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THE CENTRAL ROLE OF PROGNOSIS IN CLINICAL DECISION MAKING

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In clinical practice and training, estimating prognosis—the probability of an individual developing a particular outcome over a specific period of time, typically receives less attention than diagnosing and treating disease. Yet, many clinical decisions are not fully informed unless the patient's prognosis is considered. Because of competing chronic conditions and diminished life expectency, careful consideration of prognosis is particularly important for clinical decision making in older patients. In a systematic review in this issue of *JAMA*, Yourman and colleagues evaluate 16 validated, non-disease specific indices that predict mortality for older persons (1). The authors rigorously assess each index for generalizability, accuracy and potential bias. They conclude that none of the indices is ready for widespread use in clinical practice. Even if one or more of these prognostic indices had passed or exceeded the specified quality benchmarks (2–4), their clinical utility would be uncertain.

Each prognostic index evaluates the risk of death over discrete time periods, ranging from 6 months to 9 years. The focus on mortality risk rather than life expectancy, the average number of years of remaining life expected for a person of a given age in a specific population group, limits the use of the currently available prognostic indices. It is unlikely that busy physicians have time to wade through a large number of indices that reflect varying study populations and different lengths of follow-up. Depending on the specific clinical decision required, moreover, a single prognostic index may not provide the desired information. Using the authors' example of colon cancer screening, if the patient's 4-year mortality risk had been lower than 25%, a second prognostic index, based on a 9-year mortality risk, would be needed, because screening is not recommended when the median life expectancy is less than 7 years. However, a review of these two indices indicates that 17 distinct data points are required to calculate the scores and determine the corresponding mortality risks (5,6). Even though some of this information may be available from the medical record (i.e. age, sex, smoking history and specific chronic conditions), the remainder must be obtained directly from the patient. Considering the number of different clinical decisions that must be made when caring for a diverse panel of older patients, this approach, which requires identifying the prognostic index (or indices) that best matches the specific time frame, e.g. 2, 5 or 10 years, on a case-by-case basis and then collecting additional information that may not be readily available, is unwieldy and impractical.

A preferred alternative is a single prognostic index (or perhaps a small number of indices) based on estimated life expectancy, a metric that is familiar to both physicians and patients. Values represent the life expectancy of persons at the 50th percentile (or median) in a specific population group. As noted by the authors, clinical guidelines increasingly incorporate life expectancy as a central factor in weighing the benefits and burdens of tests

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and treatments. Aligning the metric used to assess prognosis with recommendations in clinical guidelines would likely facilitate clinical decision making. A single estimate of life expectancy, for example, would allow a physician to advise an older patient about a large array of clinical decisions, such as whether to discontinue breast cancer screening or forego tight glycemic control for Diabetes Mellitus, as noted in Table 1 of the review by Yourman et al (1).

The omission of key factors, such as certain comorbid conditions, social support, or genetic factors, is a second problem that limits the clinical utility of indices that predict mortality risk. Most indices, for example, do not include factors or conditions that are less common, but highly morbid such as Parkinson's Disease or dementia. Protective factors, such as social support and community engagement (7,8), are rarely considered. Moreover, none of the indices includes information on the age of death of parents or siblings, despite increasing evidence of the genetic contribution to exceptional longevity (9).

The goal of estimating prognosis is to improve clinical decision making and, ultimately, patient outcomes. Despite the proliferation of prognostic indices for mortality (1), there is currently no evidence that their routine use improves patient outcomes. To determine whether use of a previously validated prognostic index is better than usual care, an impact study must be conducted (10). The preferred design is a randomized, controlled trial, in which the effect of using the prognostic index is evaluated on physician behaviors and patient outcomes, compared with a control that does not include the index. Although challenging to implement, high quality studies using this approach have been successfully completed in other fields (11,12). For example, the electrocardiograph-based Thrombolytic Predictive Instrument, which estimates the risk for death and hemorrhage with and without thrombolysis, has been shown to increase the appropriate use of thrombolytic and overall reperfusion therapy in patients with inferior-wall myocardial infarction (11).

From a research perspective, new prognostic indices should be developed and validated based on life expectancy rather than mortality risk. The clinical utility of the most promising life expectancy indices should be evaluated in well-designed studies. When developing a new prognostic index, investigators should focus on data elements that are readily accessible and recordable in the electronic medical record, allowing for real time estimates of life expectancy. The incremental benefit of factors beyond age, sex, smoking history, and body mass index, which are included in most mortality prognostic indices, should be carefully evaluated to determine whether the gain in accuracy outweighs the added burden of data collection. To acknowledge the inherent variability of life expectancy estimates, median values should be accompanied by interquartile ranges, denoting the life expectancy of persons in the highest and lowest 25^{th} percentiles. Periodically, or as circumstances change, relevant data elements should be updated so that the estimates remain current. Physicians would then have ready access to this information as clinical decisions arise.

However, given the central role of prognosis in clinical decision making, waiting for the ideal index to be developed, validated and rigorously tested would not be prudent. Physicians should be trained to consider prognosis in their clinical decision making. As a starting point, age-, sex- and race-specific life expectancies (median and interquartile range) can be calculated using data from standard life tables (13). These calculations could be facilitated through use of an electronic medical record or other electronic device. Physicians could then make qualitative judgements, based on information from the medical record or clinical assessment, about whether a patient is likely to live substantially longer or shorter than an average person in his/her age and race cohort. The strongest and most consistent predictors of mortality in older persons include co-morbidity and functional status. Lung disease requiring regular use of corticosteroids or supplemental oxygen, New York Heart

Association Class III or IV congestive heart failure, renal disease requiring dialysis, advanced dementia, inability to walk more than a block, and need for personal assistance with bathing are examples of factors that would reduce life expectancy substantially below the average (5). The absence of significant co-morbid conditions or functional limitations would identify older persons who are likely to live longer than average. Two prior articles have described how this approach, which combines life expectancies obtained from life tables with qualitative judgements by physicians, can facilitate clinical decision making in older persons (14,15).

With ready access to critical prognostic information, physicians will be better equipped to make clinical decisions that are aligned with their patients' values, preferences and goals of care (16).

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