

## Commentary

# Do-not-resuscitate orders, unintended consequences, and the ripple effect

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## Abstract

Do-not-resuscitate (DNR) orders are commonly implemented in the critical care setting as a prelude to end-of-life care. This is often based on presumed prognosis for favorable outcome and interpretation of patient, family, and even physician wishes. While DNR orders explicitly apply only to an individual patient, the hospital culture and milieu in which DNR orders are implemented could potentially have an overall impact on aggressiveness of care across patients. As illustrated by the example of intracerebral hemorrhage, this may unexpectedly influence outcome even in patients without DNR orders in place.

Improving end-of-life care in the critical care setting has justifiably become an increasing priority [1]. In patients with severe neurological impairment due to stroke, head trauma, hypoxic-ischemic brain injury after cardiac arrest, and other conditions, decisions to limit or withdraw care are often made based on perception of a poor prognosis for functional outcome. The decision to limit care, however, is predicated on the assumption that the prognosis is known and accurate. The possibilities that prognostic inaccuracy early after stroke and head trauma might lead to decisions to limit care and that these care limitations might create 'self-fulfilling prophecies' of poor outcome in individual patients have been considered [2,3]. Is it also possible that a hospital milieu in which care limitation is commonly sought might also influence overall aggressiveness of care for other patients as well?

The 1983 US President's Commission on Deciding to Forgo Life-Sustaining Treatment [4] stated 'Any DNR policy should ensure that the order not to resuscitate has no implications for any other treatment decisions.' Even so, do-not-resuscitate (DNR) orders are often the first step in a continuum of limitations of care, especially in acutely hospitalized patients [5]. Patients with DNR orders are more likely to die, including those with stroke [6]. Furthermore, the effect of DNR orders is frequently manifested by physicians being more likely to withhold other therapeutic interventions, and even being less

likely to institute them in the first place [7]. Considerable variability has also been documented in the use of DNR orders [8,9], which raises the concern that variability in decision-making regarding DNR orders might reflect larger variability in aggressiveness of care that could influence patient outcome irrespective of code status. We sought to begin to address this question using spontaneous intracerebral hemorrhage (ICH) as a case example.

ICH accounts for about 15% of all stroke. With a 30-day mortality rate of about 40% and only about 20% of survivors independent at a year, ICH prognosis is often poor – although prognosis is dependent on a variety of factors such as the Glasgow Coma Scale score on admission, hemorrhage location and size, concurrent intraventricular hemorrhage and hydrocephalus, and patient age [10,11]. As of writing the present article, ICH is also without an approved treatment of proven benefit in reducing mortality and morbidity. This has led to great heterogeneity in ICH care, with approaches ranging from the very aggressive to the nihilistic [12].

We hypothesized that the rate at which a hospital uses DNR orders within the first 24 hours after ICH influences patient outcome irrespective of other hospital and patient characteristics. Early DNR orders were chosen because this means that one of the very first medical decisions made for an ICH patient was to limit care in some manner.

From a California-wide hospital discharge database, 8,233 ICH patients treated at 234 different hospitals were reviewed. Interestingly, the rate at which a hospital used DNR orders for ICH patients within the first 24 hours independently increased the odds of individual patient death, even after adjusting for numerous patient characteristics (age, race, gender, insurance status, medical comorbidities, mechanical ventilation as a surrogate for coma) and hospital characteristics (number of ICH patients treated, trauma

DNR = do not resuscitate; ICH = intracerebral hemorrhage.

center or rural hospital, teaching hospital, rate of craniotomy for ICH) [13]. Even more importantly, there was an interaction between an individual patient's DNR status and the hospital DNR rate (adjusted for case mix). This means that it not only mattered *whether* a patient was DNR (within 24 hours of admission), but it mattered in *which* hospital that patient was of DNR status. Patients with the same DNR status were treated differently in different hospitals, even accounting for other patient and hospital characteristics, and this influenced their outcome. Interestingly, the group of hospitals with the highest early DNR rate (adjusted for case mix) had lower rates of intubation and mechanical ventilation, craniotomy, ventriculostomy, and cerebral angiography for ICH patients. They also had shorter lengths of stay and lower total costs per patient.

What does this information tell us? Are DNR orders in some patients killing other patients? No. What this means is that there is something in the way overall care is delivered in these 'high-DNR' hospitals that is increasing the risk of death in individual patients treated at those hospitals, irrespective of code status. The early DNR rate of the hospital (case mix adjusted) is acting as a proxy for overall aggressiveness of care. Even in the absence of a proven treatment for ICH, nihilism is ineffective.

For severe neurological disorders such as ICH, functional outcome may be even more important than mortality. It is possible that the physicians in high-DNR hospitals are vastly superior at predicting long-term functional outcome within 24 hours of acute stroke than physicians at low-DNR hospitals, thereby sparing patients destined to have a poor functional outcome by allowing them to die during hospitalization. Doubtful. More probably, this represents an overall nihilistic approach that extends to most or perhaps all ICH patients within a specific institution, probably based on the fallibility of attempting to prognosticate too early and too precisely. The ripple effect of an approach that emphasizes early care limitation leads to an overall milieu of nihilism that, perhaps unexpectedly, may influence attitudes of care for patients beyond those with the DNR orders themselves.

So what are we to do? Just instituting a policy prohibiting DNR orders within 24 hours of hospital admission is not the answer. It is not the DNR orders themselves, but it is the care environment that emphasizes high use of early care limitations in patients that are critically ill. This is actually not surprising given that the same physicians and nurses instituting early DNR orders in one patient may be responsible for determining the need for aggressive care in others. Whether these findings extend to other neurological conditions such as traumatic brain injury or non-neurocritical care is not known.

As we increase our emphasis in critical care on end-of-life issues and compassionate palliative care, it is essential not to

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lose sight of several important principles. Precise prognostication in individual patients remains challenging, especially early after neurological catastrophes such as ICH. An overly nihilistic approach may influence global care, potentially leading to a ripple effect beyond an individual patient. Part of the art of critical care medicine is balancing aggressive care with realistic expectations and avoiding self-fulfilling prophecies of poor outcome. I think our work is still in progress.

### Competing interests

The author declares that they have no competing interests.

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