Demystifying Prognosis

5

Understanding the Science and Art of Prognostication

Shauna Gibbons and Christian T. Sinclair

Contents

S. Gibbons (✉) · C. T. Sinclair
Division of Palliative Medicine, University of Kansas Health System, 4000 Cambridge St, Kansas City, KS, USA
e-mail: sgibbons@kumc.edu; csinclair@kumc.edu

© The Author(s), under exclusive license to Springer Nature Switzerland AG 2023

C. Banerjee (ed.), *Understanding End of Life Practices: Perspectives on Communication, Religion and Culture*, Cancer Treatment and Research 187,
https://doi.org/10.1007/978-3-031-29923-0_5

5.1 Introduction

Prognostication is a fundamental clinical competency, alongside diagnosis and treatment. It can be just as critical as providing a diagnosis for both the patient and the care team. Imagine you have been given a serious diagnosis, and it is easy to see how understanding what the future holds becomes of utmost importance. Historically, when humanity's ability to diagnose and treat disease was limited, being able to accurately form a prognosis was the cornerstone of high-level medical care. As medical technology advanced the ability to diagnose and treat, prognostication receded from the forefront of medicine, in some ways taking on mantle of mystery, as evidenced by the relative paucity of study in the field for most of the twentieth century [1]. Numerous studies highlight clinician hesitance and discomfort discussing prognosis despite being a necessary medical skill. In recent years, medical culture has shifted towards placing a greater emphasis on autonomy and the role of patient decision making as central to determining the plan of care [2]. There has been a growing body of scientific knowledge and evidence supporting prognostication as a clinical skill, prompted in part by this cultural evolution. Deriving an accurate prognosis and its effective communication has thus become more important than ever [3].

5.2 The History of Prognosis: Understanding the Past and Looking to the Future

Medical prognostication, particularly surrounding the prediction of survival from disease, has ancient roots. In the fifth century BCE, the work of Hippocrates helped build the foundation of medicine as an evidence-based science, and central to his philosophy of medical skill was the ability to prognosticate. Hippocrates' aphorisms in *The Book of Prognostics* are an early example observational evidence used to forecast death and have echoes in modern medicine. Instead of framing prognosis as a supernatural power, he notably emphasizes the role of using knowledge of the patient's own trajectory and clinical evidence to support the prognosis. This approach stood in contrast to a spiritual or religious stance in which forecasting the future, particularly regarding death, is something only known to a higher power, a difference which resonates in how prognosis is perceived today.

The temptation to ascribe mystical connotations to medical prognostication has persisted throughout history and is often tangled in the larger struggle between the secular and the spiritual. In Medieval Europe, medicine was intertwined with and held in the same esteem as the practice of divination and astrology. Much of the connection has to do with the skill of prognostication, a common theme across these disciplines [4]. While medicine has become scientifically grounded over time, particularly after the Renaissance, prognostication remained a clinical skill with an almost mystical aura.

Even today, clinicians and patients underestimate the evidence-based foundation of medical prognostication and can discredit its very concrete clinical importance

when formulating a patient-centered medical plan of care. The focus of this chapter is the science behind contemporary medical prognostication. In this way, formulating and communicating prognosis should not be viewed by clinicians as an uncomfortable secret to be kept from patients, but rather as a clinical competency that can be taught, practiced, and integrated into the standard of patient-centered medical care.

5.3 What and Why We Prognosticate

The diagnosis of a serious illness often carries much uncertainty, and there are many things a clinician can prognosticate. For instance, if a person suffers a stroke, their family may wonder about the ability to live independently in the future. A patient with cancer may be interested in the possibility of a chemotherapy regimen resulting in severe side effects. In a 1981 paper, Fries and Ehrlich described five elements of serious illness that call for a prognosis: morbidity and symptom burden, mortality, disease progression, financial burden, and adverse effects of treatment [5]. These are all consequential factors in the complex medical decision making for patients and families. A clinician will likely be asked to weigh in on several of these aspects of life with a serious condition, however for the purpose of this chapter, the focus will be mainly on formulating and communicating a prognosis related to survival.

There are specific reasons why being able to estimate an individual's survival is important. Choosing a treatment plan is often dependent on time [6]. For some patients, accepting a very burdensome therapy like chemotherapy or a left ventricular assist device (LVAD) hinges on the prognosis with and without these interventions. Would the recovery time from a tumor debulking surgery be longer than the overall prognosis? Or is the prognosis such that going through a surgery would have a good chance of significant improvement in quality of life? [7] Prognostic awareness helps empower the patient to help guide their medical plan of care [8]. Similarly, for the clinician, prognosis is often a factor in the calculus of deciding a person's candidacy for a given treatment. For example, a plan of care may vary widely for someone with a prognosis of a few days versus several weeks, when considering the benefit and burden of intravenous fluids. These are very different circumstances, but both rely on an understanding of prognosis.

A thoughtful prognosis also makes early goals of care conversations possible. Having these conversations have been shown to lead to goal-concordant care. The SUPPORT Trial, a large prospective control study demonstrated prevalent miscommunication about desired medical care and a tendency towards aggressive measures at the end of life in patients admitted to the ICU. However, merely handing clinicians prognostic estimates and asking them to share it at the point of crisis was not shown to significantly affect patient outcomes [9]. The potential benefit of sharing prognostic information may be in the ongoing conversations with trusted clinicians along the disease trajectory. Goal-concordant care because of prognostic awareness is more likely when the patient is well enough to be involved [10]. To

achieve this, developing prognostic skill is needed across the medical profession, so these conversations can be started further upstream and not merely at moments of crisis [11].

