

Medical Decision-Making Research

I have published many projects in this area, such as:

Abstract: Computer-based diagnostic decision support systems (DSSs) were developed to improve health care quality by providing accurate, useful, and timely diagnostic information to clinicians. However, most studies have emphasized the accuracy of the computer system alone, without placing clinicians in the role of direct users.

OBJECTIVE: To explore the extent to which consultations with DSSs improve clinicians' diagnostic hypotheses in a set of diagnostically challenging cases.

DESIGN: Partially randomized controlled trial conducted in a laboratory setting, using a prospective balanced experimental design in 1995-1998.

SETTING: Three academic medical centers, none of which were involved in the development of the DSSs.

PARTICIPANTS: A total of 216 physicians: 72 at each site, including 24 internal medicine faculty members, 24 senior residents, and 24 fourth-year medical students. One physician's data were lost to analysis.

INTERVENTION: Two DSSs, ILIAD (version 4.2) and Quick Medical Reference (QMR; version 3.7.1), were used by participants for diagnostic evaluation of a total of 36 cases based on actual patients. After training, each subject evaluated 9 of the 36 cases, first without and then using a DSS, and suggested an ordered list of diagnostic hypotheses after each evaluation.

MAIN OUTCOME MEASURE: Diagnostic accuracy, measured as the presence of the correct diagnosis on the hypothesis list and also using a derived diagnostic quality score, before and after consultation with the DSSs.

RESULTS: Correct diagnoses appeared in subjects' hypothesis lists for 39.5% of cases prior to consultation and 45.4% of cases after consultation. Subjects' mean diagnostic quality scores increased from 5.7 (95% confidence interval [CI], 5.5-5.9) to 6.1 (95% CI, 5.9-6.3) (effect size: Cohen $d = 0.32$; 95% CI, 0.23-0.41; $P < .001$). Larger increases ($P = .048$) were observed for students than for residents and faculty. Effect size varied significantly ($P < .02$) by DSS (Cohen $d = 0.20$; 95% CI, 0.08-0.32 for ILIAD vs Cohen $d = 0.45$; 95% CI, 0.31-0.59 for QMR). **CONCLUSIONS:** Our study supports the idea that "hands-on" use of diagnostic DSSs can influence diagnostic reasoning of clinicians. The larger effect for students suggests a possible educational role for these systems.

Published as:

Friedman, C. P., Elstein, A. S., Wolf, F. M., Murphy, G. C., Franz, T. M., Heckerling, P. S., Fine, P. L., Miller, T. M., Miller, J., & Abraham, V. (1999). Enhancement of Clinicians' Diagnostic Reasoning by Computer-Based Consultation: A Multisite Study of 2 Systems. *Journal of the American Medical Association*, *282*, 1851-1856.

Other projects include:

Friedman, C.P., Gatti, G.G., Franz, T.M., Murphy, G.C., Wolf, F.M., Heckerling, P.S., Fine, P.L., Miller, T.M., & Elstein, A.S. (2005). Do physicians know when their diagnoses are correct? Implications for decision support and error reduction. *Journal of General Internal Medicine, 20*, 334-339.

Friedman, C.P., Gatti, G.G., Murphy, G.C., Franz, T.M., Fine, P.L., Heckerling, P.S. & Miller, T.M.(2002). Exploring the Boundaries of Plausibility: Empirical Study of a Key Problem in the Design of Computer-Based Clinical Simulations. *Proceedings of the 2002 American Medical Informatics Association Annual Symposium*, 275-9

Friedman, C., Gatti, G. Elstein, A., Franz, T. Murphy, G. & Wolf, F. (2001). Are clinicians correct when they believe they are correct? Implications for Medical Decision Support. *MedInfo, 10 (1)*, 454-458.

Elstein, A.S., Friedman, C.P., Wolf, F.M., Murphy, G.C., Franz, T. M., Heckerling, P.S., Fine, P.L., Miller, T.M., & Miller, J. (1998). Enhancement of diagnostic reasoning by a computer-based decision support system. *Medical Decision Making, 18*, 458. [Published abstract]

Friedman, C., Elstein, A., Wolf, F., Murphy, G, Franz, T., Fine, P. Heckerling, P, & Miller, T. (1998). Measuring the quality of diagnostic hypothesis sets for studies of decision support. *MedInfo, 9 (2)*, 864-848.

Franz, T. M., Elstein, A., Friedman, C., Murphy, G, Wolf, F., Winkvist, J., & Kim, S. (1997). The effect of physician experience and case difficulty on the diagnostic accuracy of a decision support system when diagnostic information is incomplete. *Medical Decision Making, 17*, 535. [Published abstract]

Wolf, F. M., Friedman, C. P., Elstein, A. S., Miller, J. G., Murphy, G. C., Heckerling, P. Fine, P., Miller, T., Sisson, J., Barlas, S., Capitano, A., Ng, M., & Franz, T. (1997). Changes in diagnostic decision-making after a computerized decision support consultation based on perceptions of need and helpfulness: A preliminary report. *Proceedings of the 1997 American Medical Informatics Association Fall Symposium*, 263-267.

Elstein, A. S., Friedman, C. P., Wolf, F. M., Murphy, G., Miller, J., Fine, P., Heckerling, P., Miller, T., Sisson, J., Barlas, S., Biolsi, K., Ng, M., Xiao, M., Franz, T., & Capitano, A. (1996). Effects of a decision support system on the diagnostic accuracy of users: A preliminary report. *Journal of the American Medical Informatics Association, 3*, 422-428.