

June 27, 2012

Richard J. Umbdenstock President and Chief Executive Officer American Hospital Association Liberty Place, Suite 700 325 Seventh Street, NW Washington, DC 20004-2802

Dear Mr. Umbdenstock:

I appreciate your letter and your thorough review of Leapfrog's new initiative, the Hospital Safety Score. Your comments will be helpful to the Blue Ribbon Expert Panel on the Hospital Safety Score and the Leapfrog Board of Directors as we move forward with the next round of Hospital Safety Scores to be issued in November.

Before I address your comments, I'd like to make one point of clarification. Although your letter is entitled "Comments on the Leapfrog Hospital Survey," based on the substance of your comments I believe your letter actually addresses the Hospital Safety Score. The Hospital Safety Score is a different initiative from the Leapfrog Hospital Survey, in which we have assigned letter grades assessing the safety of general hospitals in the United States. My response below concerns the Hospital Safety Score.

The purpose of the Hospital Safety Score is to give healthcare consumers information they can use to identify the safest hospitals in their community. We hope consumers will use the score as one source of information among others in choosing a hospital, and as a platform for important conversations with their doctor and other clinicians about improving patient safety in the hospitals in their community.

Although the main purpose of the Hospital Safety Score is to engage consumers, we also aim to work constructively with hospital leaders to improve the safety of hospitals nationwide, so I appreciate the engagement and thoughts of the American Hospital Association as reflected in your letter. We have been pleased with the general response from individual hospitals that received Hospital Safety Scores. Obviously, hospitals that earned an "A" have been gratified as this score highlights their safety achievements nationally and in their communities. However, the responses from hospital that earned grades below an "A," have been equally impressive. We have received over a hundred calls from hospital leaders who want to talk about t how they can improve their Hospital Safety Score. The commitment and courage of these hospital leaders has been inspiring to all of us on the Leapfrog Board of Directors and staff.

With that clarification, below I briefly address each of your comments on the methodology in turn.

## Concern: The Hospital Safety Score is biased toward hospitals that voluntarily report to the Leapfrog Hospital Survey.

If data for one of the measures on the Leapfrog Hospital Survey was not available for an individual hospital, those measures were not included when calculating that hospital's score. The Hospital Safety Score scoring methodology was developed under the guidance of an unbiased panel of the nation's foremost patient safety experts. These experts volunteered their time over nine months to recommend to Leapfrog the measures and scoring principles used in the Hospital Safety Score. When the file scoring methodology was applied to the source data, 146 hospitals that did not report to the Leapfrog Hospital Survey were among those earning an "A." Furthermore, hospitals that did complete a Leapfrog Hospital Survey appear in all grade categories, from highest to lowest.

Specifically, you criticized the Hospital Safety Score's weighting of AHA Annual Survey data related to the presence of computerized provider order-entry (CPOE) systems and intensivists in the intensive care unit (ICU). The information that hospitals report to AHA for both CPOE and ICU Staffing is far less information than what is required of hospitals that report to the Leapfrog Hospital Survey. For example, in the case of CPOE, in order to earn full-credit towards Leapfrog's CPOE standard, hospitals not only have to demonstrate a high level of adoption, but also take a 6-hour simulation test to prove their system works safely (i.e. properly alerts prescribers to medication errors).

Nonetheless, hospitals that reported to AHA through the Annual Survey they were "fully implemented" for CPOE earned a positive z-score score for that measure, and that positive z-score was applied to the measure weight. If that hospital's performance on other measures included in the score was average or above average, the hospital could have earned an "A." It seems your criticism is a misreading of the use of AHA Annual Survey data in the scoring algorithm. Because there are 26 measures included in the Hospital Safety Score, the impact of a single measure may be difficult to interpret. Our staff would be glad to brief your staff on the details of the scoring methodology.

I've attached a bibliography that explores some of the evidence around Leapfrog's CPOE and ICU Physician Staffing standards. I encourage AHA to consider revising the Annual Survey to reflect a higher standard for these two areas. We would also encourage you to publicly report information from the AHA Annual Survey by hospital. We would be glad to work with you to accomplish this.