Prognosis also has practical implications for patients and their loved ones. Surveys of patients and families at the end of life suggests, in general, a strong preference for receiving information on how much time their loved one may have. Not only must we consider the numerous physical and logistical concerns that patients have near the end of life, but we must also recognize a patient's social, emotional, and psychological quality of life is impacted by an understanding of time. Being given the opportunity to find closure, say goodbye, take part in legacy building and arrange their affairs are important to patients during this stage [12]. Similarly, a clear understanding of survival time is important to caregivers of the patient, who desire this information to help mentally prepare for increased symptom management and care giving needs, as well as to help with the grieving process [11]. Having prognostic conversations with a trusted clinician in a thoughtful way can help to build trust, ease the distress of uncertainty, and support planning within the patient's personal life.

5.4 Conceptualizing Prognostication

When approaching prognostication, it may be helpful to break down the process into its different parts. Formulating, or "foreseeing", and communicating or "foretelling" are widely accepted as the two pillars of prognostication, and this will be the focus of this chapter [13]. It is important to remember, however, that this is not where the work of prognostication ends. As we will see later in this chapter, communicating prognosis is particularly rife with opportunities for miscommunication from both the clinician and the patient perspective. For this reason, naming uncertainty and assessing understanding should be considered a vital part of prognostication. Furthermore, providing support should be thought of as an indispensable part of prognostication to emphasize the importance of having the appropriate support systems available and adequate time to have a thoughtful and compassionate discussion following what may be the worst news an individual can receive. Finally, prognostication should be thought of as an active process. Complications, response to treatment and numerous other factors may change a patient's prognosis calling for revisiting and reformulation as time passes [1, 14] (Fig. 5.1).

The Phases of Prognostication

1. Formulating
2. Communicating
3. Naming Uncertainty
4. Assessing understanding
5. Providing support
6. Reformulating.

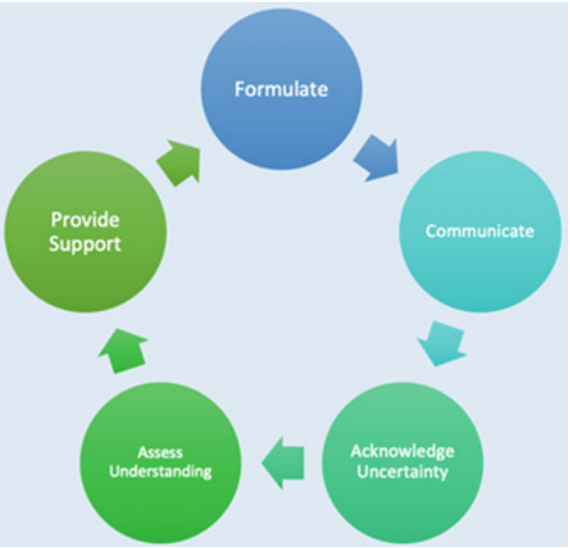

Fig. 5.1 Prognostication as a continuing conversation

5.5 The Science of Formulating Prognosis

Deriving a predicted survival time is the first step in prognostication. There are two types of approaches one may use, the subjective clinician prediction of survival or the objective actuarial (or modeled) prediction of survival. Often, some combination of the two methods is used in practice, though not in a standardized manner [14]. Though recent years have seen advancement in this area, there certainly remains ample room for growth and study. There can be inconsistent accuracy across different disease populations and at different stages in an individual's trajectory. Many of the studies that form the basis of these prognostication methods focus on advanced cancer in populations identified as "palliative", which is obviously difficult to standardize across studies, and therefore limit generalizability [13]. Another complexity in using studies in clinical practice is the inability to account for disease evolution with variables such as response to treatment and disease complications [6]. Nevertheless, with awareness of the potential pitfalls and the variety of validated tools and approaches available, a clinician can improve their ability to formulate an accurate prognosis for their patient using clinical judgement, actuarial predictions, or a combination of the two.

5.5.1 Clinical Judgement

Clinician prediction of survival (CPS) is the clinician's subjective formulation of prognosis based on the assessment of the individual patient in a clinical setting [8]. It is somewhat nebulous by definition, like any other clinical judgment, yet it

is the most frequently used method of formulating prognosis. It happens in everyday clinical practice, even if it is not formally communicated. Attempts to discern what goes into CPS suggests a combination of clinical experience, statistical data, and knowledge of the individual's trajectory. CPS can be framed in three main ways [6].

- Temporal—Quantifying the expected time frame one expects the patient will live
- Probabilistic—Estimating the probability of the patient dying in a given time frame
- The "Surprise" Question—Reflecting on if it would be a surprise if the patient died in a given time frame.

Clinician predicted survival itself is an independent prognostic factor and correlates with survival, but accuracy is variable [15]. Using the temporal framing tends to result in an overestimation of survival and seems to be less accurate than using the surprise question or a probabilistic approach with cancer patients [6]. Regardless, CPS is important to understand, since it is what most clinicians use to formulate prognosis and it fundamental to services like the Medicare Hospice Benefit. A systematic review revealed that nearly all studies of CPS provided overly optimistic predictions of survival for patients with advanced cancer and was accurate up to 29% of the time [16]. Subsequent reviews support this tendency, adding that CPS is more than twice as likely to be overly optimistic than overly pessimistic [8]. Despite lack of precision, CPS has been shown to correlate well when compared to actual survival and is a good starting point, particularly when combined with performance status, biomarkers, and other prognostic tools [16, 17]. A 2015 multicenter study showed the CPS of palliative medicine physicians was significantly more accurate compared to other specialties' estimates, although the tendency to overestimate survival remained, and several other studies do not demonstrate a significant difference in skill across specialties [17, 18].

