



Being Bumpable: *Consequences of resource saturation and near-saturation for cognitive*

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We report a set of projects that characterize technical work in the setting of resource saturation and near saturation (e.g. 100% bed occupancy or a full operating room schedule). Cost and resource limitations drive ICUs and OR utilization towards saturation.

Near-saturation conditions place a premium on practitioner cognition, especially on the ability to anticipate and prepare to cope with shifting clinical demands using available resources.[1] The conditions are regarded as normal and practitioners become adept at coping with them. One coping strategy, *bumping*, is remarkable because it is ubiquitous and reflects the contingent and conflicted nature of technical work.[2]

In bumping, a new, high priority demand is accommodated by diverting resources already in use. In the setting of an ICU, bumping involves moving one patient out of the ICU in order to allow another one in. In the operating room, bumping occurs when a scheduled case is held so that another, more urgent case can go forward. The need for bumping arises, from the indivisible nature of resources (patients, beds, and rooms are quanta that cannot be further divided); from the irreducible uncertainty that pervades healthcare settings; and from the high consequence and time pressure that characterize acute care settings.

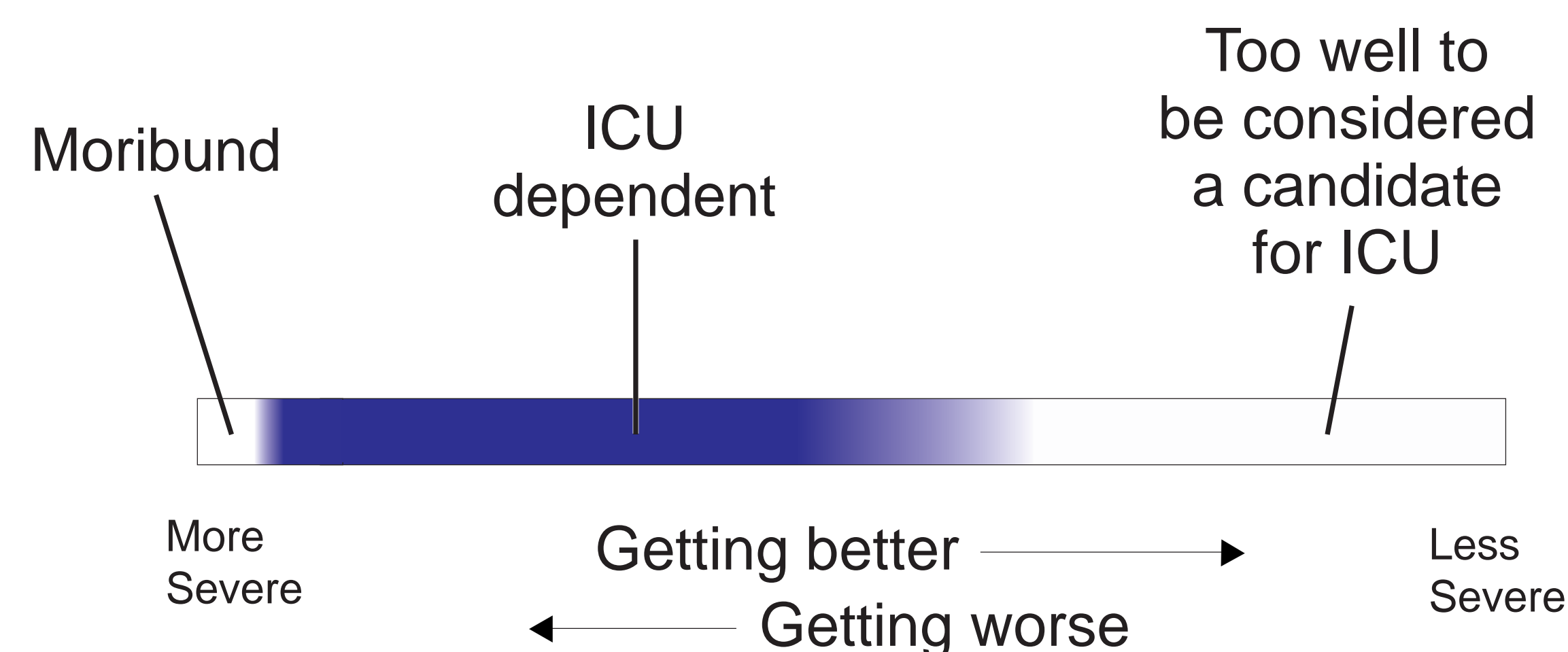
The results from our operating room and the intensive care unit studies suggest that bumping reflects normal functioning. It is a means for meeting near-saturation resource demand. Although each location has formal mechanisms for bumping, these are used to justify rather than guide practitioner decisions. The requirement for practitioners to meet the needs of patients plays out as a complicated naturalistic decision making activity [3] during which practitioners assess conditions, identify and acknowledge conflicts, forecast future developments and events, make hedges against uncertainty, and tradeoff goals in order to fashion solutions that can withstand both operational pressure and the threat of future *ex post facto* evaluations by outsiders. Bumping is neither purely medical nor purely managerial but rather reflects the synthesis of clinical factors and operational requirements. Successful bumping reflects refined practitioner skill and requires substantial effort in assessment, planning, and coordination (often across service and professional boundaries). Unsuccessful bumping creates discontinuity of care. [4] This research describes bumping and the associated cognitive activities and their impact on patient safety.

