Clinical Momentum in the Intensive Care Unit

A Latent Contributor to Unwanted Care

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Abstract

Many older adults in the United States receive invasive medical care near the end of life, often in an intensive care unit (ICU). However, most older adults report preferences to avoid this type of medical care and to prioritize comfort and quality of life near death. We propose a novel term, "clinical momentum," to describe a system-level, latent, previously unrecognized property of clinical care that may contribute to the provision of unwanted care in the ICU. The example of chronic critical illness illustrates how clinical momentum is generated and propagated during the care of patients with prolonged illness. The ICU is an environment that is generally permissive of intervention, and clinical practice norms and patterns of usual care can promote the accumulation of multiple interventions over time. Existing models of medical decision-making in the ICU describe how individual signs, symptoms, or diagnoses automatically lead to intervention, bypassing opportunities to deliberate about the value of an intervention in the context of a patient's likely outcome or treatment preferences. We hypothesize that clinical momentum influences patients, families, and physicians to accept or tolerate ongoing interventions without consideration of likely outcomes, eventually leading to the delivery of unwanted care near the end of life. In the future, a mixed-methods research program could refine the conceptual model of clinical momentum, measure its impact on clinical practice, and interrupt its influence on unwanted care near the end of life.

Keywords: critical illness; end of life care; decision-making

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Most older adults in the United States report a preference to avoid invasive medical interventions near the end of life in favor of comfort-focused care (1–3). Yet, approximately one in three Americans over age 65 years is admitted to an intensive care unit (ICU) near death, and the use of prolonged life support before death is common and increasing (4–9).

Efforts to align end-of-life medical care with patient preferences have focused on improving communication among physicians, patients, and their families. Specific interventions have targeted advanced care planning, accurate prognostication, discussion of expected outcomes, and elicitation of patients' goals and wishes for medical care near death (10–16). However, even when communication among physicians, patients, and families is optimal, system-level practice patterns have a strong influence on the delivery of patient care.

We propose a novel term for a previously unrecognized phenomenon, "clinical momentum," that describes a latent, system-level property of clinical care. Drawing from prior work in medical decision-making, behavioral psychology, and anthropology, we describe a conceptual model of clinical momentum and its influence on the provision of unwanted care in the ICU.

An Example of Clinical Momentum

A 76-year-old woman with chronic obstructive pulmonary disease requiring home oxygen therapy and ischemic cardiomyopathy with an ejection fraction of 35% is admitted to an ICU with pneumonia and respiratory failure. Soon

after admission, her condition deteriorates.

The ICU team, the patient, and her husband discuss the potential need for intubation and cardiopulmonary resuscitation. The patient informs the ICU team that she is "full code," but she does not want to be "kept alive on machines for a long time." A short time later, she is intubated and mechanically ventilated. She develops shock and receives a central venous catheter to initiate vasopressors. Over the following days, she receives a hemodialysis catheter, a bronchoscopy, and a blood transfusion. The patient's husband has been at the bedside every day and provided informed consent for the multiple invasive interventions.

On ICU Day 11, the woman remains dependent on dialysis and the ventilator. The ICU team sits down with the patient's husband to discuss another intervention—tracheostomy to provide prolonged mechanical ventilation. The husband is not sure how to respond, because "she always told me she wouldn't want to be kept alive if she was dependent on machines, but we have made it this far after going through so much already…we don't want to give up."

The ICU physicians recognize tracheostomy is required for prolonged mechanical ventilation, but they are concerned that the procedure is not aligned with the patient's preferences. They ask the husband what the wife would say if she were able to participate in the decision. The patient's husband struggles to see the difference between the tracheostomy and the prior bronchoscopy, central venous catheter insertion, hemodialysis catheter, and intubation. Instead, he is encouraged that these interventions appear to have stabilized her condition. He is unsure what his wife meant when she said she didn't want to be kept alive on machines "for a long time."