CPS accuracy also varies by the type of terminal illness and the timeline in question. The disease trajectory of organ failure such as heart failure or COPD is characterized by multiple exacerbations and recoveries, which makes coming up with accurate CPS particularly challenging, especially in the midst of an acute exacerbation. It can be difficult to tell where on the disease trajectory these patients are located. Even amongst cancer patients, there are conflicting findings on whether prognostication becomes more accurate as the patient approaches end of life. Some studies note a "horizon effect" in which short-term survival is more accurately predicted than long-term survival, but others have found the opposite [17, 19]. Even at a more basic level, the definition of "terminal" means differs from clinician to clinician, which understandably influences the content of these conversations [2].

5.5.2 Actuarial Judgement

Actuarial judgement, unlike clinical judgement, intends to remove "the human judge". Instead, it relies on data to identify and weigh relationships to form predictive models [20]. When using actuarial judgement to formulate a patient's prognosis one must keep in mind that actuarial judgement is implicitly not individualized, so clinicians still need to tailor the results to the specific patient and situation in question. Knowing in which setting the actuarial method has been validated and what variables were considered is important to ensure it is appropriate for a given scenario. Prognosticating survival often utilizes performance status, biomarkers, clinical findings, and symptoms, as these factors have demonstrated statistical relationships to survival time. When used thoughtfully, actuarial judgement based on these factors can provide illuminating and accurate information from which a prognosis is derived.

5.5.3 Performance Status

Performance status is an assessment of an individual's capacity to carry out daily tasks and has been shown to be a key prognostic factor in both cancer and non-cancer diseases. Performance status has implications for eligibility to receive certain treatments, likelihood to benefit from treatment and overall predicted survival. The Karnofsky Performance Scale (KPS), Palliative Performance Scale (PPS), and Eastern Cooperative Oncology Group (ECOG) Scale are commonly used, validated tools. These tools have prognostic value, are accurate particularly for short term prognosis and can be used to easily communicate functional status as well as to formulate prognosis [15].

5.5.4 The Karnofsky Performance Scale

A 1983 study by Mor et al. initially demonstrated the relationship between KPS and survival in cancer patients. Lower KPS scores were more strongly predictive of short-term mortality. The converse- that a high score implied a long survival, was not necessarily found to be true, making it more useful for prediction of survival of patients with poor functional status. Additionally, this scale specifies hospitalization as part of determining a score, so it is not as universally applicable [21, 22].

5.5.5 Palliative Performance Scale

The PPS was developed in 1996 to relate functional status to survival more diverse settings such as home, clinic or hospice units [23]. In a study of patients with cancer and non-cancer terminal illnesses, it was found that PPS correlates with KPS

and can be used interchangeably [24]. There is evidence to support that each gradation of PPS scores between 10 and 40% have significantly distinct Kaplan Meir survival curves for patients with advanced cancer, and thus can be used to formulate a survival time more accurately from initial assessment [25]. Additionally, a systematic review looking at PPS as a predictor of survival found that PPS can be used for both cancer and non-cancer diseases including heart failure, dementia, and COPD. A PPS of 10% accurately predicts a survival of 1–3 days for both cancer and non-cancer patients, though with higher PPS scores the range of survival became wider [26].

5.5.6 Eastern Cooperative Oncology Groupe Scale

ECOG is a widely used tool amongst oncologists, correlates with KPS and PPS but is specific to cancer patients [24]. It is used in combination with other clinical factors to help determine if a patient would tolerate chemotherapy or be a candidate for clinical trials. With a low ECOG there is a high likelihood that treatment toxicity would likely do more harm and not confer a survival benefit or improved quality of life. The American Society of Clinical Oncology recommends careful consideration of a patient's ECOG score when offering palliative chemotherapy to maximize the potential benefit. There is also the prospect of causing harm with chemotherapy. A study of patients with refractory metastatic cancer who received palliative cytotoxic chemotherapy found that those with ECOG scores of 2–3 had no effect on survival or quality of life, while patients with an ECOG of 1 actually had decreased survival and worse quality of life [27]. It is important to note, however, that the same may not necessarily be true for all cancer directed therapies. A recent meta-analysis focusing on immunotherapy suggests that a poor ECOG was not linked to worse outcomes when receiving immunotherapy and should not weigh as heavily when determining candidacy for this type of treatment [28]. This illustrates the importance of understanding the individual situation and using clinical judgement in combination with this data to make medical decisions when prognosis is a key factor.

5.5.7 Symptoms, Clinical Findings, and Biomarkers

While performance status is widely regarded as one of the most significant determinants of survival, certain symptoms and clinical findings have been identified as independent predictors of survival.

Similarly, to performance status for advanced cancer, these indicators are more accurate for predicting survival when the prognosis is short. Where tumor characteristics may drive prognosis early the disease, patient factors become more predictive in advanced disease [8, 14]. A large multicenter study of cancer patients conducted by Ruben et al. noted dysphagia, anorexia/cachexia, and dyspnea as commonly experienced symptoms near the end of life [29]. Dyspnea and delirium

are particularly strong indicators of poor short-term prognosis in advanced disease. A systematic review looking at studies of symptoms across all cancer types supports the idea of this complex of symptoms converging into a "terminal cancer syndrome" regardless of cancer site or pathology [15].

