

Predicting Death at the Time of Admission to a Medical Teaching Unit: A Retrospective Case Control Study

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About the Authors

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Case

An 81-year-old diabetic man with known chronic obstructive pulmonary disease (COPD), severe systolic heart failure, and chronic renal insufficiency was brought to hospital with a 3-week history of progressive dyspnea, orthopnea, and PND. He had a cough productive of bloody phlegm. He is followed by the heart function clinic, which recently started him on morphine in addition to furosemide 80 mg bid, ramipril 10 mg od, spironolactone 25 mg od, warfarin 2 mg od, nitroglycerin patch 0.8 mg/h daytime, and bronchodilator therapy. He is compliant with HF treatment.

His examination revealed a breathless man (RR 20), who was wheezy. His pulse was 70, regular, his blood pressure 120/60, his JVP elevated to 6 cm, and he had marked leg edema. His heart sounds were quiet, and bilateral inspiratory crackles were present on auscultation of the lungs.

Laboratory testing revealed normal electrolytes, BS 9.4, BUN 46.8, Cr 470 (usual is 370). Hemoglobin 86 normocytic, white count 8.4, INR 4.5. Arterial blood gases on room air showed pH 7.47, Pco₂ 39, Po₂ 48, and bicarbonate 27. A chest radiograph showed bilateral fluffy infiltrates and effusions. EKG showed a paced rhythm at 70 bpm. Urinalysis was normal. His ejection fraction was known to be <20%.

Assessment: advanced cardiac and renal failure in a diabetic patient with COPD.

Questionnaire

1. How reversible is the patient's overall condition?
 - a. Not reversible
 - b. Neutral
 - c. Reversible
2. How likely is the patient to die on this admission?
 - a. Very likely
 - b. Neutral
 - c. Unlikely
3. How relevant are palliative and comfort care to this admission?
 - a. Very relevant
 - b. Neutral
 - c. Not relevant
4. What treatments/goals would you recommend?
 - a. Comfort as primary goal of treatment

- b. Comfort measures plus "ward-based treatments" such as intravenous therapy to prolong life
- c. All potentially effective treatments, including cardiopulmonary resuscitation and admission to the intensive care unit as needed

Background

Over half of all deaths in Canada occur in hospital, frequently after prolonged trials of life-sustaining treatments.¹ Of the approximately 2,500 deaths each year in the Capital District Health Association in Halifax, Nova Scotia, 1,250 occur in hospital with 350 on the medical teaching unit (MTU), the most in any single hospital location. The average terminal length of stay on the MTU is 30 days, approximately twice as long as stays for patients who are discharged alive. Most MTU patients suffer from organ failure such as congestive heart failure, chronic lung disease, or progressive neurological diseases such as Alzheimer's disease. Palliative care is difficult to provide for these patients. One report from Manitoba found that only 12% of patients suffering from organ failure died on a palliative care ward. In contrast, 81% of patients with a predictable terminal illness course did.²

At our centre, all deaths on the MTU are reviewed monthly by attending physicians and discussed at morbidity and mortality rounds. These reviews, along with interviews of family members of patients who died on the teaching units,³ have demonstrated that end-of-life care goals and treatments are sometimes provided late in the course of an admission and only after curative efforts have failed. This sequential approach to providing palliative care can greatly delay the provision of palliative care. In some cases, comfort care orders are written several weeks after admission and only a day or so before death.

Identifying and talking about end-of-life goals and patient preferences for treatment earlier in the course of a patient's terminal admission is possible.⁴ Earlier conversations could increase the duration of palliative care and allow greater patient and family input into the setting of treatment goals and ultimately result in a better quality of death.⁵ Earlier proactive conversations could also increase the chance of a patient dying at home, if this is desired.

There are two approaches to more fully integrating palliative care into the "usual" care of patients admitted to the MTU. First, patients at high risk of dying could be identified at admission to receive concentrated efforts to improve end-of-life care. Such dichotomous

thinking (patients are living or dying, rather than both) likely hinders effectively integrating palliative and curative treatments. This is particularly unfortunate in tertiary care centres as expertise in end-of-life care is readily available.

Alternatively, one could systematically address palliative treatments and goals with patients felt to be at any significant risk of dying, recognizing that some patients would receive palliative treatments and survive. One heuristic approach that has been proposed to encourage this type of thinking is for physicians to ask themselves if they would be surprised if a patient were to die during a certain period of time. Answering “no” to this question is an important step toward integrating acute and palliative care goals.⁶ Since prognostic accuracy discriminates these two approaches, we sought to determine the extent that a patient’s prognosis could accurately be determined based upon data extracted from the admission histories and physical examinations.

Objectives

The objective of the study was to determine how similarly attending staff and internal medicine residents evaluate patient prognosis, disease reversibility, relevance of palliation, and the appropriate treatment options for patients being cared for on the MTU. Three specific questions were addressed:

1. How accurate are the physicians, as a group, at assessing patient prognosis and treatment options?
2. Is there a difference in accuracy between attending physicians and residents?
3. To what extent do physicians choose a wide variety of treatment options for any particular patient?

Participants and Methods

Ten participants completed the survey. Four were internal medicine residents (R2 and R3 levels), and six were experienced attending general internists. Case summaries created for eight patients were based upon data abstracted from the histories and physical examinations completed at the time of admission (see opening case description). The cases involved four consecutive patients who died after more than 48 hours in hospital. Four age- and sex-matched patients admitted during that time who survived to discharge were used as a comparator group. For each patient, participants answered four questions on a 1–3 scale (see the questionnaire).