Chronic Critical Illness and Clinical Momentum

Sometime between ICU admission and the 11th day of her ICU stay, this patient transitioned from acute to chronic critical illness. The incidence of chronic critical illness in the United States is substantial and increasing, especially among older adults (6). Unfortunately, long-term outcomes in chronic critical illness have not improved over time; patients have distress due to persistent symptoms (17, 18), a low chance of functional recovery, and poor long-term survival (19–21). In addition, most older Americans report a preference for care focused on comfort near the end of life, instead of intensive or burdensome medical interventions necessary to prolong life in chronic critical illness (1–3, 22). In a study of almost 1,500 adults with prolonged critical illness, two-thirds of patients who preferred a palliative approach to care reported receiving interventions that were inconsistent with their preferences (23), suggesting an important number of older patients with chronic critical illness receive unwanted medical care.

Like many other patients with chronic critical illness, this patient's husband is considering tracheostomy—an intervention to provide prolonged life support—despite her previous statement that living dependent on machines was unacceptable. We assert that the patient's pathway toward this moment has been influenced by clinical momentum (Figure 1).

Historical Origins and the Theoretical Basis of Clinical Momentum

In 1986, Mold and Stein first described "cascade effects" as a process in clinical medicine that "once started, proceeds stepwise to its full, seemingly inevitable, conclusion" (24). Similar to biological processes (e.g., the clotting cascade), cascade effects are triggered by an inciting event, such as the ordering of a diagnostic test. Once triggered, multiple subsequent interventions proceed along an automatic cascade without anyone stopping to consider alternative actions.

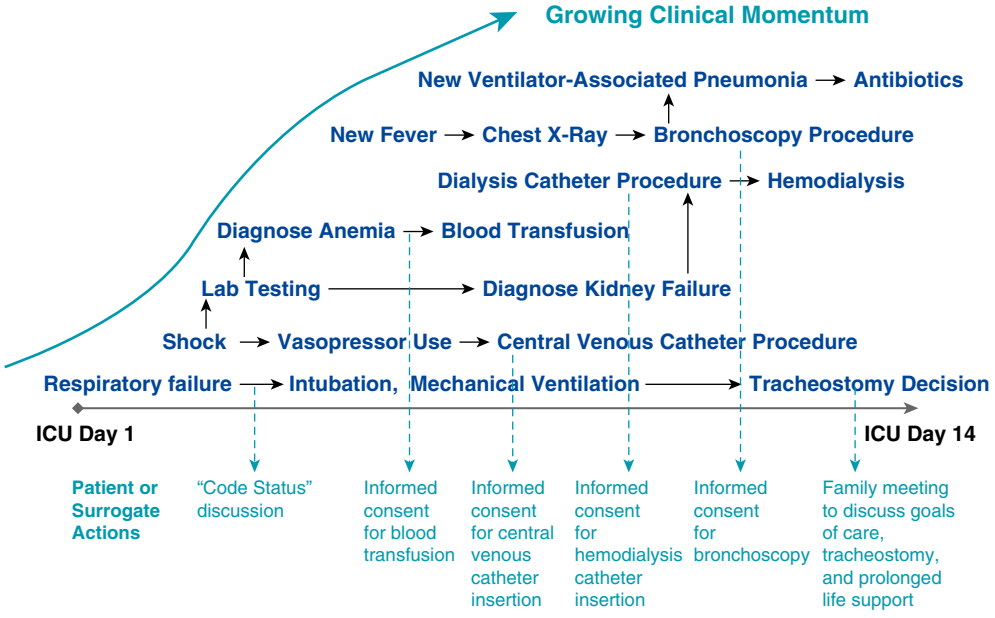

Figure 1. Longitudinal development of clinical momentum in an example patient admitted to the intensive care unit (ICU) with pneumonia and septic shock.

Although often useful in urgent clinical scenarios, Mold and Stein note the hazards of cascade effects, citing, as an example, fetal monitoring during labor for women with uncomplicated pregnancies (24). They note that monitors require women to be bed-bound and inactive, which may slow labor and prompt additional interventions, such as artificial rupture of membranes. This intervention, in turn, can increase pain, leading to the use of pain medications and subsequent abnormal readings on the fetal monitor, prompting additional interventions, and finally ending in a cesarean section. They argue, "It is not hard to see that at least in some cases, the cascade of benign interventions […] can lead to complications that lead to further interventions and more complications, and end in some final intervention […] that would not have occurred had not the cascade been set in motion" (24).