#### Concern: One hospital was unfairly graded as "C"

Your letter calls out one hospital as an example of a "C" hospital you believe should have earned a higher grade because of the information it provided through the AHA Annual Survey on regarding CPOE and ICU Physician Staffing. I hesitate to respond in detail about that one hospital, because Leapfrog has been careful to avoid pointing fingers at individual hospitals. So rather than provide a detailed analysis here of that hospital's score, I will note that hospital's score was enhanced by their CPOE score, but hurt by its lower than average adherence to surgical care guidelines, rates of hospital-acquired conditions, and lower than average performance on other measures included in the Hospital Safety Score. We

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would be glad to review this hospital's scores and findings by phone. The score details are also available for each hospital at www.HospitalSafetyScore.org.

### Concern: The Hospital Safety Score incorporates data that is self-reported and not sufficiently validated.

The Blue Ribbon Expert Panel chose to include some of the measures on the Leapfrog Hospital Survey in the Hospital Safety Score. Like all other measures in the score, these were weighted according to strength of evidence, opportunity for improvement, and impact to the patient. (Leapfrog data is only used in the Hospital Safety Score for hospitals that voluntarily reported to the Leapfrog Hospital Survey in 2011). Leapfrog's Hospital Survey is as reliable and documented a data collection and public reporting tool as any health data collection effort in the United States short of a full-scale accreditation process. As part of Leapfrog's data collection process an intensive review of all submitted surveys is performed annually.

# Concern: Leapfrog should not have assigned weight to the Hospital-Acquired Conditions measures reported by CMS.

The HAC measures are an important indication of hospital safety. The measures were considered carefully by the Blue Ribbon Expert Panel and not all of the HAC measures were included in the Hospital Safety Score. Those that did make the cut had strong evidence behind them, ample opportunity for hospital improvement, and tremendous impact to the patient. If these measures are retired in the future, or if the Blue Ribbon Expert Panel reconsiders their value to consumers, they will be removed from subsequent editions of the Hospital Safety Score. Currently, Leapfrog and the Blue Ribbon Expert Panel believe these measures provide useful information to consumers.

## Concern: Too much weight is assigned to CMS measures when other measures are missing. For instance, half of a hospital's grade could be calculated on just 5 process measures

Your analysis is incorrect, and I invite you and your staff to revisit Leapfrog's document on the scoring methodology which we sent to you prior to the public release of the Hospital Safety Score. It is available to the public at www.HospitalSafetyScore.org. Your chart details a scenario for scoring that is not possible in the methodology. There was a minimum threshold for the number of measures Leapfrog required in order to issue a score for a hospital, and your chart details scenarios that would not qualify for scoring. Indeed, hundreds of hospitals did not meet that threshold this year and were not scored. We would urge those hospitals to be more transparent in the future.

#### Concern: There are errors in the data and Leapfrog manipulated data.

With regard to making errors: we freely admit human error. Any organization that takes part in data collection and calculation has to anticipate that errors will inevitably arise, and we have done so with the highest standards of integrity and transparency. Indeed, that is why we sent all 2600+ hospitals a copy of the source data used in calculating their score, as well as the scoring methodology, five weeks prior to making the score public. We have corrected the handful of errors reported to us, but the vast majority of what we have reported has been substantiated and stands as originally reported. For the

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hospitals that were not scored (as mentioned above) this was typically because they did not provide enough publicly available data to meet our criteria for issuing a score.

With regard to the idea that Leapfrog deliberately manipulated data: this is a very serious charge for you to make without offering a single example to support it. We will launch a full investigation of any such example should you find one. You can also investigate this for yourself, as Leapfrog is transparent and makes 100% of the data used to calculate each hospitals safety score available to the public at HospitalSafetyScore.org.