Ethics

Research ethics board approval for this study was obtained. Informed consent was obtained from all physician participants.

Outcomes

Increasing experience was not associated with increased prognostic accuracy. Other studies have shown that intuitive beliefs about prognostic accuracy are not necessarily accurate. For example, the longer a doctor has cared for a patient, the less accurate is his or her prognostic assessment.⁷ In all cases, residents’ assessments were equally or more accurate than those of attending physicians, although the results were not statistically different. Self-assessed confidence in

assessments was not correlated with accuracy.

The ability to accurately assess prognosis at admission is limited. In one case, all participants correctly determined that a patient was going to die. For three other scenarios, participants chose two of the three options for each question, demonstrating some agreement. In the four remaining cases, all three options for each question were chosen at least once.

The sensitivity of the assessment in identifying patients who could survive is high. In only two instances (2/40 [5.0%]) did a participant indicate that a trial of active therapy was clearly not indicated for a patient who ultimately survived. This suggests that multiple independent assessments could potentially identify patients in whom a trial of life-sustaining treatments is not indicated. However, a larger, nonretrospective study would be necessary to support or disprove this hypothesis. Similarly, in only one case did one respondent (1/40 [2.5%]) indicate that palliative care was irrelevant to a patient who ultimately died.

Limitations

This study was retrospective. Face-to-face contact with patients could alter prognostic accuracy. The small sample size limits the ability to determine the exact impact that clinical experience has on prognostic accuracy. Finally, patients referred for admission to our MTU frequently have progressive and ultimately fatal illnesses, and our control population was age matched. The results should not be applied to younger patients with more acute illnesses or diseases with a more predictable clinical outcome.

Discussion

While the sample size is small, the results suggest that physicians are not able to prospectively identify the majority of patients admitted to a medical teaching unit who are going to die during a particular hospital admission, although the consensus reached in one case out of eight suggests that this identification is sometimes possible. There was no evidence to suggest that experience improves prognostic accuracy. Our findings are consistent with the medical literature and suggest that high-quality end-of-life care and palliative treatments could be provided throughout a patient’s terminal hospitalization if palliative treatments are initiated during, rather than after, a trial of life-sustaining treatments.

Given the high sensitivity of the assessment process to identify palliative care as relevant to all of the patients who ultimately died, it could help identify patients for whom end-of-life care should be carefully initiated. This requires that physicians effectively communicate about prognostic uncertainty and death and dying. A semistructured approach to help physicians talk with patients and their family members about end-of-life care in situations of prognostic uncertainty, and throughout a trial of life-sustaining treatment, is available.⁸

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Short Snapper

Vitamin D: The New Panacea?

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Vitamin D regulates calcium and phosphate absorption (needed for bone calcification); is antiproliferative on breast, prostate, colon, and skin cells; suppresses immune cells; and enhances muscle strength due to the presence of vitamin D receptors in these tissues. These actions have led to the investigation of vitamin D efficacy in reducing falls, as an immune modulator, and as an anticancer agent.¹

Vitamin D deficiency continues to be prevalent in Western countries, with low vitamin D levels (<50 nmol/L) in 36–57% or more of patients; 27–97% of osteoporosis patients demonstrate levels <30 nmol/L. Above 37° latitude (Atlanta, Georgia), almost no vitamin D is made in the skin between November and March; hence, approximately half the population in these latitudes have vitamin D levels <50 nmol/L. The new recommended intake of at least 800 IU/d is not achievable with current levels of food fortification (e.g., there are 100 IU vitamin D in a glass of milk). Thus, supplementation is necessary. While 800 IU/d generally results in serum levels of >75 nmol/L or more, it may be necessary to measure the 25 OH D₃ level to confirm this.

A goal of therapy is a vitamin D level >80 nmol/L. Inadequate vitamin D levels can be a cause of a poor response to antiresorptive therapy in osteoporosis patients. Doses of 2,000 IU/d, and possibly up to 10,000 IU/d, have not been shown to be harmful.² Interestingly, possible benefits in fracture reduction or cancer prevention only occur with supplements of 800 IU/d or more.

Randomized controlled trials (RCTs) show that taking calcium and 800 IU/d of vitamin D results in a 26% reduction in hip fractures and a 23% reduction in spine fractures, if there is high compliance. An intake

of 800 IU/d vitamin D is associated with a 22% reduction in the incidence of falls. Most epidemiological evidence has suggested an increased incidence of colon, prostate, and breast cancers if vitamin D levels are <50 nmol/L. Few RCTs have been done to corroborate these associations. One small study of 1,179 women using 1,100 IU/d vitamin D showed an all-cancer risk reduction of 60%.³ The Women's Health Initiative did not show any cancer reduction with 400 IU/d vitamin D, but the placebo arm (not receiving estrogen) showed a 29% reduction in colon cancer, indicating an interaction with other hormones. Doses >800–1,000 IU/d are therefore likely needed for its anticancer action. There is also an intriguing reduction in all-cause mortality seen in a meta-analysis of RCTs of vitamin D that needs to be verified.⁴

Currently under development are vitamin D analogues with a high potency for selective noncalcemic actions that may someday succeed in significantly altering disease – compared with the borderline results obtained to date with available vitamin D preparations.

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