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Predicting One-Year Mortality for High-Risk Primary Care Patients Using the “Surprise” Question

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TO THE EDITOR

Palliative care improves the value of care for patients with serious illnesses, but resource constraints necessitate targeting palliative care interventions to patients who need them most.¹ The “Surprise Question” (SQ) – “Would you be surprised if this patient died in the next 12 months?” – has emerged as an attractive, simple solution for identifying patients

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who might benefit from palliative care.^{2,3} Despite optimism about the potential of the SQ to identify primary care patients who would benefit from palliative care,⁴ there is no evidence on its performance in this setting.

METHODS

Study Cohort

We identified patients screened for high-risk care management program at a large academic primary care group practice, for whom physicians (PCPs) answered the SQ in 2013. We assumed a “No” answer represented physician prediction of high one-year mortality risk.

Primary outcome was mortality one year after SQ response, ascertained by linkage to Social Security Administration data. Demographics and comorbidities were drawn from electronic health records. We assessed SQ performance for predicting one-year mortality using area under the receiver-operating curve (AUC), sensitivity, and positive predictive value; we also calculated the odds ratio (OR) of a “No” response for one-year mortality using logistic regression.

To determine the incremental benefit of the SQ for predicting one-year mortality over and above routinely-collected administrative data, we calculated the integrated discrimination improvement (IDI)⁵ of adding SQ response to a multivariate logistic regression model of mortality on age, sex, and comorbidity score.⁶ IDI measures change in sensitivity and specificity between two models.

RESULTS

Patients in the study were predominantly female (60.3%). Mean age was 65, and 43.2% had 3 or more comorbidities. High-risk patients (SQ answer of “No”) had 4.36 times higher odds of dying than low risk patients (SQ answer: “Yes”; 95% CI 2.63–7.22, $p < 0.001$). Table 1 shows performance of the SQ as a screening test for 1-year mortality. Sensitivity of the SQ was 20.5% and specificity 94.4%, giving positive and negative likelihood ratios of 3.66 and 0.84, respectively. Given the one-year mortality rate of 6.6% in this population, positive and negative predictive values were 20.2% and 94.5%, respectively. Area under the curve (AUC) was 0.57.

In multivariate analysis, a PCP prediction of high risk via the SQ remained strongly associated with one-year mortality (OR: 2.52, 95% CI 1.46–4.34), over and above age, sex, or comorbidity score (Table 2). Predictive performance of the logistic regression model, however, was not significantly affected by SQ response: IDI was 0.88% (95% CI –0.14%–1.9%).

DISCUSSION

We found that PCP prediction of high mortality risk via the SQ failed to identify the majority of deaths, making it is a poor screening tool for one-year mortality in a heterogeneous primary care population. Adding the SQ response to a validated one-year mortality prediction model⁶ did not improve the discriminative ability of that model. These

findings are mostly consistent with prior studies examining the SQ in renal disease and cancer.^{2,3} {Moss, 2008 #1237; Moss, 2010 #1240; Moss, 2008 #1237; Moroni, 2014 #1256} Importantly, even if mortality were wholly predictable, poor near-term prognosis is only one of many triggers for palliative care initiation. Neither prognosis nor the SQ explicitly account for symptoms and other burdens of serious illness that can indicate a need for palliative care.

While these results suggest caution in using the SQ in isolation to identify poor prognosis patients in the primary care setting, the SQ did contain large amounts of signal for predicting mortality: it was strongly and significantly associated with one-year mortality, and this effect was noted over and above known predictors such as age and comorbidities. Understanding this signal, and incorporating it into more advanced predictive algorithms, could be useful topics for future research.

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TABLE 1

Tabulation of Surprise Question Response and Patient Vital Status After One Year

		Vital Status at one year from SQ		Total (%)
		<i>Deceased</i>	<i>Alive</i>	
SQ Response	<i>No</i>	23 (Death predicted, accurate)	91 (Death predicted, inaccurate)	114 (6.6%)
	<i>Yes</i>	89 (Alive predicted, inaccurate)	1,534 (Alive predicted, accurate)	1,623 (93.4%)
Total (%)		112 (6.4%)	1,625 (93.6%)	1,737

* Abbreviations: Surprise Question (SQ)

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TABLE 2

Multivariate Logistic Regression With an Outcome of Vital Status After One Year

	Odds Ratio [95% Confidence Interval]	p-value
Age	1.05 [1.03,1.06]	<0.001
Male Sex	1.61 [1.08, 2.42]	0.02
Gagne Comorbidity Score	1.23 [1.15, 1.32]	<0.001
Surprise Question Response = “No”	2.52 [1.46, 4.34]	0.001

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