

Annotated Bibliography Concerning Patient Safety Issues (as of May, 2014)
Patient Safety Center of Inquiry at VA Palo Alto Health Care System
(Drs. Gaba, Howard, Lighthall, Harrison, Fanning, Goldhaber-Fiebert, and affiliates)

THEME: Organizational Safety Theory Applied to Healthcare

Gaba DM, Maxwell MS, DeAnda A: Anesthetic mishaps: Breaking the chain of accident evolution. Anesthesiology, 66:670-676, 1987

This was a ground-breaking paper applying principles from Perrow's "Normal Accident Theory" to human error and patient safety in anesthesiology (and by extension much of health care in general).

Cooper JB, Gaba DM: A strategy for prevention of anesthetic mishaps. International Anesthesiology Clinics 27:148-152, 1989

This paper established strategies for reducing error and preventing mishaps. Different strategies were laid out for practitioners, institutions, professions, and the system as a whole.

Gaba DM, Howard SK: Conference on human error in anesthesia (meeting report). Anesthesiology 75:553-554, 1991

Drs. Gaba and Howard organized the international *Conference On Human Error In Anesthesia*, an experts' workshop which brought together for the first time human factors experts (including David Woods) and medical personnel working on error and safety. The Conference catalyzed a number of research avenues by groups around the world.

Gaba DM: Analysis of the NASA Aviation Safety Reporting System (ASRS) as a model for safety reporting in anesthesiology. White Paper for the Anesthesia Patient Safety Foundation, 1992.

This paper outlined the applicability of the NASA ASRS system model to near miss and accident reporting in anesthesiology, and by extension the rest of health care. The APSF has been working toward establishment of such a program, which has remained stalled to date due to medicolegal issues.

Gaba DM: Structural and organizational issues in patient safety: A comparison of health care to other high-hazard industries. California Management Review 43:83-102, 2000

This groundbreaking publication discusses the structure of health care as an industry in comparison to other high-hazard industries. It challenges assumptions that health care is a high reliability organization. The suggestion is made that medical error is embedded deeply in industrial and organizational structure and practices of the health care industry.

Also on this theme:

- Gaba DM: Human error in anesthetic mishaps. *International Anesthesiology Clinics* 27:137-147,1989
- Gaba DM: Human performance issues in anesthesia patient safety. *Problems in Anesthesia* 5:329-350, 1991
- Gaba DM: Anesthesia is an unique complex dynamic world (position paper for Conference on human error in anesthesia), 1991
- Gaba DM: Dynamic decision-making in anesthesiology: cognitive models and training approaches In *Advanced Models of Cognition for Medical Training and Practice*, edited by Evans DA, Patel VL. Berlin: Springer-Verlag, 1992, pp 123-147
- Gaba DM: Human performance in dynamic medical domains. In *Human Error in Medicine*, edited by Bogner, MS. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1994, pp. 197-224.
- Botney R, Gaba DM: Human factors in monitoring. In *Monitoring in Anesthesia and Critical Care*, 3rd edition, edited by Blitt CD, Hines RL. New York: Churchill Livingstone, 1994, pp. 23-54.
- Gaba DM: Risk, regulation, litigation, and organizational issues in safety in high-hazard industries. Position Paper for: Workshop on Organizational Analysis in High-Hazard Production Systems: An Academy/Industry Dialogue, 1996
- Gaba DM: Strategies for data collection and analysis to protect patient safety in office-based anesthesia and surgery settings. *Anesthesia Patient Safety Foundation Newsletter, Volume 14, Spring Issue, 2000* (also available at: http://www.gasnet.org/societies/apsf/newsletter/oba/oba_collection/oba_collection.html)**
- Gaba DM: Anaesthesiology as a model for patient safety in health care. *Br Med J* 320:785-788, 2000**
- Cooper JB, Gaba DM, Liang, B, Woods D, Blum, LN: The National Patient Safety Foundation Agenda for Research and Development in Patient Safety. *MedGenMed*, July 11, 2000 [available on-line at: <http://www.medscape.com/Medscape/GeneralMedicine/journal/2000/v02.n04/mgm0712.coop/mgm0712.coop-1.html>]**
- Gaba DM: Commentary (invited commentary on Masden LE: Diesel gas, rice, and medical errors (invited commentary). *The Pharos*, Winter, 2002.
- Cooper JB, Gaba DM: No Myth: Anesthesia Is a Model for Addressing Patient Safety (editorial). *Anesthesiology* 2002; 97:1335–7**
- Gaba DM: Out of this nettle, danger, we pluck this flower, safety: Healthcare vs. aviation and other high hazard industries (editorial). *Simul Healthc* 2007; 2:213-217**
- Moore MS, Howard SK, Lighthall G: Using the rapid response system to provide better oversight of patient care processes. *Jt Comm J Qual Patient Saf.* 2007; 33:695-8, 645.**
- Gaba DM: Head to Head: Have we gone too far in translating ideas from aviation to patient safety – No. 2011; *BMJ*; 342:c7310**
- Gaba DM: Perspective: Thorniest issues in healthcare. [Biomed Instrum Technol.](#) 2013;47:299-303.**