The fact AHA would level this charge against Leapfrog, which has an unrivaled record for integrity and a panel of experts and advisors second to none, suggests you are expressing something beyond sincere concerns about the methodology. So to be clear on the issue of "manipulation of data": disappointing though many of these grades may be to many of your member hospitals, Leapfrog, along with our expert advisors, members, advocates, and supporters, did not make these scores up. The Hospital Safety Score grades reflect real problems threatening the lives of people who depend on America's hospitals. We urge you to address those problems quickly.

Once again, I appreciate your comments. We are sharing them with the Blue Ribbon Expert Panel for their further deliberations and guidance prior to releasing the new Hospital Safety Score in November. Any further comments are most welcome, and we are as always interested in meeting with your staff or members.

I know AHA has demonstrated a strong commitment toward advancing patient safety. We believe many of the positive results reflected in Hospital Safety Scores are directly related to this work, and that translates into lives saved. We truly commend you for this leadership. We look forward to your continued leadership to improve the transparency of patient safety data, and to make progress in patient safety and quality in our hospitals.

Sincerely,

halfBride

Leah Binder

Enclosure CC: Leapfrog Board of Directors, Blue Ribbon Expert Panel, Leapfrog Members

### **Bibliography: Computer Physician Order Entry** (CPOE)

- 1. Metzger JB, Welebob E, Bates DW, Lipsitz S, Classen DC. Mixed results in the safety performance of computerized physician order entry. *Health Affairs*. 2010; 29(4): 1-9.
- 2. Metzger JB, Welebob E, Turisco F, Classen DC. Effective Use of Medication-Related Decision Support in CPOE. *Patient Safety and Quality Healthcare.* 2008 Sep/Oct: 16-24.
- 3. Metzger JB, Welebob E, Turisco F, Classen DC. The Leapfrog Group's CPOE Standard and Evaluation Tool. *Patient Safety and Quality Healthcare.* 2008 Jul/Aug: 22-25.
- 4. Adams M, Bates D, Coffman G, Everett W. Saving Lives, Saving Money: The Imperative for Computerized Physician Order Entry in Massachusetts Hospitals. U.S.A.: Massachusetts Technology Collaborative and New England Healthcare Institute; 2008.
- 5. Shamliyan TA, Duval S, Du J, Kane RL. Just what the doctor ordered. Review of the evidence of the impact of a computerized physician order system on medication errors. *Health Serv Res.* 2008 Feb; 43(1):32-53.
- Lin CP, Payne TH, Nichol, WP, Hoey PJ, Anderson CL, Gennari JH. Evaluating clinical decision support systems: Monitoring CPOE order check override rates in the Department of Veterans Affairs' Computerized Patient Order System. *JAMIA*. 2008; 15:620-626.
- Holdsworth MT, Fichtl RE, Raisch DW, Hewryk A, Behta M, Mendez-Rico E, Wong CL, Cohen J, Bostwick S, Greenwald BM. Impact of computerized prescriber order entry on the incidence of adverse drug events in pediatric patients. *Pediatrics*. 2007 Nov; 120(5):1058-66.
- 8. Classen DC, Avery AJ, Bates DW. Evaluation and Certification of Computerized Provider Order Entry Systems. *J Am Med Inform Assoc.* 2007; 14:48-55.
- Kuperman GJ, Bobb, A, Payne TH et al. Medication-related Clinical Decision Support in Computerized Provider Order Entry Systems: A Review. J Am Med Inform Assoc. 2007; 14(1):29-40. Epub 2006 Oct 26
- Del Baccaro MA, Jeffries HE, Eisenberg MA, Harry ED. Computerized provider order entry implementation: No association with increased mortality rates in an intensive care unit. *Pediatrics* 2006, 118(1): 290-295.
- 11. Kelly WN, Rucker TD. Compelling features of a safe medication-use system. *Am J Health Syst Pharm.* 2006 Aug 1;63(15):1461-8
- 12. Kilbridge PM, Welebob EM, Classen DC. Development of the Leapfrog methodology for evaluating hospital implemented inpatient computerized physician order entry systems. *Qual Saf Health Care.* 2006 Apr;15(2):81-4
- Van der Sijs H, Aarts J, Vulto A, Berg M. Overriding of drug safety alerts in computerized physician order entry. J Am Med Inform Assoc. 2006 Mar-Apr;13(2):138-47. Epub 2005 Dec 15