Others have identified a similar process in the ICU and contend that unrecognized cascade effects contribute to unwanted intensive care (25). For example, a patient in the ICU undergoes ultrasound of the legs, which demonstrates a deep vein thrombosis. He is treated with anticoagulation and then develops hemorrhagic shock from a bleeding gastric ulcer. He requires central line placement and blood transfusions, and he is eventually intubated to safely facilitate endoscopy. In an ICU, physicians, patients, and families are motivated to respond quickly to abnormal clinical signs, symptoms, and diagnostic tests. However, patient care that is dictated by cascade effects can lead to the rapid accumulation of interventions, bypassing opportunities to consider the patient's preferences and likely outcomes.

In 1991, Lynn and DeGrazia described a related concept: the "fix-it" model of medical decision-making (26). In the fix-it model, illness is a deviation from "normal" form or function, and the role of medicine is the restoration of normalcy. This model pervades the beliefs and judgements of both clinicians and the general public (27–32). Yet, as Lynn and DeGrazia and others have recognized, this model is limited. The fix-it framework assumes that a return to normal is possible, when this outcome is rarely true for chronic or complex conditions (26, 27, 29, 30, 32). Furthermore, the fix-it model encourages patients, families, and physicians to consider abnormalities as isolated, correctable problems without acknowledging the broader context of a patient's health status (27, 28). In the ICU, abnormalities in vital signs and organ function can often be "fixed." However, reliance on this model can obscure patients', families', and physicians' ability to recognize when fixing an individual abnormality will not change the patient's long-term outcome.

In 1995, the Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments (SUPPORT) trial demonstrated no benefit from an intervention designed to decrease the use of invasive treatments at the end of life (33). The intervention was based on an assumption that enhanced communication would improve decision-making and reduce invasive treatments near the end of life (34). After the trial, SUPPORT investigators offered a perspective on why their original assumption was problematic (34). They observed that patient care is more often determined by norms of clinical practice than by patient-level decisions:

> A patient with a strong viewpoint can be accommodated, but the usual patient and family will "go along," trusting that the course of care has been honed over many patients. Patients may well trust that the usual course of care will serve patients "like me" better than anything that would result from trying to customize each choice to reflect their own values (34).

Like patients, physicians are often influenced by what is "usually done." Norms of decision-making can vary widely between hospitals, and a hospital's decision-making culture among physicians has been shown to influence the intensity of end-of-life care (35).

The SUPPORT investigators propose a model from decision psychology, "recognition-primed decision-making," to explain how physicians are influenced by norms of clinical practice. In recognition-primed decision-making, decision makers match new scenarios with prior experiences and apply the first course of action that fits with a known pattern. Originally described in firefighters, recognition-primed decision-making allows individuals to make good decisions in urgent, high-stakes settings (36) without taking time to analyze probabilities and utilities (34). For example, critical care physicians might evaluate a patient with shock and quickly compare the pattern of the patient's condition with known taxonomies before initiating volume resuscitation for hemorrhagic shock. This model of decision-making is valuable for physicians caring for acutely ill patients who require emergent, life-saving interventions. However, the SUPPORT investigators argue that dependence on recognition-primed decision-making bypasses opportunities for deliberation about patient preferences or the value of likely outcomes.

In behavioral psychology, "sunk cost effects" describe how individuals are more likely to continue an activity after making a prior, irretrievable investment (37). Psychological experiments suggest that patients are more likely to continue outpatient medical interventions after investing money or effort (38). The sunk cost effect may play an important role in the ICU, where patients, families, physicians, and the entire ICU interprofessional team invest extraordinary levels of energy, effort, and resources. Ethnographic research by Kaufman characterizes this influence as patients approach the end of life (39). Kaufman notes that the trajectory of care can "bring to mind an airport moving walkway—with high sides. Once a patient and family are placed on one, its logic is more powerful, at least initially, than any individual voice, lay or medical. Everyone is stuck there—doctors, patients and families" (39). Physicians readily acknowledge and describe how interventions snowball and escalate in intensity, comparable to a "speeding train: nearly impossible for patients and their doctors to jump off" (40). A cardiac surgeon, describing the impact of prior cardiac procedures on the pursuit of future cardiac surgery, says:

> Once you've got that stent, it gets progressively harder to pull back from sending the patient onto someone like me. […] the train's going down the track about 75 miles an hour. And I walk in, and the patient is a surgical candidate, and everyone is pretty well committed to it. […] And they don't hear the issue of, "Do you know how bad you're going to feel and how long it's going to take you to feel well?" (40).

