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Survival Prediction of End Stage Cancer Patients: A Quick Review

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Abstract

Survival prediction for end stage cancer patients remains an important task in Palliative Medicine. Previously more of an art form, survival prediction has now become increasingly objective, utilizing statistical estimates of survival. Both clinician prediction survival and actuarial estimation of survival have their uses and drawbacks. This article examines the pros and cons of each and how both can be utilized at the bedside.

Keywords: Survival prediction; Palliative cancer patients; Prognosis; Review; Prognostic tools

Introduction

Patrick Young [1] was quoted as saying, "the trouble with weather forecasting is that it is right too o en for us to ignore it and wrong too o en for us to rely on it ". As with weather forecasting, survival prediction of terminally ill cancer patients is an attempt to apply objective actuarial data to a circumstance with an in nite number of variables. For many physicians, nurses and other allied health care professionals, formulating and conveying survival predictions can be a daunting task [2]. However, survival prediction for end stage cancer patients remains an important task in Palliative Medicine [3]. Previously more of an art form, survival prediction has now become increasingly objective, utilizing statistical estimates of survival [4], with the use of actuarial estimation of survival (AES), presented as scores or indexes. Clinician prediction of survival (CPS), on the other hand, depending on the clinician's experience and clinical context, formulates a survival prediction, usually in the form of a temporal prediction. To be able to use both CPS and AES tools for survival prediction require understanding of the pros and cons of each.

Survival prediction is helpful for the following reasons:

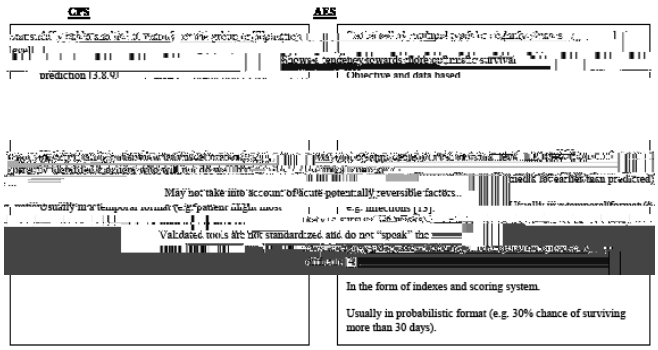
- Helps to determine goals of care and decision making by patients and families; medical decision-making by the health care team e.g. to proceed or not proceed with life sustaining treatments such as intravenous anti-biotics and transfusions.
- Patients and families want to know.
- Helps to determine the most appropriate care in the best possible setting e.g. hospice eligibility criteria.
- Resource allocation and future policy planning e.g. subsidized palliative drug plan coverage.
- Potential common language for health care practitioners who are involved in end of life planning.

Factors In uencing Survival in Advanced Cancer

Around 150 variables have been studied to predict survival [5,6]. When formulating survival prediction in the early stages of cancer, tumor pathology, co-morbidities and response to oncologic therapy are of greater importance. However, during the latter stages of cancer (e.g. stage IV metastatic small cell lung cancer), performance status, anorexia, systemic in ammation, lymphopenia, edema, symptoms like delirium, dyspnea and dysphagia become more important predictors. Many actuarial prognostic tools are based on these prognostic factors that occur during the later stages of the cancer e.g. delirium, dyspnea, poor performance status etc). A more detailed look at the variables that have either a de nite or possible impact on survival prediction can be found in Table 2 of Dr Paul Glare's paper [3] and being familiar with these factors can be very helpful.

Clinician Predicted Survival (Cps) Versus Actuarial Estimation of Survival (Aes)

Some of the features, including advantages and disadvantages of CPS and AES are summarized as follows:



Statistical Methods Employed in Aes

ere are a myriad of statistical methods employed in these AES [14]. Common methods include survival curves, with potential problems of censoring and patients lost to follow up. Receiver operator characteristics curve is also o en used to assess discrimination for binary responses e.g. alive or dead. Multi-variate analysis is o en used but not all patients have the same set of factors due to the heterogeneity of end stage cancer patients. A more detailed description of the statistical methods can be found in the paper by Bartfay [14].

Discussion

CPS is a complex, dynamic process, taking into consideration patient and disease related factors, performance status, symptom burden, and disease trajectory and laboratory markers. It does not do so in a vacuum without observation and data, thus some actuarial

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e other disadvantage is that it does not include delirium which is an important prognostic factor. De nitions of symptom based prognostic factors in the Palliative Prognostic Index (PPI) and PaP are di cult to dichotomize as symptoms including dyspnea, appetite and delirium are always on a continuum, with subjective interpretation (Table 1). e Palliative Performance Scale (PPS) may not be su ciently discriminatory for prediction survival and mid range PPS levels may be harder to interpret [3]. Even biological parameters, (e.g. in ammatory markers), may not be readily accessible and potentially confounded by acute medical events e.g. superimposed infections.

Other prognostic tools may have the problem of irrelevant time information is incorporated in the CPS, with the potential to acquire more new information as patients develop more medical problems. However, miscalibration remains a problem where patients may potentially be over treated or have a late palliative referral if the actual survival is shorter than predicted. On the contrary, potential under-treatment or a premature palliative referral, if the actual survival is longer than predicted.

Additionally, the actuarial survival data is not independent of bias, an example being the varied interpretation of functional status scales and symptoms. Still, like weather forecasting, survival prediction, despite its fallibility, can help us avoid certain "hazards". In the case of end stage cancer patients, these "hazards" may mean overly aggressive treatment or transfer to an inappropriate location of care. e need for accurate prognostication in determining goals of care and care planning necessitates our pursuit to further de ne and validate clinical factors e.g. delirium, anorexia etc.

Various AES palliative prognostic tools (see appendix A on some examples of AES tools) have been developed to improve the prognostic inaccuracy of the clinician prediction survival. e evidence of the predictive value of the Palliative Performance (PaP) score is among the best. However, each palliative prognostic tool has its own drawbacks [3]. For example, being constrained to the 30 day limit and needing blood work in the PaP tool may not practical in certain settings (e.g. hospice or near death) and not ideally applicable to Onco-hematological patients.

understanding, a CPS can then be formulated. e clinician at the bedside will take the overall clinical situation into consideration with a validated AES tool (e.g. PaP, PPS) and formulate the survival prediction (e.g. 3 to 6 weeks) relevant to the individual patient, clinical context and hospice criteria. However, future studies will need to be done to validate this approach.

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