- Shah NR, Seger AC, Seger DL et al. Improving acceptance of computerized prescribing alerts in ambulatory care. J Am Med Inform Assoc. 2006 Jan-Feb;13(1):5-11. Epub 2005 Oct 12.
- Galanter WL, Polikaitis A, DiDomenico RJ. A trial of automated safety alerts for inpatient digoxin use with computerized physician order entry. J Am Med Inform Assoc. 2004 Jul-Aug;11(4):270-7. Epub 2004 Apr 2.
- 16. Potts AL, Barr FE, Gregory DF, Wright L, Patel, NR. Computerized physician order entry and medication errors in a pediatric critical care unit. *Pediatrics* 2004; 113(1):59-63
- 17. Birkmeyer JD, Dimick JB. Leapfrog safety standards: potential benefits of universal adoption. The Leapfrog group. Washington, DC: 2004.
- King WJ, Paice N, Rangrej J et al. The effect of computerized physician order entry on medication errors and adverse drug events in pediatric inpatients. *Pediatrics*. 2003 Sep;112(3 Pt 1):506-9.
- 19. Kaushal R, Shojania KG, Bates DW. Effects of computerized physician order entry and clinical decision support systems on medication safety: a systematic review. *Archives of Internal Medicine*. 2003;163:1409-1416.
- 20. Birkmeyer CM, Lee J, Bates DW, Birkmeyer JD. Will electronic order entry reduce health care costs? *Effective Clinical Practice*. 2002;5: 67-74.
- Mekhijan HS, Kumar RR, Kuehr L et al. Immediate benefits realized following implementation of physician order entry at an academic medical center. J Am Med Inform Assoc, 2002; Sept-Oct; 9(5) 529-39.
- 22. Agency for Healthcare Research and Quality. HCUPnet, Healthcare Cost and Utilization Project. Rockville, MD; 2001.
- 23. Chertow GM, Lee J, Kuperman GJ, Burdick E, Horsky J, Seger DL, Lee R, Mekala A, Song J, Komaroff AL, Bates DW. Guided medication dosing for inpatients with renal insufficiency. *Journal of the American Medical Association*. 2001; 286:2839-2944.
- Pedersen CA, Schnieder PJ, Santell JP. ASHP national survey of pharmacy practice in hospital settings: prescribing and transcribing – 2001. *American Journal of Health Systems Pharmacy*. 2001; 58:2251-2266.
- Bates DW, Teich JM, Merchia PR, Schmiz BS, Kuperman GJ, Spurr CD. Effects of Computerized Physician Order Entry on Prescribing Practices. Archives of Internal Medicine. 2000; 160: 2741-2747.
- Teich JM, Merchia PR, Schmiz JL, Kuperman GJ, Spurr CD, Bates DW. Effects of computerized physician order entry on prescribing practices. *Archives of Internal Medicine*. 2000;160:2741-2747.
- Bates DW, Teich JM, Lee J, Seger D, Kuperman GJ, Ma'Luf N, Boyle D, Leape L. The impact of computerized physician order entry on medication error prevention. Journal of the American Medical Informatics Association. 1999; 6:313-21.
- Kohn, LT, Corrigan JM, Donaldon MS (eds): To Err is Human: Building a Safer Health System: a report from the Committee on Quality of Healthcare in America, Institute of Medicine, National Academy of Sciences. National Academy Press, Washington, DC, 1999.