Features of clinical momentum have been previously described in clinical contexts outside of the ICU. Clinical

momentum may play an important role in the initiation of dialysis for patients with chronic kidney disease (41). For example, hospitalization for an unrelated medical condition can lead to placement of vascular hemodialysis access in patients who had previously decided against hemodialysis. A similar momentum has also been identified by surgeons considering high-stakes surgical decisions (42). Surgeons describe their resignation to the force of momentum when the diagnosis of a surgical problem creates an inevitable trajectory toward surgical intervention. They report feeling powerless to interrupt this momentum and, in some cases, note that it is easier to operate than to explain to patients and families why surgery might not be valuable (42).

Recognizing Clinical Momentum in the ICU

For the example patient described above, a new fever in the ICU triggers a cascade. Everyone is motivated to "fix" this abnormal vital sign. Following the usual pattern of care, the physician orders a series of diagnostic tests to identify the fever's source. The chest radiograph demonstrates a new infiltrate. Unconsciously using recognition-primed decision-making, the physician recognizes bronchoscopy is the next appropriate step. Bronchoscopy is part of the usual practice in the ICU, commonly performed to diagnose pneumonia in patients who are on a ventilator. The patient has already received an endotracheal tube, a central venous catheter, an arterial catheter, a feeding tube, a blood transfusion, multiple medications, and many blood draws. With the sunk costs already invested by the patient, husband, and ICU team, no one questions the plan for bronchoscopy.

Under the influence of clinical momentum, the physician and husband plan for the intervention without considering how a newly diagnosed ventilator-associated pneumonia may change the patient's outcome. The nosocomial infection has decreased the probability of a favorable outcome for the patient, yet this change has not been acknowledged. The husband and the ICU team consider this new problem to be fixable. They are not compelled to discuss how the patient's worsening condition may lead to dependence on a ventilator and a prolonged period of recovery. Because they do not discuss the longer-term implications, no one considers the new diagnosis in the context of the patient's preferences.

Days later, when long-term ventilation is first discussed, the ICU team sees the tracheostomy decision as a turning point. The ICU team attempts to explain how this next intervention (tracheostomy) is different from all the rest. The husband, however, does not recognize this moment as distinct from the many discussions that have occurred since his wife's admission to the ICU. Clinical momentum obscures his

