA, Strull W, Kanter MH. The Next Organizational Challenge: Finding and Addressing Diagnostic Error. *Joint Commission Journal on Quality and Patient Safety* 2014;40:102-110.
- (30) Graber ML, Wachter RM, Cassel CK. Bringing diagnosis into the quality and safety equations. *JAMA* 2012;308:1211-1212.
- (31) Graber ML, Kissam S, Payne VL et al. Cognitive interventions to reduce diagnostic error: a narrative review. *BMJ Quality & Safety* 2012;21:535-557.
- (32) Graber M, Berner EE. Diagnostic Error: Is Overconfidence the Problem? *The American Journal of Medicine Supplement*:5. 2008.
- (33) Klein G. Sources of error in naturalistic decision making tasks. *Proceedings of the 37th Annual Meeting of the Human Factors and Ergonomics Society* 1993.
- (34) Klein G. *Sources of Power: How People Make Decisions*. Cambridge, Massachusetts: The MIT Press, 1998.
- (35) Klein G. Naturalistic decision making. *Hum Factors* 2008;50:456-460.
- (36) Kostopoulou O, Delaney BC, Munro CW. Diagnostic difficulty and error in primary care--a systematic review. *Fam Pract* 2008;25:400-413.
- (37) Kostopoulou O, Russo JE, Keenan G, Delaney BC, Douiri A. Information distortion in physicians' diagnostic judgments. *Med Decis Making* 2012;32:831-839.

- (38) Lorincz CY, Drazen E, Sokol PE et al. Research in Ambulatory Patient Safety 2000–2010: A 10-year review. *American Medical Association* 2011.
- (39) Mamede S, Schmidt HG, Rikers R. Diagnostic errors and reflective practice in medicine. *J Eval Clin Pract* 2007;13:138-145.
- (40) McDonald KM, Matesic B, Contopoulos-Ioannidis DG et al. Patient safety strategies targeted at diagnostic errors: a systematic review. *Ann Intern Med* 2013;158:381-389.
- (41) McNutt R, Abrams R, Hasler S. Diagnosing diagnostic mistakes: AHRQ web morbidity and mortality rounds. AHRQ . 2005. 9-25-2006.
- (42) Meyer AN, Payne VL, Meeks DW, Rao R, Singh H. Physicians' Diagnostic Accuracy, Confidence, and Resource Requests: A Vignette Study. *JAMA Intern Med* 2013.
- (43) Murphy DR, Laxmisan A, Reis BA et al. Electronic health record-based triggers to detect potential delays in cancer diagnosis. *BMJ Qual Saf* [serial online] 2013; Accessed August 27, 2013.
- (44) Murphy DR, Laxmisan A, Reis BA et al. Electronic health record-based triggers to detect potential delays in cancer diagnosis. *BMJ Qual Saf* 2014;23:8-16.
- (45) Newman-Toker DE, Pronovost PJ. Diagnostic Errors--The Next Frontier for Patient Safety. *JAMA* 2009;301:1060-1062.
- (46) Phillips R, Jr., Bartholomew LA, Dovey SM, Fryer GE, Jr., Miyoshi TJ, Green LA. Learning from malpractice claims about negligent, adverse events in primary care in the United States. *Qual Saf Health Care* 2004;13:121-126.
- (47) Raab SS, Grzybicki DM, Janosky JE et al. Clinical impact and frequency of anatomic pathology errors in cancer diagnoses. *Cancer* 2005;104:2205-2213.
- (48) Raab SS, Grzybicki DM. Quality in Cancer Diagnosis. *CA Cancer J Clin* 2010;60:139-165.
- (49) Redelmeier DA. Improving patient care. The cognitive psychology of missed diagnoses. *Ann Intern Med* 2005;142:115-120.
- (50) Sarkar U, Bonacum D, Strull W et al. Challenges of making a diagnosis in the outpatient setting: a multi-site survey of primary care physicians. *BMJ Qual Saf* 2012;21:641-648.
- (51) Sarkar U, Bonacum D, Strull W et al. Challenges of making a diagnosis in the outpatient setting: a multi-site survey of primary care physicians. *BMJ Qual Saf* 2012;21:641-648.
- (52) Schiff GD. Medical error: a 60-year-old man with delayed care for a renal mass. *JAMA* 2011;305:1890-1898.
- (53) Schiff GD, Hasan O, Kim S et al. Diagnostic Error in Medicine: Analysis of 583 Physician-Reported Errors. *Arch Intern Med* 2009;169:1881-1887.
- (54) Schiff GD, Kim S, Abrams R, Cosby K, Lambert B, Elstein AS. Diagnosing diagnosis errors: Lessons from a multi-institutional collaborative project. *Advances in Patient Safety: From Research to Implementation (Volume 2: Concepts and Methodology)*. Rockville, MD.: Agency for Healthcare Research and Quality AHRQ Publication Nos. 050021 (1-4).; 2005;255-278.