THEME: Applications of Crew Resource Management (CRM) training to health care

Howard SK, Gaba DM, Fish KJ, Yang GS, Sarnquist FH: Anesthesia crisis resource management training: teaching anesthesiologists to handle critical incidents. Aviation, Space, and Environmental Medicine 63:763-770, 1992

This pioneering paper describes the derivation and application of Crew Resource Management training principles to the simulation-based training of anesthesiologists, resulting in a curriculum termed Anesthesia Crisis Resource Management (ACRM). This curriculum has now been adopted at a variety of centers around the world, and has been extended to other health care domains.

Gaba DM, Fish KJ, Howard SK: Crisis Management in Anesthesiology. New York, Churchill Livingstone, 1994

The textbook about crisis management in anesthesiology, and by extension to many other health care domains. This book is required reading for participants in CRM-type training courses in health care.

Halamek LP, Kaegi DM, Gaba DM, Sowb YA, Smith BC, Smith BE, Howard SK: Time for a new paradigm in pediatric medical education: Teaching neonatal resuscitation in a simulated delivery room environment. Pediatrics 106:(4) e45 (Available On-line at <http://www.pediatrics.org/cgi/content/full/106/4/e45>)

A description of the initial experience with extending ACRM to the training of neonatologists and pediatricians regarding teamwork in neonatal resuscitation

Gaba DM, Howard SK, Fish KJ, Smith BE, Sowb YA: Simulation-based training in Anesthesia Crisis Resource Management (ACRM): a decade of experience. Simulation and Gaming: 32:175-193, 2001

This paper provides an review of ACRM and ACRM-like training, including more recent developments such as the multi-year ACRM curriculum, the “patient death scenario”, the pedagogical strategies of “Training Crews to Work in Teams”, “Combined Team Training” and assessment of performance.

Reznek M, Smith-Coggins R, Howard S, et al. Emergency Medicine Crisis Management (EMCM): Pilot study of a simulation-based crisis management course for emergency medicine. Acad Emerg Med; 2003; 10: 386-9.

This paper is the initial description of the EMCRM course. Since the initial course EMCRM has developed into a full 3-stage curriculum.

Lighthall GK, Barr J, Howard SK, Geller E, Sowb Y, Bertaccini E, Gaba D: Use of a Fully Simulated ICU Environment for Critical Event Management Training for Internal Medicine Residents. *Critical Care Medicine*, 2003, 31:2437-2443

This paper is the initial description of the ICU CRM course, Improving the Management of Patient Emergency Situations. This is a uniquely multidisciplinary simulation training program for interns (internal medicine), residents (surgery, medicine, anesthesia), critical care fellows, ICU nurses, respiratory therapists, and pharmacists.

