

Prognostication: An art forgotten

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Abstract

Dr. Christian Sinclair, Medical Director of the Providence Medical Centre Palliative Care Team, Kansas defined Medical Prognostication as “a prediction of future medical outcomes of a treatment or a disease course based on medical knowledge”. Some confuse it with ‘fortune telling’. But it is actually fore seeing or foretelling and not talking on behalf of God as the future events are neither created by doctors nor is there a divine angle to it. Of the three main pillars of clinical medicine - diagnosis, prognosis and treatment, the most difficult and unfortunately most neglected is prognosis. Several prediction tools and indices are available but it is important to remember the prognostication triad (disease factors, extraneous factors and treatment modalities available) for proper application of these mathematical tools. Formulating accurate predictions and communicating them effectively can not only help patient and his family to take judicious decisions especially in emergency situation and end of life care but also reduce the miscommunication which is often a reason for dissatisfaction among the patient. Prognostication is a dying art, a lost skill and what Hippocrates had written in 400 BC “Declare the past, diagnose the present, foretell the future; practice these arts” is the need of the hour. The skill needs to be understood, learnt and practised in order to master it.

Key words: Art of Medicine; Prediction tools; Prognostication.

Introduction:

Prognostication is the prediction of the likely outcome of one's present standing. Medical prognostication is a prediction of future medical outcomes of a treatment or a disease course based on medical knowledge. It is a fundamental and a traditional core clinical skill in the practice of Medicine, but unfortunately, forgotten by most. In the “Art and Science” of Medicine, one of the

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important art is the skill of prognostication which like any other skill needs to be acquired, practised and exhibited. Diagnosis, prognosis and treatment are the three main components of clinical medicine and of them prognosis is most complex and difficult.

Need for prognostication

For the physician it is important to prognosticate as it directs decision making and management strategy. It helps in classifying patients into meaningful groups by scientists and researchers for comparison. The health care analysts calculate the cost effectiveness of a particular treatment protocol based on the prognosis. In addition, the patient and his family needs to be assisted in taking judicious medical decisions which are directed and not just bothersome.²

History

Hippocrates in his Book of Prognostics written in 400 B. C has the opening remarks “It appears to me a most excellent thing for the physician to cultivate prognosis; for by foreseeing and foretelling, in the presence of the sick, the present, the past, and the future, and explaining the omissions which patients

have been guilty of, he will be the more readily believed to be acquainted with the circumstances of the sick; so that men will have confidence to entrust themselves to such a physician.”³ In 19th century physicians practicing the French school of Medicine had the main aim of arriving to a diagnosis and offering a satisfying prognosis while curing the disease was secondary. With the shift to Western Medicine the focus shifted to curing the disease. Medical textbooks of end 19th century devoted ten percent to the topic of prognostication but by 1950 it started decreasing and finally there is no mention regarding prognostication in the text books even today.

Prognostication and Bioethics

Expectation of the patient is an accurate, optimistic yet honest prognosis from the physician, which is often impossible. As a result, physicians find themselves in a situation of “Sociological ambivalence” i.e. a situation that embodies contradictory demands placed on the occupants of a particular social role. Foreseeing and foretelling are two distinct elements of prognostication. Foreseeing is a physician’s inward cognitive estimate about the future course of a patient’s illness and foretelling is the physician’s outward communication of the estimate to the patient. To respond to the daunting task of prognostication, physicians sometimes resort to religious or magical overtones which is not acceptable in the biomedical context. While unfavourable predictions are difficult to formulate and communicate, the favourable ones increases the onus on the physician. Favourable predictions, whether volunteered by physicians or elicited by patients make the patient belief that the physician will cause the favourable outcome that he has predicted.⁴

To further clarify the role of prognosis in bioethical decisions, a situation of bioethical reasoning about the withdrawal of life support can be discussed. The questions which may arise- The patient is going to die life support is of no further benefit and may be harming the patient. Should we withdraw life support? This pattern of reasoning often neglects issues like how do we know that the patient is going to die? How do we know that there is no further benefit in continuing with the same? Are we authorised to make such predictions? What if the predictions are wrong? What if other external factors influence the

predictions? What if the predictions contribute to the outcome and change the ‘reality’ of the situation?