There are also particular signs and symptoms to consider when coming up with a prognosis in non-cancer diseases. For instance, survival for anoxic brain injury after cardiac arrest relies heavily on neurological exam findings. Even if CPR is successful in achieving return of spontaneous circulation after an in-hospital arrest, only about 20–30% of these patients will survive the hospitalization. Even if a patient survives to discharge from the hospital, morbidity and mortality remains extremely high. Of those who die, most deaths will be due to neurological damage sustained during resuscitation. A patient's exam in the three days following arrest is heavily suggestive of their prognosis. Coma lasting greater than six hours after arrest is associated with severe neurological damage and indicates recovery to independent function in the ensuing year will be unlikely. Lack of pupillary or corneal reflex by day three carries a grim prognosis and most of these patients will not survive the hospitalization. The Full Outline of Unresponsiveness (FOUR) score incorporates brainstem reflexes, motor response, eye movement and respiratory status into a tool that can help determine prognosis by tracking scores on the first 3 to 5 days after the event [30].

Organ failure presents interesting challenges in prognostication given disease trajectory and the need to account for systemic consequences of this type of disease process. For patients with COPD, forced expiratory ventilation (FEV1) is used to quantify physiologic disease severity and is linked to mortality. This alone, however, provides an incomplete picture of patient's clinical condition and of their prognosis. Risk of mortality is more complex due to the systemic effects of pulmonary dysfunction. A study published in the New England Journal of Medicine found that all-cause mortality for ambulatory patients was better predicted by considering the severity of dyspnea, BMI, and six-minute walk performance in addition to FEV1 [31]. Frequent hospitalization has also been shown to be an independent predictor of mortality, regardless of FEV1. Admission to the ICU in particular doubles 1 year mortality from 30% to around 60%. There is also some data suggesting that biomarkers associated with chronic inflammation, particularly leukocytosis and fibrinogen, are also associated with increased 3-year mortality [31–33]. Chronic hypercapnia portends a significantly worse 1-year mortality, but interestingly hypercapnia during an acute exacerbation is not associated with worse in-hospital mortality [33].

Heart failure is similarly complex. There is the problem of prognosticating in an acute exacerbation but there are also the added complexities of different types of heart failure, for instance preserved versus reduced ejection fraction, and various etiologies like ischemic versus nonischemic. A large, multicenter cohort study in 2006 helped to elucidate predictive factors for ambulatory patients with heart failure. It found that NYHA class symptoms, systolic blood pressure, hemoglobin, EF, sodium, and ischemic etiology were all independent predictors of poor outcome. This study was used to create the Seattle Heart Failure Model, which is

widely used to predict 3-, 2- and 1-year mortality, as well as to assess the survival benefit of guideline directed therapy for individual patients [34]. Like COPD, simply being hospitalized is a poor prognostic factor, with a 30-day mortality of about 10%. For patients admitted with acute on chronic heart failure, biomarkers including elevated creatinine and BUN, low sodium, and physical findings such as tachycardia and low blood pressure all increased risk of in-hospital mortality [35, 36]. Risk stratifying these patients is key to guiding important medical decisions when it comes to advanced heart failure therapies and helps to guide prognostic awareness for patients and families who have likely experienced prior multiple admissions and recoveries.

5.5.8 Prognostic Tools

Prognostic tools have been developed to help incorporate functional status, symptoms, biomarkers, clinical findings, and in some cases, clinician predicted survival, with the goal of providing more accurate prognostication. These tools can be used in conjunction with clinician predicted survival to provide a more accurate estimation of prognosis. Care should be taken however to ensure that each tool is used in a cohort and setting that has been validated. As always, it remains important to be cognizant of the fact that for whatever prognosis is calculated, an individual's disease trajectory may differ for a multitude of patient and disease related factors.

5.5.9 Cancer

The Palliative Prognostic Score (PaP), and Palliative Prognostic Index (PPI) were developed to aid in the prognostication of survival in cancer. The PaP has clinician prediction of survival built into the score and was validated across several settings and stages of the disease [8]. The presence of delirium was later added to the PaP to create the D-PaP which was further able to discriminate prognostic cohorts. A multicenter prospective cohort study validated the PaP, D-PaP, PPI, and PiPs tools across variable settings, including patients receiving chemotherapy. These tools demonstrated an accuracy of 69% or greater in predicting both long- and short-term survival. This study did note that the practicality, particularly of PaP and D-PaP, made these tools less feasible for routine use when compared to the PPI [37].

5.5.10 Heart Failure

The Seattle Heart Failure Model (SHFM) is widely used to help predict 1-, 2-, and 3-year survival. It has been validated across a diverse range of heart failure models and can be used for both hospitalized patients with acute exacerbations of heart failure and ambulatory patients that are at their baseline. The SHFM is able to

demonstrate the possible benefit from adding guideline directed medical therapy and can discriminate a patient's risk of death from decompensated heart failure versus from sudden cardiac death [34]. Patients hospitalized with heart failure have high short-term mortality rates. Separate tools including the Acute Decompensated Heart Failure National Registry (ADHERE) Model and Enhanced Feedback for Effective Cardiac Treatment (EFFECT) have been developed to predict 30-day mortality for this group [35].