Lighthall G, Poon T, Harrison T: Using in-situ simulation to improve in-hospital cardiopulmonary resuscitation. *Jt Comm J Qual Impro* 2010; 36: 209-216

Lighthall GK, Mayette M, Harrison TK: An institutionwide approach to redesigning management of cardiopulmonary resuscitation. *Jt Comm J Qual Patient Saf* 2013; 39: 157-66

These pioneering papers form the basis of curriculum for the Code Team Simulation Instructor Course created and taught at the VAPAHCS Simulation Center for VA SimLEARN

Also on this theme:

Holzman RS, Cooper JB, Gaba DM, Philip JH, Small S, Feinstein D: Anesthesia crisis resource management: Real-life simulation training in operating room crises. *Journal of Clinical Anesthesia* 7: 675-687, 1995

Kurrek MM, Fish KJ: Anaesthesia crisis resource management training: an intimidating concept, a rewarding experience. *Can J Anaesth* 43:430-434, 1996

Halamek LP, Howard SK, Kaegi DM, Smith BE, Smith BC, Gaba DM: The simulated delivery room as a laboratory for the study of human performance (abstract). *J Invest Med* 46:167A, 1998

Sowb Y, Howard S, Gaba DM, Bushell E, Geller E, Barr J: Subjective assessment of an ACRM-based training for hospital ICU personnel (abstract). *Anesthesia & Analgesia* 2002; 94: S-129

Reznek M, Smith-Coggins R, Howard S, Kiran K, Harter P, Sowb Y, Gaba D, Krummel T: Emergency Medicine Crisis Resource Management (EMCRM): Pilot Study of a Simulation-based Crisis Management Course for Emergency Medicine. *Acad Emerg Med* 2003; 10: 386-9

Lee SK, Pardo M, Gaba D, Sowb Y, Dicker R, Straus EM, Khaw L, Morabito D, Krummel TM, Knudson MM: Trauma assessment training with a patient simulator: a prospective, randomized study. *J Trauma* 2003; 55: 651-7

Gisoni MA, Smith-Coggins R, Harter PM, Soltysik RC, Yarnold PR: Assessment of resident professionalism using high-fidelity simulation of ethical dilemmas. *Acad Emerg Med* 2004; 11: 931-7

Harrison TK, Gaba DM: New Vistas in Patient Safety and Simulation, *Anesthesia Clinics*, Vol. 25, No. 2 (book review). *Anesth. Analg* 2008; 106: 354

Cooper JB, Blum R, Carroll JS, Dershwitz M, Feinstein DM, Gaba DM, Morey JC, Singla AK: Differences in safety climate among hospital anesthesia departments and the effect of a realistic simulation-based training program. *Anesth Analg* 2008; 106:574-84

Knudson MM, Khaw L, Bullard MK, Dicker R, Cohen MJ, Staudenmayer K, Sadjadi J, Howard S, Gaba D, Krummel T: Trauma training in simulation: translating skills from SIM time to real time. *J Trauma* 2008; 64: 255-63; discussion 263-4

Gaba DM: Crisis resource management and teamwork training in anaesthesia (editorial). Br J Anesth; 2010; 105:3-6

Gaba DM: Where do we come from? What are we? Where are we going? (editorial). *Simul Healthc*. 2011; 6:195-196.

Kardong-Edgren S, Gaba D, Dieckmann P, Cook DA: Reporting inquiry in simulation. *Simul Healthc* 6: Suppl S63-S66

Gaba DM: Adapting space science methods for describing and planning research in simulation in healthcare: science traceability and Decadal Surveys *Simul Healthc* 2012; 7:27-31

Gaba DM: Simulations that are challenging to the psyche of participants: how much should we worry, and about what? (editorial) Simul Health 2013; 8:4-7.

Weinger M, Burden A, Steadman R, Gaba D: This is not a test! Misconceptions surrounding the Maintenance of Certification in Anesthesiology Simulation Course. Anesthesiology 2014; Anesthesiology Online First (epub ahead of print), May 21, 2014, doi: 10.1097/ALN.0000000000000303

Steadman R, Burden A, Huang Y, Gaba D, Cooper J: Practice Improvements Based on Participation in a Simulation Program for the Maintenance of Certification in Anesthesiology Program. Anesthesiology (Under Revision) 2014

THEME: Realistic Simulation for Research and Training Concerning Human Performance in Health Care

Gaba DM, DeAnda A: A comprehensive anesthesia simulation environment: Re-creating the operating room for research and teaching. Anesthesiology 69:387-394, 1988

The original description of the first modern patient simulator, invented at VA/Stanford. The commercially available Eagle Patient Simulator derives from this work (and from the 2nd generation simulator also developed at VA/Stanford).