Prognostication triad

The complexity of Prognostication is based on several factors which is depicted by the prognostication triad. (Fig. 1)

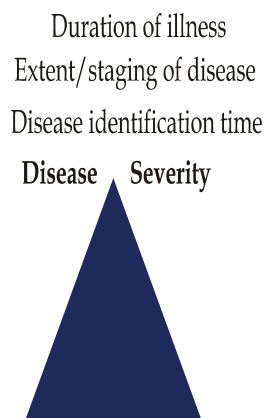


Fig. 1: Prognostication Triad

Treatment	Extraneous Factors
Drugs	Co morbidities
Effects/side effects	Age/sex
Efficacy of Drugs	Genetic factors
Consultant’s Expertise	Environmental influence

Commonly used estimators are:

1. Prognosis- free survival:
The period during and after treatment in which the disease being treated does not get worse.
2. Survival rate:
Percentage of people in treatment group who are alive for a period of time after diagnosis.
3. Survival time:
The duration of life remaining from the time of diagnosis.

Predicting tools

Though several prognostic tools are available and applicable to specific population but accurate predictions are impossible and an universal tool for all diseases also cannot be recommended as of now. The tools are mostly research oriented and its application in clinical scenario is often limited. Predictive accuracy of weather forecasting has improved due to advancement in data collection techniques, innovative analytical methods

and information science. More accurate and individualized prognostication tools are required in order to progress in precision medicine. Identification and validation of key variables and integrating them into algorithms have improved the value of these tools. Efforts should be made for centralized, coordinated uniformity in development and standardisation in application; only then the consistency, utility and quality of the existing and quality of the existing prognostication tools will improve. Reasonable estimates can be calculated by simple mathematical modelling techniques but for prognostication more precise estimates and restoring prognostication as a core clinical proficiency is important. Further research is required in order to integrate validated prediction models with clinical predictions of survival.

Of the various prognostic tools and scales that are available, the most frequently used ones are those based on the patients functional status viz.

Karnofsky Performance Score (KPS)

David Karnofsky, an American oncologist, in 1949 stratified patients with terminal illness on a scale of 100 (fully functional) to 0 (dead). Self-care,

burden of illness and activity are taken into account. This scale (Table 1) is more applicable to research settings rather than clinical application. Only 10% of patients with less than 50% score survive more than 6 months

Table 1: Karnofsky Performance Score (KPS)

%	Creteria
100	Normal; no complaints; no evidence of disease
90	Able to carry on normal activity; minor signs or symptoms of disease
80	Normal activity with effort; some signs or symptoms of disease
70	Cares for self; unable to carry on normal activity or to do active wor
60	Requires considerable assistance and frequent medical care
50	Disabled; requires special care and assistanc
40	Severely disabled; hospitalisation is indicated, although death not imminent
30	Severely disabled; hospitalisation is indicated, although death not imminen
20	Very sick; hospitalisation necessary; active support treatment is necessar
10	Moribund; fatal processes
0	Dead

Palliative Performance Scale (PPS)

Table 2: Palliative Performance Scale (PPS)

%	Ambulation	Activity level Evidence of disease	Self-care	Intake	Level of Consciousness	Estimated median survival in days		
100	Full	Normal No disease	Full	Normal	Full	(a)	(b)	(c)
90	Full	Normal Some disease	Full	Normal	Full	NA	NA	108
80	Full	Normal with effort Some disease	Full	Normal	Full			
70	Reduced	Cant do normal job or work Some disease	Full	Normal or reduced	Full	45		
60	Reduced	Cant do hobbies or housework Significant disease	Occasional assistance needed	As above	Full or confusion	29	4	
50	Mainly sit/lie	Cant do any work Extensive disease	Considerable assistance needed	As above	Full or confusion	30	11	41
40	Mainly sit/bed	As above	Mainly assistance	As above	full or drowsy or confusion	18	8	
30	Bed Bound	As above	Total Care	Reduced	As above	5	E	
20	Bed Bound	As above	As above	Minimal		4	2	6
10	Bed Bound	As above	As above	Mouth care only	As above	1	1	
0	Bed Bound							