5.5.11 Liver Disease

The Model for End-Stage Liver Disease (MELD) score is used to predict 3-month mortality in patients with end stage liver disease regardless of the etiology. It was created in 2000 initially to gauge the possible outcome undergoing transjugular intra hepatic portosystemic shunt procedure but was subsequently validated as a prognostic tool for liver disease in diverse settings [38]. The model, and its updated counterpart the MELD-Na, for patients with hyponatremia, use objective inputs such as INR, sodium, and BUN. In 2002, with increasing need for liver transplantation and studies showing that long wait time on the transplant list did not correlate to increased mortality, there was a shift to using MELD score as a way to allocate organs with the sickest patients gaining priority [39]. This adjustment did lead to a 12% decrease in mortality while on the list but concerns for certain populations being underrepresented by the MELD score perimeters [40].

5.5.12 COPD

Historically, FEV1 had been used to categorize COPD severity and as the main prognostic factor when determining mortality. This, however, did not account for the many systemic effects of COPD that contribute to overall mortality. A 2004 study proposed the BODE Index, multidimensional assessment that was found to have significantly better prognostic capability for four-year mortality than FEV1 alone. This scale combines BMI, FEV1, exertional capacity, patient reported dyspnea as gauged by the Medical Research Council Scale [31]. In addition to predicting death, the BODE Index is also useful to predict risk of exacerbations and hospitalizations [41]. Unlike the Seattle Heart Failure Model, the BODE Index does not incorporate the effects of initiating COPD directed treatments. For patients hospitalized with a COPD exacerbation, the DECAF score is a strong prognostic indicator in hospital mortality and is useful for risk stratifying patients on admission [42].

5.5.13 On the Issues of Race and Prognostication Models

In the late 2010s, clinicians and researchers began to question the role of race more actively in risk-prediction models, for example calculating glomerular filtration rate, which has implications for dialysis initiation and transplant eligibility [43]. The impacts of structural racism in health care access and care received is likely the primary driver of outcome differences, not any factors attributed solely to race This is an evolving area that has scientific, clinical, and cultural implications for the modern clinician. When considering any prognostic model, it is prudent to understand how race and racism could have impacted the modeling, validation, and application, and consider alternative models.

5.5.14 Prognostication in the Dying Process

Much of the study of prognostication focuses on a scale of months and years. This makes sense considering the utility of good prognostication along the disease trajectory to help guide the treatment plan and important medical decision making. Equally important, however, is prognostication for the imminently dying patient. Once a decision is made to transition to a comfort focused plan of care, it may seem that communicating a prognosis of hours versus days is a trivial thing, but in practice it is very significant for a patient's loved ones. Many times, asking about prognosis is amongst the first questions family will enquire after transitioning to comfort measures. An inquiry about time may hint at deep apprehensions or wishes that will inform the experience of their loved one's death. A husband asking, "So how long do you think this is going to take?" may be worried about prolonged suffering. A daughter asking if her father will be around until the end of the week may be hoping that a death doesn't occur at the same time as her child's birthday. Although prognostication of an imminently dying patient no longer deals with disease directed treatments, there are still important factors at play that warrant skilled prognostication.

Formulating a prognosis at the end of life calls for an assessment of the individuals' symptoms and interpretation of signs found on exam. A combination of physical signs, symptom burden and assessment of functional decline, particularly using the Palliative Performance Scale, seems to lead to the most accurate predictions [44]. A rapid deterioration of PPS score has been noted in the 1–2 months preceding death in cancer patients [45]. High symptom burden has been linked to mortality even amongst those with a relatively good functional status. In the last week of life, dyspnea, fatigue, dysphagia, and drowsiness becomes more severe [46]. An observational study of cancer patients admitted to palliative care units found seven physical signs including Cheyne-Stokes respirations, absence of radial artery pulse, and mandibular respirations, were specific predictors of imminent death within three days. Of note, these signs were not present in all patients who died within three days [47]. While much of what we know about imminent death is based on studies of patients with advanced cancer, a systematic review

of symptoms at the end stages of various diseases including cancer, organ failure and AIDS, described a convergence of symptoms as person nears death, despite having experienced differing disease trajectories at earlier stages. These symptoms include weight loss, dyspnea, loss of appetite and fatigue [48].

Explaining and normalizing the process and prognosis of dying can be helpful for loved ones of the imminently dying person. Knowing what changes to expect, when to expect them and what this means in terms of prognosis help ease the discomfort of the unexpected.

5.6 Communicating Prognosis

Equally as important as formulating the prognosis is its effective communication. This may seem deceptively simple, but many studies have shown that it can be fraught with opportunities for misunderstanding. Confusion can flow from both the clinician and the patient perspectives. It is well documented that for patients, absorbing medical information, particularly when it pertains to bad news, is difficult and incomplete. At the same time, there is also a tendency for clinicians to equivocate and euphemize in these situations, thus further muddying the picture [3]. A study of advanced cancer patients and their oncologists showed a high rate of prognostic discordance, with 68% of patients rating their survival significantly different than what their oncologist had determined their survival to be. Patients and oncologists were not aware of this discordance in the majority of cases [49]. The obligation falls on the clinician to make the effort to understand how the patients perceive this information as well as their own bias in delivering prognosis. If this discussion is thoughtfully constructed, communicating prognosis can help build trust, decrease anxiety, and give patient's the tools they need to pursue goal concordant medical care [50].

5.6.1 The Clinician Perspective

Being mindful of one's own tendencies and biases as a clinician is an important first step in communicating prognosis. This is dependent on the individual's experience to some extent, but certain trends have been elucidated and are important to be aware of, as most physicians, regardless of specialty, will be faced with a situation in which they are asked to communicate prognosis [2].