Gaba DM, DeAnda A: The response of anesthesia trainees to simulated critical incidents. Anesthesia and Analgesia 68:444-451, 1989

DeAnda A, Gaba DM: Unplanned incidents during comprehensive anesthesia simulation. Anesth Analg 71:77-82, 1990

DeAnda A, Gaba DM: The role of experience in the response to simulated critical incidents. Anesth Analg 72:308-315, 1991

The original research studies on decision making of anesthesiologists using realistic simulation.

Gaba DM, Howard SK, Flanagan B, Smith BE, Fish KJ, Botney R: Assessment of clinical performance during simulated crises using both technical and behavioral ratings. Anesthesiology 89:8-18, 1998.

A large and complex study demonstrating the feasibility (and limitations) of assessing both technical performance of anesthesiologists and their performance at the key behaviors of crisis resource management.

Gaba D: The future vision of simulation in health care. Quality and Safety in Health Care, 2004;13(Suppl 1):i2–i10.

A comprehensive look at the broad vision of simulation in health care, categorizing the diverse applications of simulation according to 11 dimensions. Discusses drivers and implementing mechanisms for various societal entities, and provides alternative retrospective histories of simulation from the viewpoint of 2025.

Fanning RM, Gaba DM: The role of debriefing in simulation-based learning. Simul Healthcare 2007; 2:115-125

A detailed review of the principles, practice, and literature on debriefing as used in simulation-based learning. Describes the history of debriefing as well as many of the key issues in its effective use.

Dieckmann P, Gaba D, Rall M: Deepening the theoretical foundations of patient simulation as social practice. Sim Healthcare 2007; 2:183–193, 2007

A major theoretical piece on the underlying foundations of simulation learning

Also on this theme:

Gaba, DM: Improving anesthesiologists' performance by simulating reality (editorial). *Anesthesiology* 76:491-494, 1992

Gaba DM: Anesthesia simulators -- a virtual reality. *American Society of Anesthesiologists Newsletter*. 57 (8):20-23, August, 1993

Botney R, Gaba DM, Howard SK, Jump B: The role of fixation error in preventing the detection and correction of a simulated volatile anesthetic overdose. *Anesthesiology* 79: A1115, 1993

Botney R, Gaba DM, Howard SK: Anesthesiologist performance during a simulated loss of pipeline oxygen. *Anesthesiology* 79: A1118, 1993

Gaba DM: Full scale anesthesia simulators in the United States. *In Anesthesia: Implications for the Coming Century*, edited by Ikeda K, Kazama T, Katoh T, Doi M, Takahashi H. Tokyo: Churchill Livingstone Japan, 1996, pp15-23.

Gaba DM: Simulators in Anesthesia. *In Advances in Anesthesia*, edited by Lake, C. St. Louis: Mosby-Year Book, Inc., Volume 14, 1996, pp 55-94.

Gaba DM: Patient simulators. *In Anesthesia Equipment*, 2nd edition, edited by Ehrenwerth J, Eisenkraft JB. St. Louis: Mosby, (In Press)

Sowb YA, Loeb RG, Smith BE, Cognitive Performance During Simulated Ventilation-Related Events, *Anesthesiology* 1997; A-943

Smith BE, Loeb RG, Gaba DM, Weinger M. Simulation in Human Factors Research: A Progress Report, Society for Technology in Anesthesia Abstract/Poster, 1998