1. Woods DD (1988). Coping with complexity: the psychology of human behavior in complex systems. In Goodstein et al., eds. *Tasks, Errors, and Mental Models*. NY: Taylor and Francis.

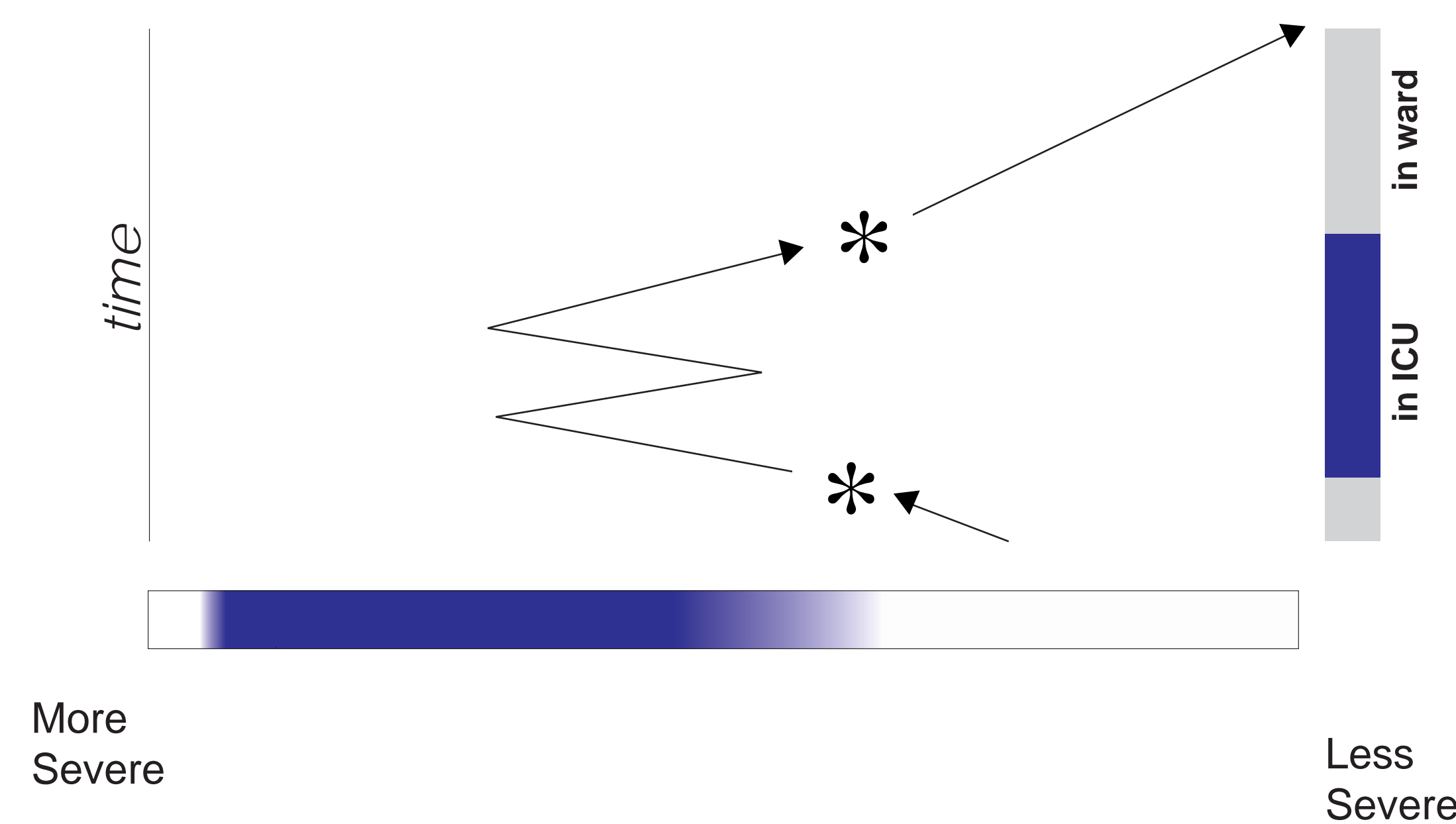
2. Barley S, Orr J (1997). *Between craft and science: technical work in US settings*. Ithaca: Cornell.