There is a certain discomfort in delivering a prognosis that effects medical professionals broadly. Talking about death is still a taboo subject in many cultures and can seem even more so when one is asked to predict death. A large survey of internists found that most of the participants perceived delivering a prognosis distressing, and 90% of respondents felt that accurate prognostication was more difficult than diagnosis. Somewhat surprisingly, this high level of discomfort was felt across all specialties, including those asked to prognosticate frequently such has critical care physicians and oncologists [2]. Having more years of experience

also did not add to a clinician's confidence with this skill. This study identified several possible explanations for this uneasiness. Clinical uncertainty regarding disease trajectory is often cited, as well as lack of training in how to formulate and deliver prognosis. Even implementation of society guidelines for having prognostic discussions does not change this. For instance, a separate survey reported similarly, feelings of uncertainty and inadequate training amongst cardiologists despite American Heart Society recommendations for yearly prognostic discussions as the standard of care for patients with advanced heart failure [51]. Clinicians also cite guilt about having to deliver bad news, as well as the perception that prognosis is not something that patients want to hear.

5.6.2 The Patient Perspective

Contrary to what clinicians perceive, patients and their caregivers tend to want prognostic information. A systematic review of prognostic communication by Parker et al. aimed to describe standards for communicating prognosis in a non-ICU setting for patients with a survival of less than 2 years. Notably, individuals may have different desires for information. Based on this review, about 60% of patients desired some information about survival at or around the time of diagnosis. The majority of patients and their caregivers also wanted information related to the dying process and to candidly discuss what this process would entail [11, 52]. Caregivers felt less anxiety with more information about what symptoms and changes to watch for as their loved one progressed in the disease trajectory. Patient and caregiver need for prognostic information was important to them across many domains of life.

5.6.3 Bridging the Gap: Frameworks for Communicating Prognosis

With any serious medical conversation, it helps to have a framework to help structure the discussion. Maltoni et al. proposed several recommendations to help improve accuracy with prognostication based on the limitations of clinician predicted survival found in a systematic review. The central recommendation for clinicians relying on CPS is to essentially be aware of the many opportunities for bias in formulation and communication of prognosis, and to take steps to help mitigate these biases. These recommendations include the following:

- Use clinician judgement in conjunction with another prognostic tool
- Consider asking for specialty input from more experienced colleagues
- Plan on reevaluating prognosis at fixed intervals.

After this initial "gut check" is done, the task then becomes contemplating the best way to present this information to the patient. Prior to delivering the prognosis,

the clinician should consider the patient's preference for information, the setting in which this information is delivered, and with whom the information is shared [11, 52].

As discussed earlier in this chapter, patients and caregivers in general do desire prognostic information. With that in mind, it is important to recognize that individual patients may prefer different amounts of information, ranging from those that want specific details to those that want barely any specific information at all. Clinicians often cite lack of time during appointments as one of the reasons delivering prognosis is difficult. Care should be taken to ensure that a comfortable setting and adequate time exists in the appointment to have a thoughtful conversation, assess understanding and provide support. Finally, it is also prudent to consider who is with the patient during the prognostic conversation and ensure that it is ok to share with them.

The language used to convey the prognosis is significant. It should be clear in order to avoid confusion but needs to be thoughtful enough to encompass the nuances of prognostication. Some studies have indicated that presenting information as a probability or percentage can be confusing to patients, though some individuals will specifically desire numbers or statistics [53]. If asked to present this information, it is prudent to be aware of framing bias, in which individuals—both clinicians and patients—respond in different ways based on if information is framed as a gain versus a loss [52]. For instance, saying someone has a 20% chance of survival likely produces a more optimistic interpretation than saying they have an 80% chance of dying. One might consider presenting both the negative and positive framings to counter this effect. In general, when providing predicted survival, time frames should be given in ranges such as weeks to months, or months to years. Presenting prognosis as Typical-Best–Worst Case scenarios can also be helpful [55]. For instance, one might say "typically, patients in a similar situation may gain several months if the cancer responds to this treatment, with a survival of years being the best case. In the worst case, we see no response and survival is most likely weeks to months." Ultimately, it is up to the clinician to build a relationship with the patient and gain and understanding of the best way to communicate with the individual.

5.6.4 Cross-Cultural Communication and Prognosis

As with any patient encounter, it is important to take into consideration cultural differences when communicating prognosis. Central to cross cultural communication is acknowledging provider bias and understanding that patients with different cultural backgrounds may desire different information. Simultaneously, it is imperative to resist stereotyping or assuming what the patient and their family would want to know [55]. One should not assume a patient's perspective solely based on their cultural background. This becomes particularly essential when discussing something as difficult as prognosticating death, where maintaining patient-clinician trust is paramount. While it is important to educate oneself about diverse patient

populations, many well intended providers may use limited knowledge in an inadvertently harmful and reductive manner. This results in treating patients of diverse backgrounds as monolithic groups rather than as individuals with complex personal experiences and influences and can cause miscommunication and distrust.

Approaching these encounters with a sense of cultural humility helps to avoid this pitfall. Cultural humility asks us to approach every patient interaction with the mindset of learning from that individual patient without assumptions and to engage in ongoing self-reflection [56]. When approaching any patient about prognostication, but particularly someone from a different cultural background, it is key to explore that individual's wishes and perspectives on prognosis with a sense of genuine curiosity. What information on prognosis is wanted or needed by the individual? How, when and with whom should this information be shared? What is the individual's idea of a good death? For instance, is this at home, in a hospital, or somewhere else? The answers to these questions vary from person to person. It is easy the provider to unintentionally impose our own bias and assumptions, but it is important to work to actively counteract this impulse. If you don't know, ask. As simple as this may seem it can be difficult to remember but is vital to communicating prognosis in a way that is patient centered.