- Devitt HJ, Kurrek MM, Cohen MM, Fish KJ, Fish MP, Murphy PM, Szalai J. Testing the raters: Inter-rater reliability during observation of anaesthesia simulator performance. *Canadian Journal of Anaesthesia* 44:924-928, 1997
- Fish MP, Flanagan B. Incorporation of a Realistic Anesthesia Simulator into an Anesthesia Clerkship. *In* *Simulators in Anesthesiology Education*, edited by Henson L, Lee A, Basford A. New York: Plenum Publishing Corporation, 1998.
- Gaba DM: Research techniques in human performance using realistic simulation, *In* *Simulators in Anesthesiology Education*, edited by Henson L, Lee A, Basford A. New York: Plenum Publishing Corporation, 1998, pp. 93-102.**
- Smith BE, Gaba DM: Simulators. *In* *Clinical Monitoring: Practical Applications for Anesthesia and Critical Care*, edited by Lake C, Blitt C, Hines R. Philadelphia: W. B. Saunders, 2001, pp. 26-44.**
- Devitt HJ, Kurrek MM, Cohen MM, Fish KJ, Fish P, Noel AG, Szalai J. Testing Internal Consistency and Construct Validity During Evaluation of Performance in an Anesthesia Simulator (submitted)
- Gaba DM: Two examples of how to evaluate the impact of new approaches to teaching (editorial). *Anesthesiology* 96:1-2, 2002
- Bushell E, Gaba DM: Anesthesia simulation and patient safety. *Problems in Anesthesia*, 13:506-514, 2001
- Gaba DM: What makes a “good” anesthesiologist? (editorial). *Anesthesiology*, 2004, 101:1061-1063.
- Gaba DM: The future’s here, we are it (editorial). *Simulation in Healthcare*, 2006, 1:1-2.
- Dutta S, Gaba D, Krummel T: To simulate or not to simulate: what is the question? (editorial). 2006; 243:301-303.**
- Dismukes RK, Gaba DM, Howard SK: So many roads: facilitated debriefing in healthcare (editorial). *Simulation in Healthcare*; 2006, 1:23-25.**
- Gaba DM: What Does Simulation Add to Teamwork Training? AHRQ WebM&M [serial online]. March, 2006. Available at: <http://webmm.ahrq.gov/perspective.aspx?perspectiveID=20> . Accessed March 15, 2006.**
- Gaba DM: What's In a Name? A Mannequin by Any Other Name Would Work As Well.[Editorial] *Simulation in Healthcare*; 2006, 1:64-65
- Harrison TK, Manser T, Howard SK, Gaba DM: Use of cognitive aids in a simulated anesthetic crisis. *Anesth Analg* 2006; 103: 551-6**
- Lighthall GK, Barr J: The use of clinical simulation systems to train critical care physicians. *J Intensive Care Med*. 2007; 22:257-69.**
- Ottestad E, Boulet JR, Lighthall GK: Evaluating the management of septic shock using patient simulation. *Crit Care Med*. 2007; 35:769-75
- Glavin RJ, Gaba DM: Challenges and opportunities in simulation and assessment (editorial). *Simul Healthc*; 2008, 69-71
- Fann JI, Caffarelli A, Georgette G, Howard SK, Gaba DM, Youngblood P, Mitchell RS, Burdon TA: Improvement in Coronary Anastomosis with Cardiac Surgery Simulation. *J Thor Cardiovasc Surg*; 2008, 136:1486-1491
- Rall M, Gaba DM: Patient simulators. *In* *Anesthesia, 7th edition*, edited by Miller RD. New York: Churchill Livingstone, 2009.**
- Gaba DM, Dunn WF: Procedural risks in thoracentesis: Process, progress, and proficiency (editorial). *Chest*; 2009, 135:1120-1123
- Gaba DM: Do as we say, not as you do: Using simulation to investigate clinical behavior in action (editorial). *Simul Healthc*; 2009, 4:67-69**
- Gaba DM: The pharmaceutical analogy for simulation: a policy perspective (editorial). *Simul Healthc*. 2010; 5:5-7**

Gaba DM: Training and nontechnical skills: the politics of terminology (editorial). *Simul Healthc*. 2011; 6:8-10

Mudumbai SC, Gaba DM, Boulet J, Howard SK, Davies MF Feasibility of an internet-based global ranking instrument. *J Grad Med Educ* 2011; 3:67-74.