- 29. Ash JS, Gorman PN, Hersh WR. Physicians order entry in U.S. hospitals. *Proceedings/AMIA Annual Symposium.* 1998; 235-9.
- 30. Bates DW, Leape L, Cullen DJ, et al. Effect of computerized physician order entry and a team intervention on prevention of serious medication errors. JAMA. 1998; 280:1311-16.
- Bates DW. Drugs and adverse drug reactions: how worried should we be? (Editorial). JAMA. 1998; 279:1216-1222.
- 32. Evans RS, Pestotnik SL, Classen DC, et al. A computer-assisted management program for anti-biotics and other antiinfective agents. N Engl J Med. 1998; 338:232-238.
- Bates DW, Spell N, Cullen DJ, et al. The costs of adverse drug events in hospitalized patients. JAMA. 1997; 277:307-311.
- Classen DC, Pestotnik SL, Evans RS, Lloyd JF, Burke JP. Adverse drug events in hospitalized patients: excess length of stay, extra costs, and attributable mortality. JAMA. 1997; 277:301-306.
- Overhage JM, Tierney WM, Zhou XH, McDonald CJ. A randomized trial of "corollary orders" to prevent errors of omission. *Journal of the American Medical Informatics Association.* 1997;4:346-375.
- Glaser J, Teich JM, Kuperman G. Impact of information events on medical care. In: Proceedings and abstracts of the 1996 Healthcare Information and Management Systems Society Annual Conference. February 6, 1996; Atlanta, GA, Ill. Pages 1-9.
- 37. Paterno M, Teich JM, Seger DL, Bates DW. A practical method for presenting drug interactions to clinicians. Proc AMIA Annu Fall Symp. 1996; 20:872.
- 38. Bates DW, Cullen D, Laird N, et al. Incidence of adverse drug events and potential adverse drug events. JAMA. 1995; 274:29-34.
- 39. Johnson JA, Bootman HL. Drug-related morbidity and mortality: a cost-of-illness model. Arch Intern Med. 1995; 155:1949-1956.
- 40. Leape LL, Bates DW, Cullen DJ, et al. Systems analysis of adverse drug events. JAMA. 1995; 274: 35-43.
- 41. Bates DW, O'Neil AC, Boyle D, et al. Potential identifiability and preventability of adverse events using information systems. J Am Med Assoc. 1994; 1:404-411.
- 42. Evans RS, Pestotnik SL, Classen DC, Horn SD, Bass SB, Burke JPP. Preventing adverse drug events in hospitalized patients. Ann Pharmacother. 1994; 28:523-527.
- Sittig DF, Stead WW. Computer-based physician order entry: the state of the art. J Am Med Inform Assoc. 1994; 1:108-123.
- 44. Bates DW, Leape LL, Petrycki S. Incidence and preventability of adverse drug events in hospitalized adults. J Gen Intern Med. 1993; 8:289-294.
- 45. Massaro TA. Introducing physician order entry at a major academic medical center. Acad Med. 1993; 68:20-25.

- 46. Tiech JM, Spurr CD, Flammini SH, et al. Response to a trial of physician based inpatient order entry. Proc Annu Symp Comput Appl Med Care. 1993; 17:316-320.
- 47. Tierney WM, Miller ME, Overhage JM, McDonald CH. Physician inpatient order writing on microcomputer workstations. JAMA. 1993; 269:379-383.
- Teich JM, Hurley JF, Beckley RF, Aranow M. Design of an easy-to-use physician order entry system with support for nursing and ancillary departments. Proc Annu Symp Comput Appl Med Care. 1992; 16:99-103.
- 49. Brown GC. Medication errors: a case study. Hospitals. 1979; 53:61-2, 65.

