Commentary

Commentary on Masel *et al*. Predicting discharge of palliative care inpatients by measuring their heart rate variability

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Abstract: The accurate determination of prognosis is a challenging and important aspect of end of life care. A more accurate prognosis provides patients and their families' time to plan and prepare for the end of life, and prioritize care based on individual goals and values. While a number of prognostic tools and indices provide insight into a patient's general prognosis, the use of heart rate variability (HRV) as a predictor of live discharge from a palliative care unit (PCU) is a unique approach to exploring non-invasive ways for more accurate prognostication.

Keywords: End of life; prognostic tools; heart rate variability (HRV)

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Mr. J is a 50-year-old man with metastatic colon cancer admitted to the palliative care unit (PCU) for management of worsening pain and nausea. He has a large and supportive family, and his goals are to return home as quickly as possible. He was able to perform all of his basic activities of daily living at home, and his family is looking forward to a short stay in the PCU so that he can make an upcoming family reunion. Mr. J requires a significant amount of opioids for pain control, and as a result becomes more sedated. He shows signs of clinical deterioration after an aspiration event, and dies while in the PCU one week later. His family is distressed that he died so quickly and was not able to make the reunion, and wonders if there was a way they could have predicted his outcome and brought him home sooner.

The likelihood of discharge home from a PCU is a salient and challenging issue not only for patients and their families, but for healthcare providers as well. The article by Masel and colleagues (1) provides an interesting glimpse into the challenges of predicting the likelihood of live discharge from an inpatient PCU, and attempts to identify a predictive tool based on the use of heart rate variability (HRV) measurement. HRV measurement is a non-invasive tool used predominantly in the cardiology and anesthesiology fields, and the potential for prediction of live discharge from a PCU has not previously been studied. While 55% of patients enrolled in the study died in the PCU, it seems that this is not the expectation: rather, patients are admitted for management of acute symptoms with the hope of live discharge. Identifying a tool such as HRV measurement to predict live discharge can help patients and their families better prepare for the road ahead, and help tailor care to a person's unique goals and values.

Using a prospective, single-center cohort study of 60 enrolled patients admitted to the Medical University of Vienna Palliative Care Unit, the authors identified no significant correlation between HRV and live discharge from the unit. The authors did find a significantly higher functional performance status in discharged patients compared to patients who died in the PCU based on the KPS and PPS measures. Correlation between HRV and actual prognosis was listed as an area of further study and not explored in this article.

A similar study was just published in the *Journal of Pain and Symptom Management* which focused on vital sign variation in patients who died in the PCU and whether there was an association between vital sign changes and impending death (2). They found that a large proportion of patients had normal vital signs on the day of death and that, at best, vital sign variation had a low positive likelihood ratio for a patient dying in the next three days.

The study by Masel and colleagues magnifies one of the most challenging aspects, not only of palliative care, but of medicine in general: the accurate determination of prognosis. A clear understanding of prognosis helps patients and their families plan and prepare for the end of life, and this time to prepare significantly impacts coping and grief (3). While some patients are not interested in knowing their prognosis, others can think of nothing else when given a terminal diagnosis and struggle between wanting to know the truth and maintaining hope (4). Simple, non-invasive measures to assist in determining prognosis may be helpful, but as the authors suggest should always be factored into the patient's general condition, and specific goals and values.

There are certain conditions with better prognostic validity. For example, in one study the development of respiratory secretions (aka "death rattle") was correlated with less than 48 hours of survival in roughly 75% of patients (5). Recent studies have shown that prognostic indices (such as the Palliative Prognostic Score and the Palliative Prognostic Index) are helpful in predicting survival in terms of weeks or months (but these use clinical judgment as a large part of their determination) (6). Certain diseases and clinical conditions are associated with relatively predictable prognoses. For example, a diagnosis of multiple metastatic brain lesions without radiation therapy carries a prognosis of 1-2 months, compared to 3-6 months with radiation therapy (7). With a general sense of prognosis known from the above measures, as well as the KPS and PPS tools referenced in the study, is there any added benefit to more precise prognostication?

More accurate prognostication is important for many reasons, particularly in an inpatient setting such as a PCU. Not only does it allow family time to plan and prepare, it gives healthcare teams time to organize appropriate support systems and resources such as hospice. A better sense of one's prognosis can lead to improved resource utilization, timely discussion of goals, and care focused on the patient's values. This, in turn, may lead to fewer hospital readmissions and a decrease in the administration of unwanted interventions at the end of life. For example, if a patient is admitted to a PCU and determined to have a poor prognosis and low likelihood of live discharge, arrangements could be made to discharge him sooner and arrange for supportive services so that he may die comfortably at home. Any transition of care, particularly at the end of life, carries its own psycho-social-emotional implications—as such, any way to more specifically predict prognosis, through HRV or other means, may be helpful as long as the patient and family are interested in knowing this information.

As the authors suggest, further investigation is necessary to identify more accurate predictors of prognosis at the end of life—the article adds to the growing literature addressing this issue, and is a very interesting exploration of non-invasive technology as applied to a very challenging situation.

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