



Prognostication: Medicine's Lost Art

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With the recent diagnosis of glioblastoma in Senator Edward Kennedy, the press asked the “time” question: “How much time does he have left?” As we know, most patients succumb within 12-18 months after diagnosis.¹ Estimating disease outcomes within a range can be done with some confidence. It is more difficult to predict the outcome for an individual patient.

Medical prognostication, “a prediction of future medical outcomes of a treatment or a disease course based on medical knowledge,”² has become something of a lost art. Prognosis, diagnosis, and therapeutics make up the main clinical skills in medical practice. Seventy-five years ago, when most effective medical therapies did not exist, the most skilled physicians were astute diagnosticians and frequent prognosticators.³ Today, in the exam or intensive care room, discussion focuses on diagnostic and therapeutic options. Prognostication takes a back seat. Some of this relative neglect may come from the hope that prognosis will not be necessary, that cure will be the outcome.

Medicine has delineated four major trajectories for the common causes of death.

The first, sudden death, or a squared death curve, often occurs as a result of trauma, accident, or suicide. Each member of the group is alive and functionally able until death, without antecedent decline in function.

Second, with cancer, a typical death curve can be drawn for each type of malignancy. While the time axis will be shorter and the functional decline steeper for patients with glioblastoma than for those with prostate cancer, a relatively predictable rate of decline to death can be described for incurable malignancy.

The third type is the most difficult to predict - mortality from chronic diseases, such as congestive heart failure (CHF) or chronic obstructive pulmonary disease. The classic death curve shows a years-long, slow decline with intermittent acute crises. After the crises the individual usually recovers, but not to the previous functional level until a final crisis cannot be, or is not, treated; and death occurs.

The final death curve describes the slow languishing of Alzheimer's and other neurodegenerative diseases. This trajectory is shallow, as the functional decline is slow and progressive; it allows for years of very poor function and life quality before death, which often comes following a seemingly minor illness or without a clear precipitant.⁴

After considering which death curve a patient is on, formulating an accurate prognosis requires acknowledging our own fear and bias as physicians. Studies have surveyed physician attitudes about prognostication. Many physicians described prognosticating as stressful and difficult. They believed that patients expected too much certainty, and more than half of physicians surveyed felt inadequately trained in prognosis.⁵

Christakis, et al surveyed 343 physicians regarding their estimation of life expectancy when 468 terminally ill patients were referred to hospice. The patients were 45% male; 65% had cancer. The patients' predicted life expectancy was compared to actual survival. Only 20% of doctors' predictions were accurate, defined as +/- 33% of actual survival. Sixty-three percent were overly optimistic and just 17% were overly pessimistic. Physicians overestimated in either direction by a factor of 5.3.⁶

In another study, treating oncologists predicted survival on average to within 3 months for a cohort of patients with metastatic breast or prostate cancer who lived an average of 9 months.⁷ The most experienced physicians were most successful at prognostication. Non-oncologic medical subspecialists were the least accurate prognosticators in this trial, and more likely to be overly pessimistic than other groups. What is more surprising is that longer doctor-patient relationships actually decreased a physician's ability to accurately predict survival. The authors proposed that a “prognosis consult” might be valuable, since non-invested physicians with extensive clinical experience were the most accurate prognosticators.⁶

In addition to knowing the likely death curve for a disease state, it is important to consider functional losses suffered by the patient. Several clinical prediction models exist. The **Karnofsky Performance Scale (KPS)**, first described in 1949 by the American oncologist David Karnofsky, stratifies patients with terminal illness on a scale of 100 (fully functional) to 0 (dead), taking into account self-care, activity, and burden of illness.⁸ One early study of the KPS estimated that each increase in 10 points offered another 2 weeks of life expectancy, though this study was designed more for research than clinical application.⁹

The more recent **Palliative Performance Scale (PPS)** takes into account additional functional domains. The PPS scores patients on ambulation, activity and evidence of disease, self-care, oral intake, and level of consciousness.¹⁰ One study involving 773 patients already admitted to a Palliative Medicine unit in Canada noted that PPS score, gender, and age, but not diagnosis were strongly correlated with survival. Of note, the older men had shorter survival.¹¹

These scales are useful for thinking about life expectancy for patients in the community and the clinic. As discussed earlier, patients who are hospitalized, particularly those with an acute exacerbation of a chronic disease, are at higher risk for death.

