

Abstract Title: Poor health numeracy predicts hospital length of stay independent of procedure and comorbidities.

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Background: Patient comprehension of information is an essential component of informed consent. Without complete understanding of the risks and benefits associated with a procedure, patients may potentially make decisions that are disadvantageous or discordant with their true preference. We have previously shown that patients have poor health numeracy and poor comprehension of risks and risk modification. Our aim was to investigate the relationship between health numeracy and perioperative outcomes.

Methods: This study was approved by the University of Wisconsin Hospital and Clinics Institutional Review Board, and all subjects provided written, informed consent to participate. The recruitment of the study cohort and initial health numeracy survey methods have been published elsewhere. After enrollment, participants were followed for 365 days from the actual date of surgery, or 365 days after the originally scheduled date if the procedure was canceled. Data were collected on the patient, initial hospital stay, and surgical outcomes. American College of Surgeons National Surgical Quality Improvement Project (NSQIP) estimated complication rates and inpatient length of stay were calculated for each patient. Data were analyzed using conventional bivariate statistics, and multivariable models of length of stay were created using Cox proportional hazards regression.

Results: Of the 213 participants, 199 (93%) had their scheduled surgery. Of those, 120 (56%) were anticipated to require postoperative hospitalization, and 94 (44%) in fact stayed for at least one night. Median American Society of Anesthesiologists (ASA) Physical Status at time of surgery was 2 (interquartile range [IQR] 2-3). Length of stay among participants anticipated to require postoperative hospitalization (n=120) was correlated with ASA Physical Status ($\rho = -0.314$, $p = 0.003$), NSQIP estimated length of stay ($\rho = 0.648$, $p < 0.001$) and inversely correlated with health numeracy score ($\rho = -0.268$, $p = 0.004$, Figure 1) highest level of educational achievement ($\rho = -0.216$, $p = 0.023$), and income ($\rho = -0.278$, $p = 0.003$). In a multivariable Cox proportional hazards model, length of stay was associated with NSQIP estimated length of stay (hazard ratio [HR] per 1-unit increase = 1.47, 95% CI = 1.30 – 1.67, $p < 0.001$) and inversely associated with health numeracy (HR per 1-unit increase = 0.78, 95% CI = 0.67 – 0.94, $p = 0.008$).

Conclusions: Poor health numeracy predicted hospital length of stay independent of a well-established, comorbidity- and procedure-based prediction model. These findings strongly suggest that patients are at risk of poor health outcomes as a result of misunderstanding health information. Further research is needed to validate these results in other populations and to assess the use of health numeracy as a risk-stratification tool and a means of identifying patients who will benefit from personalized presentation of health information.

Figure 1:

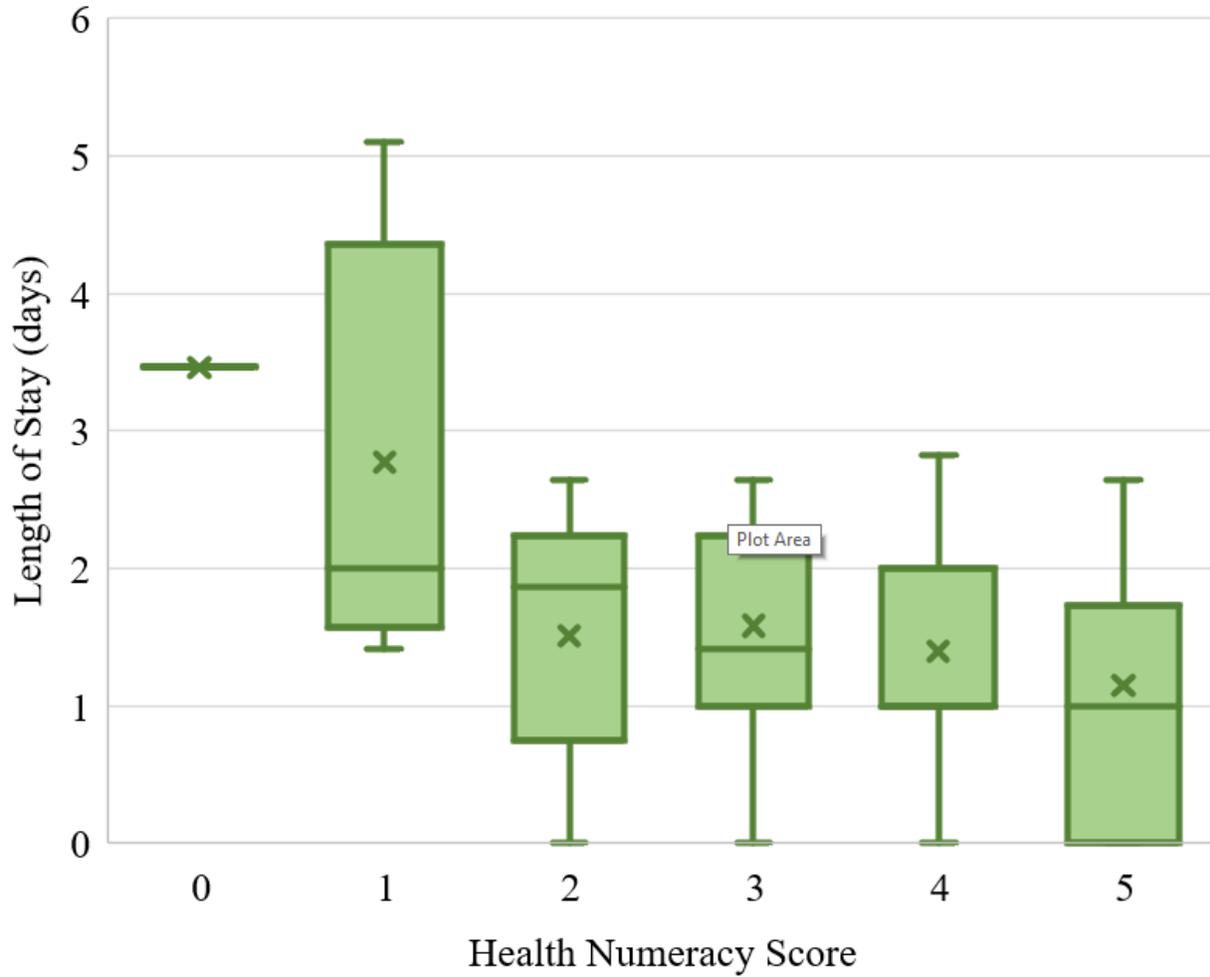


Figure 1 Legend:

Box plot of preoperative health numeracy score versus postoperative length of stay among cohort patients scheduled for inpatient surgery and who had their scheduled surgery (n = 112). An "X" marks the arithmetic mean for each group. Length of stay was inversely and monotonically correlated with preoperative health numeracy score ($\rho = -0.268$, $p = 0.004$).