#### Bibliography: ICU Physician Staffing (IPS)

- 1. Sapirstein A., Needham DM, Pronovost, PJ. 24-hour intensivist staffing: Balancing benefits and costs. *Critical Care Medicine*, 2008. Vol 36 (1):367-368.
- Pronovost PJ, Holzmueller CG, Clattenburg L, Berenholtz S, Martinez EA, Paz JR, Needham DM. Team care: beyond open and closed intensive care units. *Curr Opin Crit Care*. 2006; 12: 604-608.
- Pronovost PJ, Needham DM, Waters H, Birkmeyer CM, Calinawan JR, Birkmeyer JD, Dorman T. Intensive care unit phylician staffing: Financial modeling of the Leapfrog standard. *Critical Care Medicine*, 2004. June 32(6): 1247-1253.
- 4. Birkmeyer JD, Dimick JB. Leapfrog safety standards: potential benefits of universal adoption. The Leapfrog Group. Washington, DC: February 2004.
- Breslow MJ, Rosenfeld BA; Doerfler M; Burke G; Yates G; Stone DJ.; Tomaszewicz P; Hochman R; Plocher DW. Effect of a multiple site intensive care unit telemedicine program on clinical and economic outcomes: An alternativ paradigm for intensivist staffing. *Critical Care Medicine*. 2004. January 32(1):31-38.
- 6. Rockeymoore MB, Holzmueller CG, Milstein A, Dorman T, Pronovost PJ. Updating the leapfrog group intensive care unit physician staffing standard. *J Clin Outcomes Manage*. 2003: Jan10; (1):31-37.
- Pronovost PJ, Angus DC, Dorman T, Robinson KA, Dremsizov TT, and Young TL. Physician Staffing Patterns and Clinical Outcomes in Critically III Patients: A Systematic Review, *JAMA*, 2002; 288: 2151-2162.
- 8. Agency for Healthcare Research and Quality. HCUPnet, Healthcare Cost and Utilization Project. Rockville, MD; 2001.
- 9. Baldock G, Foley P, Brett S. The impact of organizational change on outcome in an intensive care unit in the United Kingdom. *Intensive Care Medicine*. 2001; 27:865-872.
- 10. Birkmeyer JD, Birkmeyer CM, Skinner JS. Economic implications of the Leapfrog Safety Standards. The Leapfrog Group, Washington, DC. 2001.
- 11. Dimick JB, Pronovost PJ, Heitmiller RF, Lipsett PA. Intensive care unit physician staffing is associated with decreased length of stay, hospital cost, and complications after esophageal resection. *Crit Care Medicine*. 2001; 29: 753-758.

- 12. Goh AY, Lum LC, Abdel-Latif ME. Impact of 24 hour critical care physician staffing on case-mix adjusted mortality in pediatric intensive care. *The Lancet 2001*; 357:445-446.
- 13. Agnus DC, Kelly M, Schmitz R, White A, Popovich J. Current and projected workforce requirements for care of the critically ill and patients with pulmonary disease: can we meet the requirements of an aging population? *JAMA*. 2000; 284:2762-2770.
- 14. Blunt MC, Burchett KR. Out-of-hours consultant cover and case-mix-adjusted mortality in intensivist care. *Lancet.* 2000; 356:735-736.
- 15. Birkmeyer JD, Birkmeyer CM, Wennberg, DE, Young MP. Leapfrog safety standards: potential benefits of universal adoption. The Leapfrog Group. Washington, DC: 2000.
- Dimick JB, Pronovost PJ, Lipsett PA. The effect of ICU physician staffing and hospital volume on outcomes after hepatic resection [abstract]. *Critical Care medicine.* 2000; 28:A77.
- 17. Rosenfeld BA, Dorman T, Breslow MJ, et al. Intensive care unit telemedicine: alternate paradigm for providing continuous intensivist care. *Critical Care Medicine*. 2000; 28:3925-3931.
- 18. Ghorra S, Reinert S, Cioffi W, Buczko G, Simms HH. Analysis of the effect of conversion from open to closed Surgical Intensive Care Unit. *Ann Surgery*. 1999; 229(2):163-171.
- Hanson CW, Deutschman CS, Anderson HL, et al. Effects of an organized critical care service on outcomes and resource utilization: A cohort study. *Critical Care Medicine*. 1999; 27:270-274.
- Pronovost P, Jenckes MW, Dorman T, et al. Organizational characteristics of intensive care units related to outcomes of abdominal aortic surgery. *JAMA*. 1999; 281(14):1310-1317.
- Pronovost PJ, Young T, Dorman T, Robinson K, Agnus DC. Association between ICU physician staffing and outcomes: a systematic review. *Critical Care Medicine.* 1999; 27:A43.
- 22. Multz AS, Chalfin DB, Samson IM, et al. A "closed" medical intensive care unit (MICU) improves resource utilization when compared with an "open" MICU. *Am J Respir Crit Care Med.* 1998; 157:1468-73.
- 23. Pollack MM, Cuerdon TC, Getson PR. Pediatric intensive care units: results of a national survey. *Critical Care Medicine*. 1998; 26:1317-26.
- 24. Zimmerman JE, Wagner DP, Draper EA, Wright L, Alzola C, Knaus WA. Evaluation of acute physiology and chronic health evaluation III predictions of hospital mortality in an independent database. *Crit Care Med.* 1998; 26:1317-26.
- 25. Manthous CA, Amoateng-Adjepong Y, Al-Kharrat T, et al. Effects of a Medical Intensivist on patient care in a community teaching hospital. Mayo Clin Proc. 1997; 72:391-399.
- Pollack MM, Patel KM, Ruttimann UE. The Pediatric Risk of Mortality III Acute Physiology Score (PRISM III – APS): a method of assessing physiologic instability for pediatric intensive care unit patients. *Journal of Pediatrics*. 1997; 131:575-581.