Palliative Performance Scale (Table 2) is a modification of KPS which has incorporated additional functional domains like level of consciousness, ambulation, level of disease and oral intake. This scale is useful for application to patients in the community as well as clinic.

Palliative Prognostic Index (PPI)

In Palliative Prognostic Index (Table 3) apart from PPS and oral intake, symptoms (dyspnea, delirium) and signs (edema) are also taken into account. It has a sensitivity of 80% and a specificity of 85%. PPI of more than 6.0 has a survival of less than 3 weeks.

Table 3: Palliative Prognostic Index

Variable	Partial Score	Value
PPS		
10-20	4	
30-50	2.5	
60+	0	
Oral Intake		
Severely Reduced	2.5	
Moderately Reduced	10	
Normal	0	
Edema		
Present	1.0	
Absent	0	
Dyspnea at Rest		
Present	3.5	
Absent	0	
Delirium		
Present	4.0	
Absent	0	
Total Score	6 week survival	
	PPV	NPV
	0.83	0.71

Palliative Prognostic Score (PnP) is also used for prognostication (Table 4).

Table 4: The Palliative Prognostic Score (PnP)

Criterion	Assessment	Partial Score
Dyspnea	No	0
	Yes	1
Anorexia	No	0
	Yes	1.5
Karnofsky Performance Status	≥3	0
	10-20	2.5
Clinical Prediction of Survival (weeks)	> 12	0
	11-12	2.5
	7-10	4.5
	5-6	6
	3-4	8.5
	1-2	8.5

Total WBC (x10 ⁹ /L)	≤8.5	8.6 - 11	0
	>11		0.5
Lymphocyte Percentage	20-40%		0
	12-19.9%		1
	<12%		2.5
Risk Group	30 Day Survival		Total Score
	A		0.55
B	>70%		0-5.5
C	30-70%		11.1-17.5

Several validated disease specific (organ specific) prognostication scales are available, viz

1. Cardiac (NYHA class, Seattle Heart Failure Model)
2. Pulmonary (BODE Index)
3. Renal (Age modified Charlson Comorbidity Index)
4. Hepatic (MELD Score in end stage liver disease)
5. Dementia (FAST staging, Mortality Risk Index)
6. CHF-OPTIMIZE-HF (Heart failure quality improvement study normogram)

Biochemical parameters

Several biochemical parameters predict poor prognosis and maybe used individually or in combination.

- Low serum Albumin denotes long standing malnutrition
- High TC / Low lymphocyte % denotes immunosuppressive state of the patient.
- Persistent hyponatremia in spite of corrective measures.
- Thrombocytosis is a negative prognostic indicator in multiple cancers.
- High serum Bilirubin denotes active liver failure or sepsis.
- High Alk. Phosphatase denotes increased metabolic state at present.
- High LDH indicates high cell metabolism.
- High CRP denoting increased metabolism / cell turnover.
- Vit B 12 >600pmol/L in Hematologic disorders like chronic myelogenous leukaemia, polycythaemia vera, promyelocytic leukaemia, hyper eosinophilic syndrome, acute hepatitis, hepatocellular carcinoma, cirrhosis and metastatic liver disease.