Mudumbai SC, Gaba DM, Boulet JR, Howard SK, Davies MF: External validation of simulation-based assessments with other performance measures of third-year anesthesiology residents. *Simul Healthc* 2012; 7:73-80

THEME: Effects of Sleep Deprivation and Fatigue on Health Care Personnel

Howard SK, Gaba DM: Human Performance and Patient Safety. In Patient Safety in Anesthetic Practice, edited by Morrell R, Eichhorn J. New York: Churchill Livingstone, 1997, pp. 431-466

This chapter is largely about sleep deprivation and fatigue issues, reviewing the literature on the topic, discussing findings from our laboratory, and suggesting avenues of approach for countermeasures

*Howard SK, Gaba DM, Rosekind MR, Zarcone VP: Excessive Daytime Sleepiness In Resident Physicians: Risks, Intervention, And Implications. *Acad Med* 77:1019-1025, 2002*

This paper provides the first scientific documentation of the magnitude of sleep debt in health care personnel, showing that both in the baseline and post-call state the physicians had levels of daytime sleepiness at or worse than that of patients with narcolepsy or sleep apnea.

*Gaba DM, Howard SK: Fatigue among clinicians and the safety of patients. *New Engl J Med* 347:1249-1255, 2002*

This is a major policy review of fatigue and safety in health care compared to other high hazard industries.

*Howard SK, Rosekind MR, Katz JD, Berry AJ. Fatigue in Anesthesia: Implications and Strategies for Patient and Provider Safety. *Anesthesiology* 97:1281-94, 2002*

This paper is a major scientific review of circadian and sleep physiology, performance issues, policies and countermeasures related to anesthesiology.

*Howard SK, Gaba DM, Smith BE, Weinger MB, Herndon C, Keshavacharya S, Rosekind MR: Simulation study of rested versus sleep deprived anesthesiologists. *Anesthesiology*,98:1345-1355 2003*

This paper describes a complex simulation-based study of performance of anesthesiology trainees in managing a long simulated case both when highly fatigued and when highly rested. The complicated set of results highlight the difficulties of measuring clinical performance, and the nature of fatigue-induced performance variability. A key lesson is that fatigue degrades many sorts of performance only modestly until subjects are asleep at which point their performance is zero.

Also on this theme:

Howard SK, Smith BE, Gaba DM, Rosekind MR: Performance of well-rested vs. highly-fatigued residents: A simulator study (abstract). *Anesthesiology* 1997; 87:A:981

Howard SK, Healzer JM, Gaba DM: Sleep and work schedules of anesthesia residents: A national survey (abstract). *Anesthesiology* 1997; 87:A932.

Howard S, Keshavacharya S, Smith B, Rosekind M, Weinger M, Gaba D: Behavioral evidence of fatigue during a simulator experiment (abstract). *Anesthesiology* 1998; 89: A1236

Herndon CN, Weinger MB, Smith BE, Howard SK, Rosekind MR, Gaba DM: Use of task analysis to evaluate the effects of fatigue on performance during simulated anesthesia cases (abstract). *Anesthesiology* 1998; 89: A1180

Smith-Coggins R, Rosekind MR, Hurd S, Buccino KR. Relationship of day versus night sleep to physician performance and mood. *Annals of Emergency Medicine* 1994; 24:928-34.

Smith-Coggins R, Rosekind MR, Buccino KR, Dinges DF, Moser RP. Rotating shiftwork schedules: can we enhance physician adaptation to night shifts. *Acad Emerg Med* 1997; 4:951-61.

Howard SK, Rosekind MR, Katz JD, Berry AJ. Fatigue in anesthesia: implications and strategies for patient and provider safety. *Anesthesiology*. 2002; 97:1281-94

THEME: Safety Culture/Climate and Risk Analysis of Safety in Health Care

Gaba DM, Howard SK, Jump B: Production pressure in the work environment: California anesthesiologists' attitudes and experiences. Anesthesiology 81:488-500, 1994

A ground-breaking study demonstrating the prevalence of pressures to cut corners and to favor throughput and production over safety in anesthesiology.