- 27. Carson SS, Stocking C, Podsadecki T, et al. Effects of organizational change in the medical intensive care unit of a teaching hospital. A comparison of 'open' and 'closed' formats. *JAMA*. 1996; 276:322-328.
- 28. Pollack MM, Patel KM, Ruttimann UE. PRISM III: an updated Pediatric Risk of Mortality score. *Critical Care Medicine*. 1996; 24:743-752.
- 29. Mallick RM, Strosberg M, Lambrionos J, Groeger JS. The intensive care unit medical director as manager. Impact on performance. *Medical Care*. 1995; 33:611-624.
- 30. Shortell SM, Zimmerman JE, Rousseau Dm, et al. The performance of intensive care units: does good management make a difference? *Medical Care.* 1994; 32:508-25.
- 31. Knaus WA, Wagner DP, Zimmerman E, Draper EA. Variations in mortality and length of stay in intensive care units. *Ann Int Med.* 1993; 118:752-61.
- 32. Groeger JS, Strosberg MA, Halpern NA, et al. Descriptive analysis of critical care units in the United States. *Critical Care Medicine*. 1992; 20:846-63.
- 33. Brown JJ, Sullivan G. Effect on ICU mortality of a full-time critical care specialist. Chest. 1989; 96:127-29.
- 34. Pollack MM, Katz RW, Ruttimann UE, Getson PR. Improving the outcome and efficiency of intensive care: The impact of an intensivist. *Crit Care Med.* 1988; 11-17.
- 35. Reynolds HN, Haupt MT, Thill-Baharozian MC, Carlson RW. Impact of critical care physician staffing on patients with septic shock in a university hospital medical intensive care unit. *Journal of the American Medical Association.* 1988; 260:3446-3450.
- 36. Li TCM, Phillips MC, Shaw L, Cook EF, Natanson C, Goldman L. On-site physician staffing in a community hospital intensive care unit. *JAMA*. 1984; 252(15):2023-27.

#### **Additional Reference Articles**

Health Affairs, "Mixed Results in the Safety Performance of Computerized Physician Order Entry," (http://content.healthaffairs.org/content/29/4/655.abstract)

2012 Leapfrog Hospital Survey (which includes measure specifications) https://leapfroghospitalsurvey.org/download-survey-materials/.

2012 Leapfrog Hospital Survey Reference Book (which includes scoring algorithms) https://leapfroghospitalsurvey.org/download-survey-materials/

Information on the National Quality Forum Safe Practices <a href="https://leapfroghospitalsurvey.org/download-survey-materials/">https://leapfroghospitalsurvey.org/download-survey-materials/</a>