3. Klein G (1999). *Sources of Power: How People Make Decisions*. Cambridge: MIT Press.

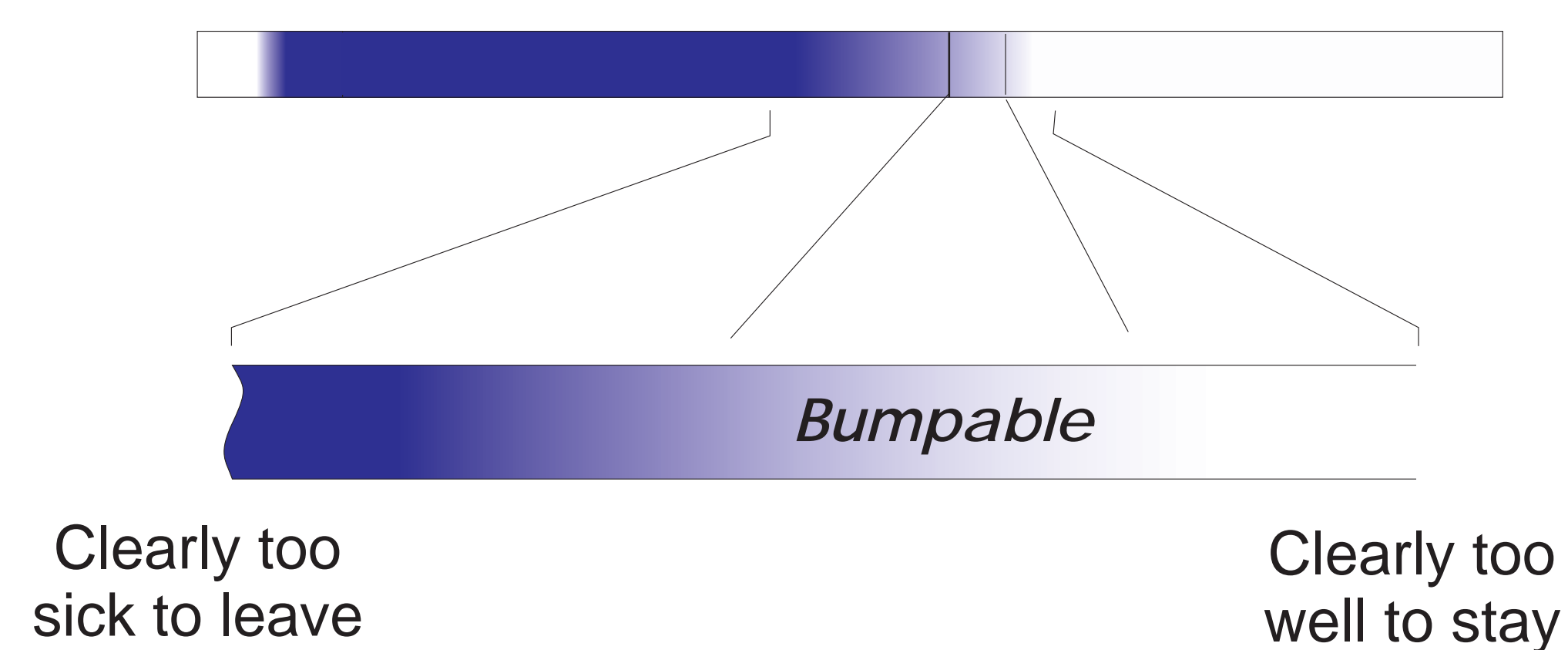
4. Cook, Render, Woods (2000). Gaps in the continuity of care and progress on patient safety. *BMJ* 320:791-4.