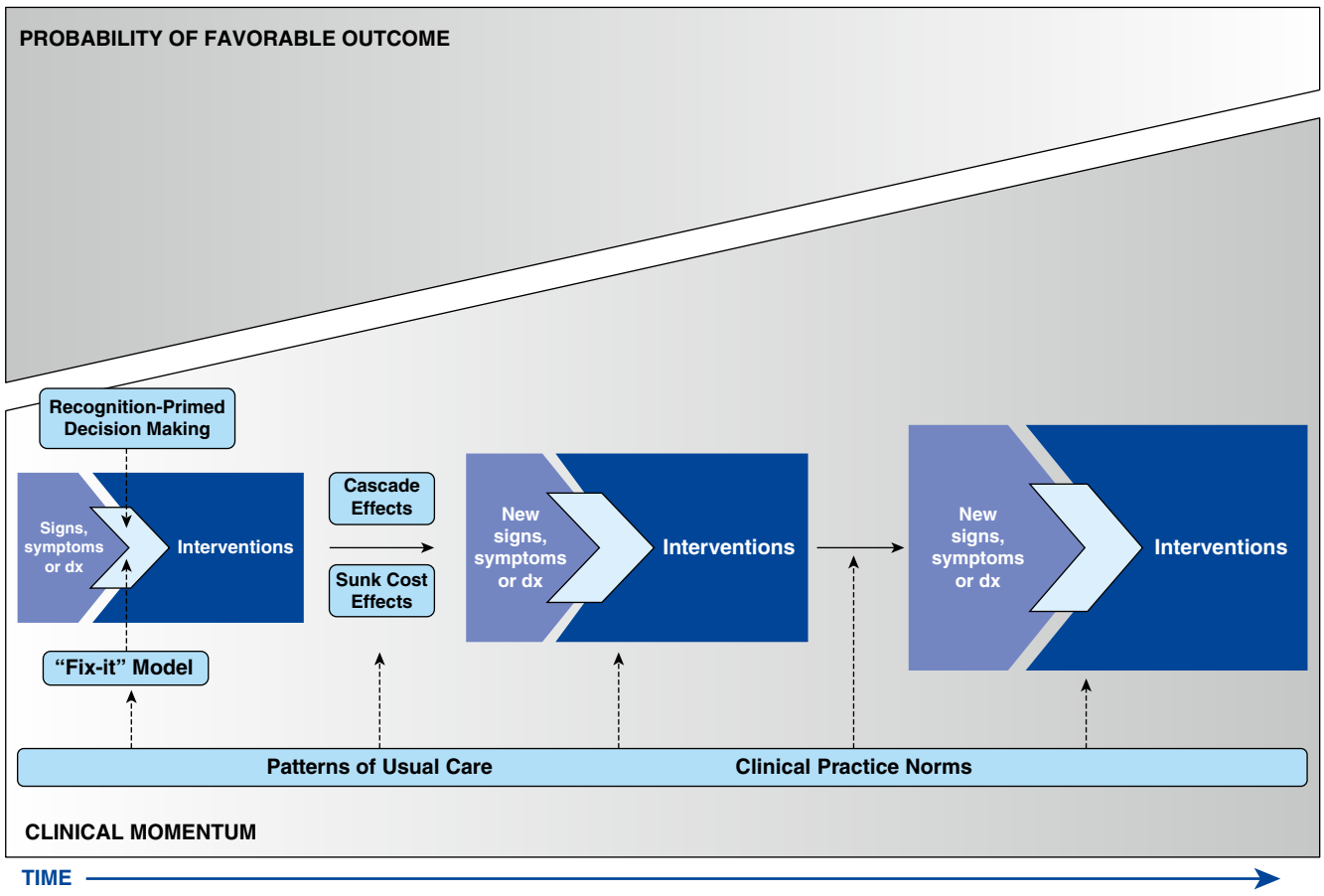

Figure 2. Conceptual model of clinical momentum developing over time in the intensive care unit.

ability to recognize that his wife is on a pathway leading to unwanted care.

Conceptual Model of Clinical Momentum

Integrating prior work in medical decision-making, behavioral psychology, and anthropology, we have developed a conceptual model of clinical momentum (Figure 2). Clinical momentum begins with an automatic link between an abnormal clinical sign, symptom, or diagnosis and an intervention. Clinical momentum builds over time with the accrual of multiple interventions, reinforcing the automatic link. As the influence of clinical momentum increases over time, the probability of a favorable outcome for patients who remain critically ill decreases—yet the momentum has obscured the ability of patients, families, and physicians to consider the long-term outcomes.

Future Directions

We plan to use a mixed-methods research approach to refine our conceptual model of clinical momentum and measure its influence on patient care in the ICU. Drawing from the experiences of physicians, patients, and family members, we aim to expand and modify our working model to produce a pragmatic definition of clinical momentum that is grounded in clinical and personal experiences in the ICU. On the basis of our conceptual model, we will develop an analytic strategy to quantify and characterize the trajectory of clinical momentum over time during an ICU stay, using individual interventions as the unit of measurement. By targeting clinical momentum as an important determinant of patient care in the ICU, we can develop novel strategies and interventions to interrupt its influence on the provision of unwanted care.

Addressing the problem of unwanted end-of-life medical care requires a comprehensive understanding of the processes and patterns that promote such care. We believe our model of clinical momentum describes an important contributor to unwanted care, particularly for patients at risk of chronic critical illness. Optimal communication among physicians, patients, and families about expected outcomes and patient preferences is critical in the ICU. However, even when communication is ideal, clinical momentum can push patients and physicians toward a pathway of unwanted care. ■

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