Singer SJ, Gaba DM, Geppert JJ, Sinaiko AA, Howard SK, Park KC. The Culture of Safety: Results from an Organization-wide Survey in 15 California Hospitals. Quality and Safety in Health Care; 2003; 12: 112-118.

This paper gives initial data from a rigorous implementation of a new survey on safety culture and climate synthesized from several previous instruments. The survey is unique in several ways: it deals with a broad set of safety climate issues; it is administered to all health care workers in the hospital, but also targets senior management & physicians; it used a rigorous sampling with tracking of non-responders; it was conducted at multiple institutions of different types.

Gaba DM, Singer S, Sinaiko A, Bowen J, Ciavarelli A: Differences in safety climate between hospital personnel and naval aviators. Human Factors; 2003, 45:173-185

This is another ground-breaking paper comparing the responses of health care workers to those of naval aviators to matched questions concerning safety climate. On average the health care respondents had a 3-fold greater “problematic

response” (answers suggesting an absence of antithesis of a safety climate) compared to naval aviators.

NOTE: A similar paper with new data but similar results is: *Singer SJ, Rosen A, Zhao S, Ciavarelli AP, Gaba DM: Comparing safety climate in naval aviation and hospitals: implications for improving patient safety. Health Care Manage Rev; 2010; 35:134-146.*

Singer S, Meterko M, Baker L, Gaba D, Falwell A, Rosen A: Workforce Perceptions of Hospital Safety Culture: Development and Validation of the Patient Safety Climate in Healthcare Organizations Survey. Health Serv Resch 42:1999-2021, 2007

Data on safety culture from 92 hospitals throughout the US

Also on this theme:

Paté-Cornell ME, Murphy DL, Lakats LM, Gaba DM: Patient risk in anesthesia: Probabilistic risk analysis and management improvements. *Annals of Operations Research* 67: 211-233, 1996

Pate-Cornell ME, Lakats LM, Murphy DM, Gaba DM: Anesthesia patient risk: a quantitative approach to organizational factors and risk management options. *Risk Anal* 17:511-523, 1997.

Singer SJ, Dunham KM, Bowen JD, Geppert JJ, Gaba DM, McDonald KM, Baker LC. Lessons from a California Hospital Consortium About Safety Climate and Safety Practices. In: Henriksen K, Battles JB, Lewin DI, Marks E, editors. *Advances in patient safety: From research to implementation*. AHRQ Publication No. 05-0021-3 (Vol. 3, Implementation Issues). Rockville, MD: Agency for Healthcare Research and Quality; February, 2005. Available online at: <http://www.ahrq.gov/qual/advances/>

Gaba DM, Singer SJ, Rosen, AK: Safety culture: Is the “unit” the right “unit of analysis”? (editorial) *Crit Care Med* 2007; 35:314-315

Singer S, Meterko M, Baker L, Gaba D, Falwell A, Rosen A: Workforce Perceptions of Hospital Safety Culture: Development and Validation of the Patient Safety Climate in Healthcare Organizations Survey. *Health Serv Resch* 2007; 42:1999-2021

Cooper JB, Blum R, Carroll JS, Dershwitz M, Feinstein DM, Gaba DM, Morey JC, Singla AK: Differences in safety climate among hospital anesthesia departments and the effect of a realistic simulation-based training program. *Anesth Analg* 2008; 106:574-84

Rosen A, Gaba DM, Meterko M, Singer S, Shokeen P, Zhao S, Labonte A, Falwell A, “Recruitment of Hospitals for a Safety Climate Study: Facilitators and Barriers, Joint Commission J on Qual and Pt Safety 2008; 34:275-284

Hartmann CW, Rosen AK, Meterko M, Shokeen P, Zhao S, Singer S, Falwell A, Gaba DM: An Overview of Patient Safety Climate in the VA. *Health Serv Res* 2008; 43:1263-1284

Singer S, Rathgeb T, Falwell A, Gaba DM, Baker L: Patient safety climate in US hospitals: Variation by management level. *Med Care*; 2008; 46:1149-1156

Singer SJ, Gaba DM, Falwell A, Lin S, Hayes J, Baker L: Patient safety climate in 92 US hospitals: differences by work area and discipline. *Med Care*. 2009 47(1):23-31.