Schema exist for predicting in-hospital mortality from CHF, including a recently published point-system based on the few factors most strongly predicting mortality (age, heart rate, systolic blood pressure, serum creatinine, primary cause of admission, and the presence of left ventricular systolic dysfunction). Derived from data collected from the 48,000-pa-

Tools and Resources:

Palliative Performance Scale:

Available on-line at http://palliative.info/resource_material/PPSv2.pdf

OPTIMIZE-HF heart failure quality improvement study nomogram:

Available on-line at <https://www.optimize-hf.org/art/OPT-Mortality.pdf>

Home & Hospice Care of Rhode Island Online resources for performance scales and hospice criteria for chronic disease.

Available on-line at <http://www.hhcri.net/guidelines.html>

Prognostication, in-depth, detailed review of the literature:

Glare and Sinclair¹⁵

tient OPTIMIZE-HF heart failure quality improvement study, the scale and nomogram can be found online [<https://www.optimize-hf.org/art/OPT-Mortality.pdf>].¹²

Patients with advanced stage malignancies are more often concerned with prognosis than are patients with chronic diseases. Experienced oncologists are usually the most able prognosticators for their patients. Generally, patients with metastatic or extensive solid or hematologic cancers who have stopped palliative chemotherapy have fewer than 6 months to live. However, patients with prostate and breast cancers can have a more indolent course. Several sequelae of cancer predict a more limited prognosis. These include malignant hypercalcemia (except in those with newly diagnosed breast cancer or myeloma), malignant pericardial effusion, and neoplastic meningitis. These conditions limit life expectancy to 8-12 weeks. In the case of multiple brain metastases, life expectancy is 1-2 months without radiation and 3-6 months with radiation.¹³

Having an accurate estimation of prognosis has been shown to affect patients' choices regarding treatment, especially regarding emergency and end-of-life care. Murphy et al. asked 287 adults 60-99 years old, without telling them of the true probability of its success, whether they would want CPR in case of cardiac arrest during an acute illness. Forty-one percent initially wanted CPR attempted. After learning that survival to discharge from the hospital ranges from 10-17%, only 22% still wished for resuscitation, and only 6% over the age of 86 wished a resuscitation attempt. When queried about having CPR attempted in the setting of a chronic disease with a one-year life expectancy, only 11% asked for CPR. Upon learning that discharge rates range from 0-5% under this scenario, only 5% preferred that CPR be attempted.¹⁴

Prognostication is fraught with difficulty, and in an age of advanced and extensive treatment options has become a dinosaur of sorts. Ultimately what is gleaned from research is that knowledge of the death curve of the patient's life-limiting di-

agnosis can help inform prognosis. Additionally, remembering important co-morbidities and the patient's functional status will facilitate further personalization of prognosis. As physicians, we should know that we tend toward overestimation of life expectancy. Clinical models exist for many common chronic and oncologic diseases that enable physicians to use objective criteria to predict mortality. As difficult a conversation as this can be, patients appreciate knowing their prognosis, even if limited, so they can plan for their remaining time.

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Disclosure of Financial Interests

The author has no financial interests to disclose.

9SOW-RI-GERIATRICS-112008

The analyses upon which this publication is based were performed under Contract Number 500-02-RI02, funded by the Centers for Medicare & Medicaid Services, an agency of the U.S. Department of Health and Human Services. The content of this publication does not necessarily reflect the views or policies of the Department of Health and Human Services, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government. The author assumes full responsibility for the accuracy and completeness of the ideas presented.