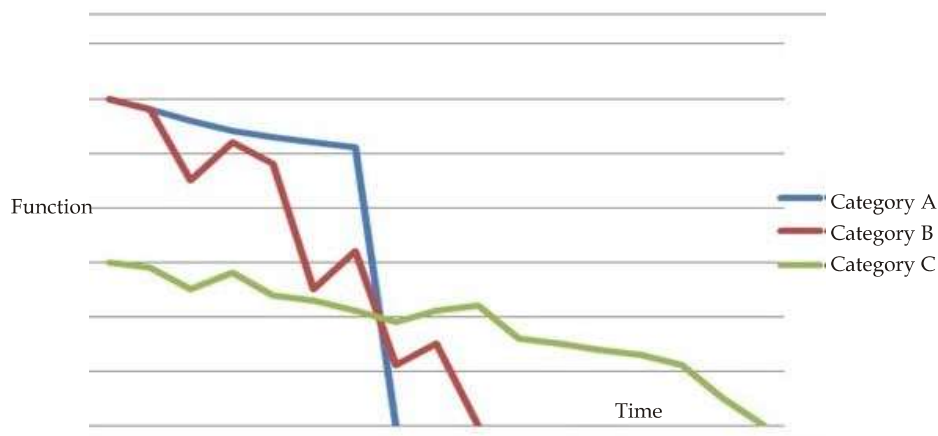


Fig. 2: Advanced disease trajectories

- Uric Acid $>7.2/\text{dl}$ denotes high cell turnover and hyper metabolism.

Majority of the advanced disease trajectories fall into one of three categories (Fig. 2)

1. Category A: Seen in malignancy where functional status of the patient is maintained for months to years when an acute event leads to mortality.
2. Category B: Often seen in chronic obstructive airway diseases and congestive cardiac failure. It is characterised by slow decline due to episodes of acute decomposition with partial recovery.
3. Category C is seen in diseases which usually has at onset, functional or cognitive deficits. Example. Dementia, chronic neurological diseases etc. At a variable interval from onset there is progressive decline.⁵

Functional incapacitation caused by the disease is also an important parameter which should be considered along with the trajectory curve.

Approach for discussing prognosis

Communicating the prognosis is a difficult task. No formal training is included in the medical education. Finlay and Casarett reinforce SPIKES protocol, developed by Walter Baile, as a good tool.

The first step is setting (S) of the discussion which includes the preparation of the physician and the patient (and family members) as well as the physical environment. The second step is perception (Prognostication) i.e. to assess how much patient understands about his disease. The third step is Invitation and information (I), i.e. understanding

patient's preference regarding the quantity and the context of what patient desires to hear. The fourth step is knowledge (K) i.e. after ensuring S, P and I, the actual information is delivered to the patient and family. The next step is Emotion and empathy (E) i.e. understanding the patients (and family members) reactions and emotions as well as clarifying any further doubts. Finally 'S' is for summarizing and strategizing in order to ensure that the discussion has been understood. This is not the end, the physician should subsequently help patient and relatives to take meaningful decisions.

Several studies have demonstrated physicians tendency to overestimate survival as they rely more on clinical predictions. It has been observed that average of several physicians prognosis is often more accurate than that of a single physician. It is best to deliver prognosis in terms of time frame rather than specific time periods i.e. Hours to days or days to weeks or months to years etc.

When communicating a prognosis it is necessary to consider cultural and personal differences as well as patients desire pertaining to method of delivery and quantum of information. The corner stone of patient centred care and prognostic conversation is good communication.

In a seriously ill patient it is a daunting task to have a meaningful conversation in an emotionally charged environment. All the participants i.e. the patient, the family members and the clinicians should have a supporting communication behaviour in order to create a model of communication that address the dynamics.

Conclusion

Clinician's accuracy in determining prognosis is aided by the disease specific prognostication tools. However, Physicians clinical experience and intuition should not be ignored and should add to the skill. In a review by Innes and Payne's in 2009 on whether the patients want to know their prognosis, majority of the patients wanted some information about their future in an honest way. Integrated validated prediction models with clinical predictions of survival and formal training in the medical education can make today's physicians' better prognosticators.

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