5.7 Conclusion

Prognostication is a complex clinical proficiency that asks the clinician to meld objective and the subjective. It asks the clinician not to shy away from uncertainty but instead to acknowledge it and embrace it. The dual nature of medicine as a science and an art is apparent in the process of formulating and communicating a prognosis. Research, particularly in the last two decades continues to provide a more robust basis for understanding the science behind prognosis. Simultaneously, there has also been a trend towards more openness surrounding end of life communication and attention to patient and family experience of this phase of life. Understanding the data, using the available tools, and honing the skill of prognostication is an essential part of providing thoughtful patient-centered care to individuals facing serious illness. As you explore this book, the fundamentals of formulating a prognosis based on a clinician's judgement or a tool built on data will help enhance your clinical knowledge and practice but incorporating a sense of cultural humility and understanding may be the most meaningful way to better serve those under your care.

References

1. Thomas J, Cooney L, Fried T (2019) Prognosis reconsidered in light of ancient insights-from hippocrates to modern medicine. JAMA Intern Med 179:820–823
2. Christakis N, Iwashyna T (1998) Attitude and self-reported practice regarding prognostication in a national sample of internests. Arch Intern Med 158:2389–2395

3. Innes S, Payne S (2009) Advanced cancer patients' prognostic information preferences: a review. Palliat Med 23:29–39
4. Fidora A (2013) Divination and scientific prediction: the epistemology of prognostic sciences in medieval Europe. Early Sci Med 18:517–535
5. Fries J, Ehrlich G (1981) Prognosis: contemporary outcomes of disease. The Charles Press Publishers, Philadelphia
6. Hui D, Paiva C, Fabbro E (2019) Prognostication in advanced cancer: update and directions for future research. Support Care Cancer 27:1973–1984
7. Miner T (2005) Palliative surgery for advanced cancer: lessons learned in patient selection and outcome assessment. Am J Clin Oncol 411–414
8. Maltoni M, Caraceni A, Brunelli C et al (2005) Prognsotic factors in advanced cancer patients: evidence-based clinical recommendations-A study by the steering committee of the European association for palliative care. J Clin Oncol 23:6240–6248
9. Connors A, Dawson N, Desbiens N et al (1995) A controlled trial to improve care for seriously ill hospitalized patients: the study to understand prognoses and preferences for outcomes and risks of treatments (SUPPORT). JAMA 274:1592–1598
10. Brighton L, Bristow K (2016) Communication in palliative care: talking about the end of life, before the end of life. Postgrad Med J 92:466–470
11. Parker S, Clayton J, Hancock K et al (2007) A systematic review of prognostic/end-of-life communication with adults in the advanced stages of a life-limiting illness: patient/caregiver preferences for the content, style, and timing of information. J Pain Symptom Manage 34:81–93
12. Steinhauser K, Christakis N, Clipp E et al (2000) Factors considered important at the end of life by patients, family, physicians and other care providers. JAMA 284:2476–2482
13. Glare P, Sinclair CT, Stone P et al (2015) Predicting survival in patient's with advanced disease. In: Cherney N (ed) Oxford textbook of palliative medicine, 5th edn. Oxford University Press, Oxford, pp 65–73
14. Hui D (2015) Prognostication of survival in patients with advanced cancer: predicting the unpredictable? Cancer Control 22:489–497
15. Vigano A, Dorgan M, Librarians J et al (2000) Survival prediction in terminal cancer patients: a systematic review of the medical literature. Palliat Med 14:363–374
16. Glare P, Virik K, Jones M et al (2003) A systematic review of physicians' survival predictions in terminally ill cancer patients. BMJ 327:195–198
17. Chow E, Harth T, Hruby G et al (2001) How accurate are physicians' clinical predictions of survival and the available prognostic tools in estimating survival times in terminally ill cancer patients? A systematic review. Clin Oncol 30:209–218
18. Amano K, Maeda I, Shimoyama S et al (2015) The accuracy of physicians' clinical predictions of survival in patients with advanced cancer. J Pain Symptom Manage 50:139–146
19. Mackillop W, Quirt C (1997) Measuring the accuracy of prognostic judgements in oncology. J Clin Epidemiol 50:21–29
20. Dawes R, Faust D, Meehl P (1989) Clinical versus actuarial judgement. Science 243:1668–1673
21. Mor V, Laliberte L, Morris J et al (1984) The Karnofsky performance status scale: an examination of its reliability and validity in a research setting. Cancer 53:2002–2007
22. Yates J, Chalmer B, McKegney F (1980) Evaluation of patients with advanced cancer using the Karnofsky performance status. Cancer 45:2220–2224
23. Anderson F, Downing G, Hill J et al (1996) Palliative performance scale (PPS): a new tool. J Palliat Care 12:5–11
24. de Kock I, Mirhossenini M, Lau F et al (2013) Conversion of Karnofsky performance status (KPS) and eastern cooperative performance status (ECOG) to palliative performance scale (PPS), and the interchangeability of PPS and KPS in prognostic tools. J Palliat Care 29:163–169
25. Lau F et al (2009) Use of the palliative performance scale (PPS) for end-of-life prognostication in a palliative medicine consultation service. J Pain Symptom Manag 965–972