Some part of the ICU stay occurs at the fuzzy part of the continuum, in between being too sick to leave and too well to stay. In the technical argot of the ICU, these patients are bumpable. That is, they are not so well that they must be transferred out of the ICU but not so severely ill that they cannot be transferred to the ward if they resource they are consuming is needed for another patient. Interestingly, in every ICU we have examined practitioners understand and use some form of bumpable to address ICU resource demands and conflicts.

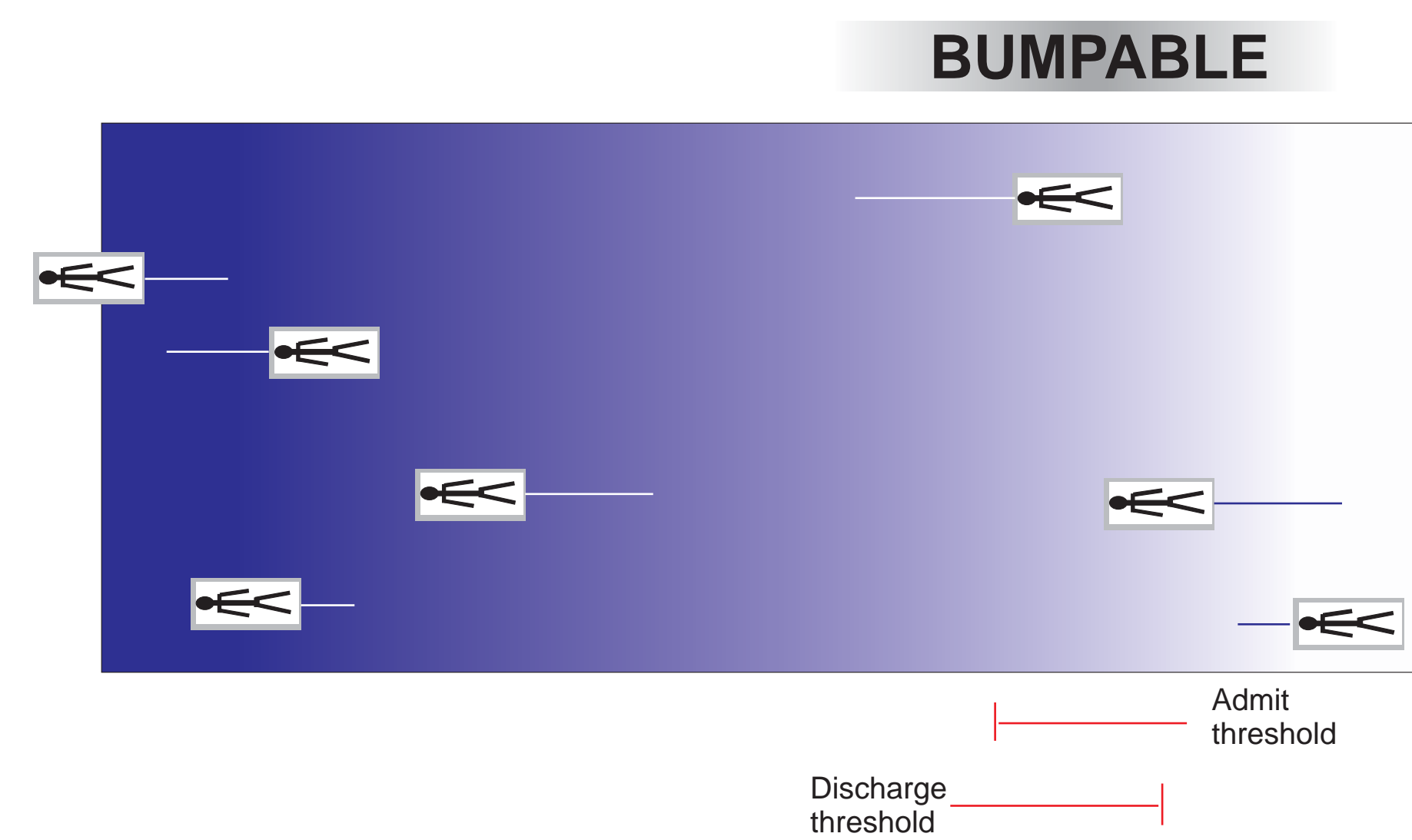


Imagine the course of an individual patient over time. The patient's condition worsens enough that he/she enters the ICU. In the ICU, the patient's condition improves enough over time to be well enough to leave the ICU for the ward. A graph of the patient's severity over time shows a "severity trajectory." Note that the important decision points occur in the fuzzy part of the severity continuum.



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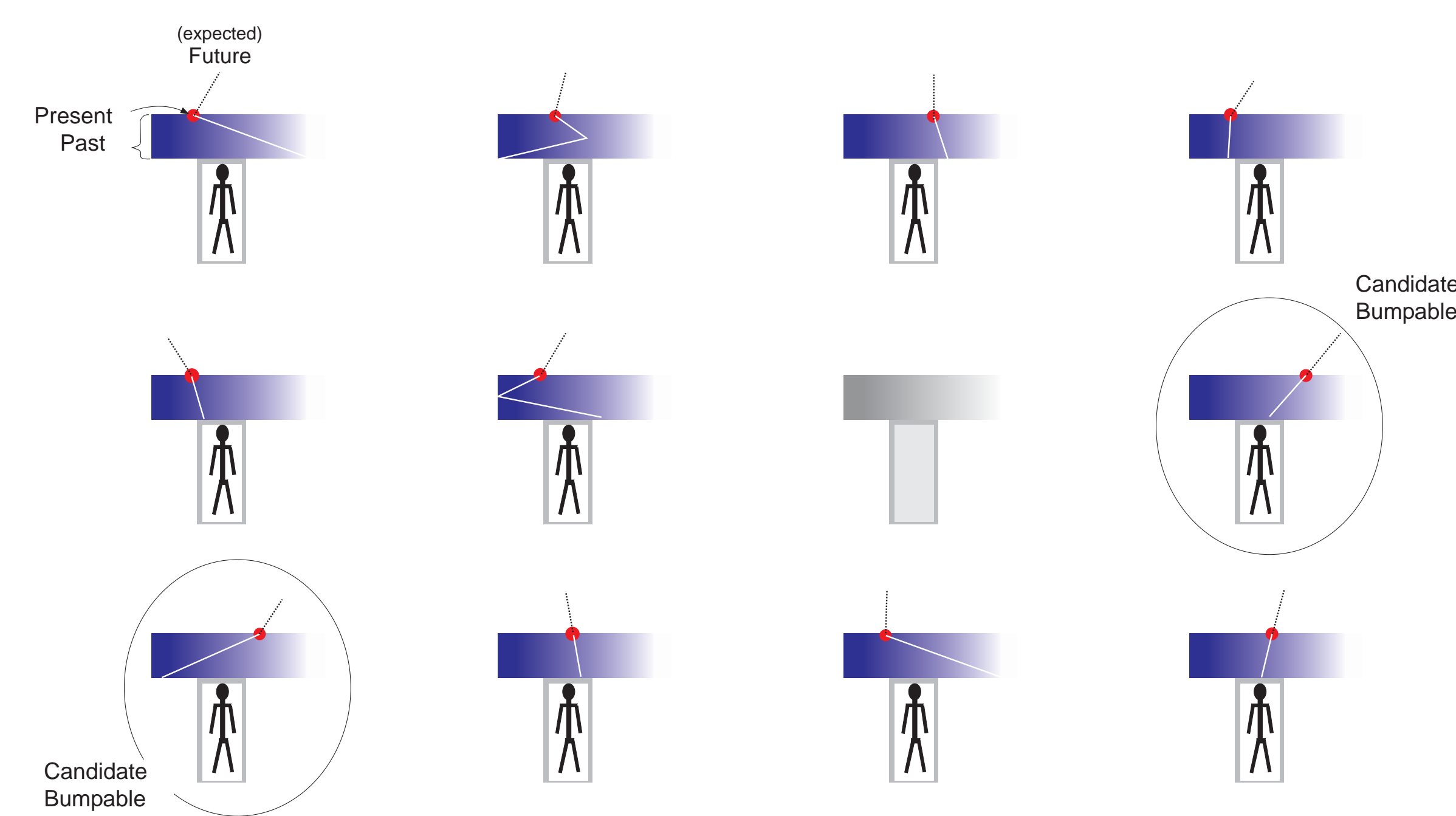
demands on ICU practitioners