- (55) Schiff GD, Leape LL. Commentary: how can we make diagnosis safer? *Acad Med* 2012;87:135-138.
- (56) Schiff GD, Puopolo AL, Huben-Kearney A et al. Primary Care Closed Claims Experience of Massachusetts Malpractice Insurers. *JAMA Intern Med* 2013.
- (57) Schiff GD. Minimizing Diagnostic Error: The Importance of Follow-up and Feedback. *The American Journal of Medicine* 2008;121:S38-S42.
- (58) Schiff GD, Bates DW. Can Electronic Clinical Documentation Help Prevent Diagnostic Errors? *N Engl J Med* 2010;362:1066-1069.
- (59) Schwartz A, Weiner SJ, Weaver F et al. Uncharted territory: measuring costs of diagnostic errors outside the medical record. *BMJ Qual Saf* 2012;21:918-924.
- (60) Scott IA. Errors in clinical reasoning: causes and remedial strategies. *BMJ* 2009;338:b1860.
- (61) Sevdalis N, Jacklin R, Arora S, Vincent CA, Thomson RG. Diagnostic error in a national incident reporting system in the UK. *J Eval Clin Pract* 2010.
- (62) Singh H. Editorial: Helping Health Care Organizations to Define Diagnostic Errors as Missed Opportunities in Diagnosis. *Joint Commission Journal on Quality and Patient Safety* 2014;40:99-101.
- (63) Singh H, Giardina TD, Forjuoh SN et al. Electronic health record-based surveillance of diagnostic errors in primary care. *BMJ Qual Saf* 2012;21:93-100.
- (64) Singh H, Giardina TD, Meyer AN, Forjuoh SN, Reis MD, Thomas EJ. Types and Origins of Diagnostic Errors in Primary Care Settings. *JAMA Intern Med* 2013;1-8.
- (65) Singh H, Giardina TD, Petersen LA et al. Exploring situational awareness in diagnostic errors in primary care. *BMJ Qual Saf* 2012;21:30-38.
- (66) Singh H, Graber M. Reducing diagnostic error through medical home-based primary care reform. *JAMA* 2010;304:463-464.
- (67) Singh H, Graber ML, Kissam SM et al. System-related interventions to reduce diagnostic errors: a narrative review. *BMJ Qual Saf* 2012;21:160-170.
- (68) Singh H, Meyer AN, Thomas EJ. The frequency of diagnostic errors in outpatient care: estimations from three large observational studies involving US adult populations. *BMJ Qual Saf* 2014.
- (69) Singh H, Naik A, Rao R, Petersen L. Reducing Diagnostic Errors Through Effective Communication: Harnessing the Power of Information Technology. *Journal of General Internal Medicine* 2008;23:489-494.
- (70) Singh H, Petersen LA, Thomas EJ. Understanding diagnostic errors in medicine: a lesson from aviation. *Qual Saf Health Care* 2006;15:159-164.
- (71) Singh H, Sethi S, Raber M, Petersen LA. Errors in cancer diagnosis: current understanding and future directions. *J Clin Oncol* 2007;25:5009-5018.
- (72) Singh H, Sittig DF. Were My Diagnosis and Treatment Correct? No News is Not Necessarily Good News. *J Gen Intern Med* 2014;29:1087-1089.

- (73) Singh H, Thomas EJ, Mani S et al. Timely follow-up of abnormal diagnostic imaging test results in an outpatient setting: are electronic medical records achieving their potential? *Arch Intern Med* 2009;169:1578-1586.
- (74) Singh H, Thomas EJ, Wilson L et al. Errors of diagnosis in pediatric practice: a multisite survey. *Pediatrics* 2010;126:70-79.
- (75) Singh H, Thomas E, Khan MM, Petersen L. Identifying diagnostic errors in primary care using an electronic screening algorithm. *Arch Intern Med* 2007;167:302-308.
- (76) Singh H, Weingart SN. Diagnostic errors in ambulatory care: dimensions and preventive strategies. *Adv Health Sci Educ Theory Pract* 2009;14 Suppl 1:57-61.
- (77) Sittig DF, Singh H. A red-flag-based approach to risk management of EHR-related safety concerns. *J Healthc Risk Manag* 2013;33:21-26.
- (78) Trowbridge R, Salvador D. Addressing diagnostic errors: An institutional approach. <http://www.npsf.org/paf/npsfp/fo/pdf/Focus%20v13-3-2010.pdf> [serial online] 2010;13:1-2 Available from: The National Patient Safety Foundation.
- (79) Wachter RM. Why diagnostic errors don't get any respect--and what can be done about them. *Health Aff (Millwood)* 2010;29:1605-1610.
- (80) Wahls TL, Cram P. Diagnostic errors associated with failure to follow up on abnormal results [abstract]Wahls TL, Cram P. *Society of General Internal Medicine Annual Scientific Meeting* 2007;Abstract #322
- (81) Wears RL. What makes diagnosis hard? *Adv Health Sci Educ Theory Pract* 2009;14 Suppl 1:19-25.
- (82) Wears RL, Nemeth CP. Replacing hindsight with insight: toward better understanding of diagnostic failures. *Ann Emerg Med* 2007;49:206-209.
- (83) Weingart SN, Saadeh MG, Simchowitz B et al. Process of care failures in breast cancer diagnosis. *J Gen Intern Med* 2009;24:702-709.
- (84) Winters B, Custer J, Galvagno SM, Jr. et al. Diagnostic errors in the intensive care unit: a systematic review of autopsy studies. *BMJ Qual Saf* 2012;21:894-902.
- (85) Zwaan L, de BM, Wagner C et al. Patient record review of the incidence, consequences, and causes of diagnostic adverse events. *Arch Intern Med* 2010;170:1015-1021.
- (86) Zwaan L, Thijs A, Wagner C, van der WG, Timmermans DR. Relating faults in diagnostic reasoning with diagnostic errors and patient harm. *Acad Med* 2012;87:149-156.

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