26. Baik D, Russell D, Jordan L et al (2018) Using the palliative performance scale to estimate survival for patients at the end of life: a systematic review of the literature. J Palliat Med 21:1651–1661
27. Prigerson H, Bao Y, Shah M et al (2015) Chemotherapy use, performance status, and quality of life at the end of life. JAMA Oncol 1:778–784
28. Yang F, Markovic S, Molina J et al (2020) Association of sex, age, and eastern cooperative oncology group performance status with survival benefit of cancer immunotherapy in randomized clinical trials: a systematic review and meta-analysis. JAMA Netw Open 3:1–11
29. Ruben D, Mor V, Hiris J (1988) Clinical symptoms and length of survival in patients with terminal cancer. Arch Intern Med 148:1586–1591
30. Ngyen K, Pai V, Rashid S et al (2018) Prognostication in anoxic brain injury. Am J Hosp Palliat Med 35:1446–1455
31. Celli B, Cote C, Marin J et al (2004) The body-mass index, airflow obstruction, dyspnea, and exercise capacity index in chronic obstructive pulmonary disease. NEJM 350:1005–1017
32. Mullerova H, Maselli D, Locantore N et al (2015) Hospitalized exacerbations of COPD: risk factors and outcomes in the ECLIPSE cohort. Chest 147:999–1007
33. Seneff M, Wagner D, Wagner R et al (1995) Hospital and 1-year survival of patients admitted to intensive care units with acute exacerbation of chronic obstructive pulmonary disease. JAMA 274:1852–1857
34. Levy W, Mozaffarian D, Linker D et al (2006) The Seattle heart failure model: prediction of survival in heart failure. Circulation 113:1424–1433
35. Lagu T, Pekow P, Shieh M et al (2016) Validation and comparison of seven mortality prediction models for hospitalized patients with acute decompensated heart failure. Circ Heart Fail 9:1–11
36. Peterson P, Rumsfeld J, Liang L et al (2010) A validated risk score for in-hospital mortality in patients with heart failure from the American heart association get with the guidelines program. Circ Cardiovasc Qual Outcomes 3:25–32
37. Baba M, Maeda I, Morita T et al (2015) Survival prediction for advanced cancer patients in the real world: a comparison of the palliative prognostic score, delirium-palliative prognostic score, palliative prognostic index and modified prognosis in palliative care study predictor mod (57)el. Eur J Cancer 51:1618–1629
38. Kamath P, Wiesner R, Malinchoc M et al (2001) A model to predict survival in patients with end-stage liver disease. Hepatology 33:464–470
39. Wiesner R, Edwards E, Freeman R et al (2003) Model for end-stage liver disease (MELD) and allocation of donor livers. Gastroenterology 124:91–96
40. Sacleux S, Samuel D (2019) A critical review of MELD as a reliable tool for transplant prioritization. Semin Liver Dis 39:403–413
41. Marin J, Carrizo S, Casanova C et al (2009) Prediction of risk of COPD exacerbations by the BODE index. Respir Med 103:373–378
42. Echevarria C, Steer J, Heslop-Marshall K (2016) Validation of the DECAF score to predict hospital mortality in acute exacerbations of COPD. Thorax 71:133–140
43. Delgado C, Baweja M, Burrows N et al (2021) Reassessing the inclusion of race in diagnosing kidney disease: an interim report from the NKF-ASN task force. Jam Soc Nephrol 32:1305–1317
44. White N, Harries P, Harris A et al (2018) How do palliative care doctors recognise imminently dying patients? A judgement analysis. BMJ Open 8:1–9
45. Seow H, Barbera L, Sutradhar R et al (2011) Trajectory of performance status and symptom scores for patients with cancer during the last six months of life. J Clin Oncol 29:1151–1158
46. Hui D, dos Santos R, Chisholm G et al (2015) Symptom expression in the last seven days of life among cancer patients admitted to acute palliative care units. J Pain Symptom Manage 50:488–494
47. Hui D, Santos R, Chisholm G et al (2014) Clinical signs of impending death in cancer patients. Oncologist 19:681–687

48. Solano J, Gomes B, Higginson I (2006) A comparison of symptom prevalence in far advanced cancer, AIDS, heart disease, chronic obstructive pulmonary disease and renal disease. J Pain Symptom Manage 31:58–69
49. Gramling R, Fiscella K, Xing G et al (2016) Determinants of patient-oncologist prognostic discordance in advanced cancer. JAMA Oncol 2:1421–1426
50. Hagerty R, Butow P, Ellis P et al (2005) Communicating prognosis in cancer care: a systematic review of the literature. Ann Oncol 16:1005–1053
51. Dunlay S, Foxen J, Cole T et al (2015) A survey of clinician attitudes and self reported practices regarding end-of-life care in heart failure. Palliat Med 29:260–267
52. Masterson M, Applebaum A, Budda K et al (2018) Don't shoot the messenger: experiences of delivering prognostic information in the context of advanced cancer. Am J Hosp Palliat Med 35:1526–1531
53. Epstein R, Alper B, Quill T (2004) Communicating evidence for participatory decision-making. JAMA 291:2359–2366
54. Perneger T, Agoritsas T (2011) Doctors and patients' susceptibility to framing bias: a randomized trial 26:1411–1417
55. Periyakoil V, Denney-Koelsch E, White P et al (eds) (2019) Primer of palliative care. American Academy of Hospice and Palliative Medicine, Chicago
56. Chang E, Simon M, Dong X (2012) Integrating cultural humility into health care professional education and training. Adv Health Sci Educ 17:269–278