Singer S, Lin S, Falwell A, Gaba D, Baker L: Relationship of safety climate and safety performance in hospitals. *Health Serv Res*; 2009, 44:399-421

Kaafarani HM, Itani KM, Rosen AK, Zhao S, Hartmann CW, Gaba DM: How does patient safety culture in the operating room and post-anesthesia care unit compare to the rest of the hospital? *Am J Surg*; 2009, in press (Epub ahead of print, 6 March, 2009)

- Hartmann CW, Meterko M, Rosen AK, Zhao S, Shokeen P, Singer S, Gaba DM Relationship of Hospital Organizational Culture to Patient Safety Climate in the Veterans Health Administration. *Med Care Res Rev*; 2009, 66:320-338
- Singer SJ, Falwell A, Gaba D, Meterko M, Rosen A, Hartmann CW, Baker L: Identifying organizational cultures that promote patient safety. *Health Care Mgmt Rev*: 2009, in press
- Singer SJ, Hartmann, CW, Hanchate A, Zhao S, Meterko M, Shokeen P, Lin S, Gaba D, Rosen AK, "Comparing safety climate between two populations of hospitals in the US." *Health Services Research*; 2009, *Health Serv Res*. 44;1563-83
- Singer SJ, Falwell A, Gaba D, Meterko M, Rosen A, Hartmann CW, Baker L: Identifying organizational cultures that promote patient safety. *Health Care Mgmt Rev*: 2009; 34:300-311
- Rosen AK, Singer S, Zhao S, Shokeen P, Meterko M, Gaba D. Hospital safety climate and safety outcomes: Is there a relationship in the VA? *Med Care Res Rev*. 2010; 67:590-608
- Rosen AK, Singer S, Zhao S, Shokeen P, Meterko M, Gaba D. Hospital safety climate and safety outcomes: Is there a relationship in the VA? *Med Care Res Rev*. 2010; 67:590-608
- Singer SJ, Rosen A, Zhao S, Ciavarelli AP, Gaba DM: Comparing safety climate in naval aviation and hospitals: implications for improving patient safety. *Health Care Manage Rev*; 2010; 35:134-146**

THEME: Human Factors, Psychology, and Patient Safety

Gaba DM, Lee T: Measuring the workload of the anesthesiologist. *Anesthesia and Analgesia* 71:354-361, 1990

The original study applying standard human factors techniques to measure mental workload to anesthesiologists during actual clinical care. This was the forerunner of many studies listed below.

Sowb YA, Howard SK, Raemer DB, Feinstein D, Fish KJ, Gaba DM: Clinicians' recognition of the Ohmeda Modulus II Plus and Ohmeda Excel 210 SE Anesthesia Machine System Mode and Function. *Simulation in Healthcare*; 2006, 1:26-31.

Also on this theme:

Sowb YA, Loeb RG. Cognitive analysis of intra-operative critical events: A problem-driven approach to aiding clinicians performance. *Journal of Cognition, Technology, and Works* 4:107-119, 2002.

Blike GT, Cravero J, Sowb YA, Lancaster J, Whalen K. A semi-quantitative method for evaluating the efficacy and safety of pediatric sedation. *Pediatrics* 2002; SUBMITTED.

Sowb YA, Loeb RG, Smith BE. Clinicians' Management of Patient's Inspired Oxygen Concentration (FIO₂). *Anesthesia & Analgesia* 2002; SUBMITTED.

Weinger MB, Herndon OW, Zornow MH, Paulus MP, Gaba DM, Dallen LT: An objective methodology for task analysis and workload assessment in anesthesia providers. *Anesthesiology* 80:77-92, 1994

Botney R, Gaba DM: Human factors in monitoring. In *Monitoring in Anesthesia and Critical Care*, 3rd edition, edited by Blitt CD, Hines RL. New York: Churchill Livingstone, 1994, pp. 23-54.

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