At any given moment in an ICU, some patients are improving and others are worsening. Expectations about ICU resource management are based on the predicted pattern of change, the expected demand for resources (e.i., empty beds), and the local sense of what sorts of patients are bumpable. Multiple factors play on the determination of who is bumpable, e.g., the future course of the patient, the quality of care available on the ward to which the patient might be bumped, and a host of social factors related to patients and their physicians.

What Does It Mean?

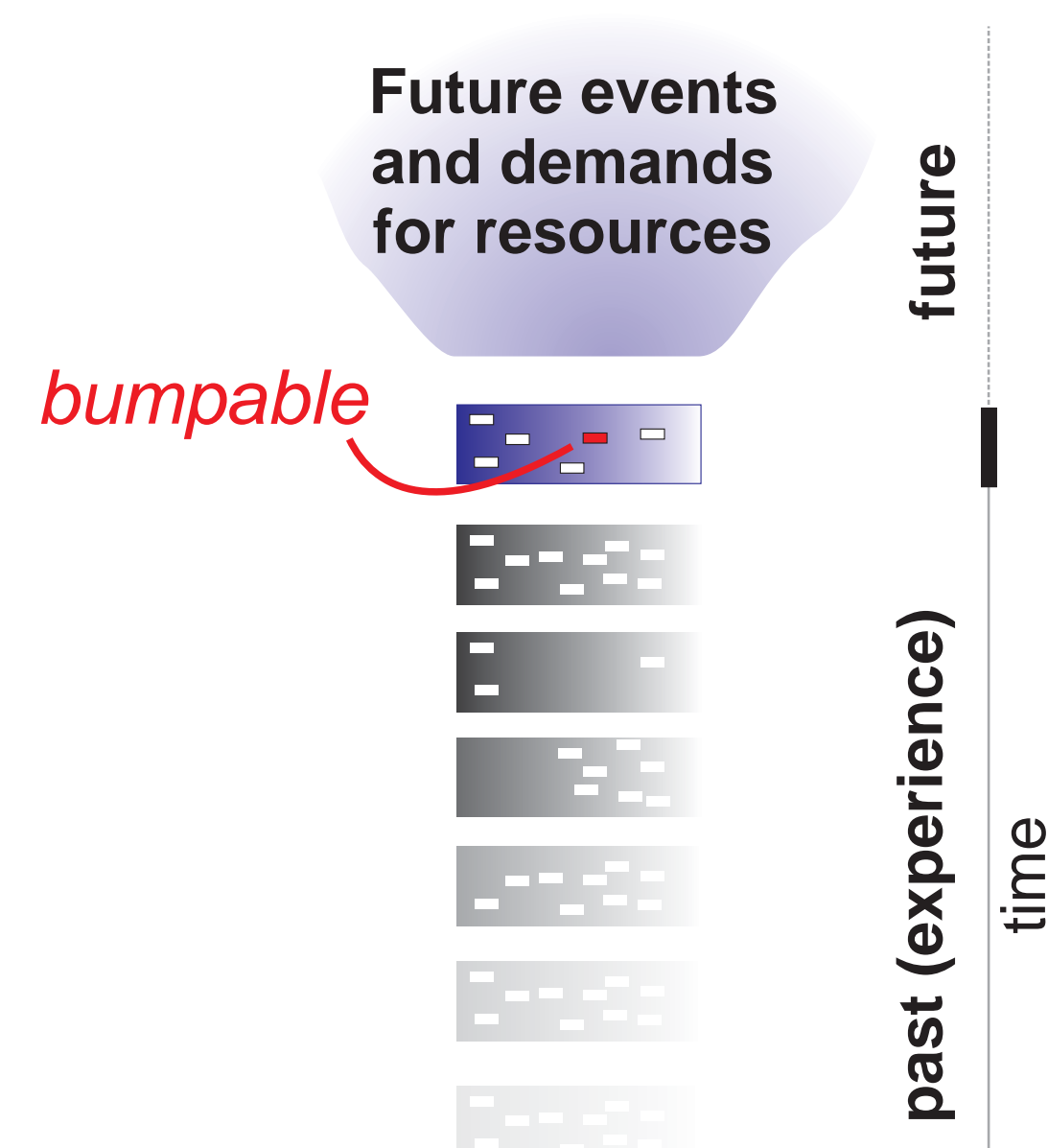
Technical work in healthcare requires practitioners to balance competing demands for resources and attention across multiple patients. These trade-offs are largely hidden from the view of outsiders. When excess resources are available, few trade-offs are needed but this is seldom the situation in ICUs. Because ICUs work at near saturation, the regular and routine identification of bumpable patients is a feature found in virtually every ICU.



Both the difficulty and the need for identifying bumpable patients increase as the ICU census approaches saturation. The closer to saturation, the more formal are the procedures for determining who is bumpable. The need to identify bumpable patients puts a premium on the ability of any planners to predict future patient course. Determinations of what constitutes a bumpable patient are characteristics of the local ICU and work practice rather than being features of the patient *per se*. N.B. the candidates for designation as bumpable are not those taking up most of the time and attention of the staff.

The need to identify bumpable patients is driven by uncertainty about the future. This uncertainty comes in two forms: uncertainty about the future courses of patients already in the ICU and uncertainty about the future demand for the resources that are currently committed to those patients.

Success in identifying bumpable patients and in the management of the bumping process is a source of system resilience. Success makes the problem of resource saturation appear to be less significant. But the graceful degradation of performance that bumping entails may hide the systemic vulnerability that comes from operating healthcare facilities at or near saturation.



The ability of ICUs to accommodate the varying demands for resources is partly the result of being able to successfully identify and bump patients. Successful bumping of patients requires high levels of expertise and an intimate understanding of the consequences of bumping. The need to identify bumpable patients is partly a function of the anticipated demands for ICU resources. Study of how, and how many, patients are identified as bumpable the the actual process of bumping offers researchers insight into the demands of ICU work.

Bumpable is a ubiquitous feature of ICUs but is also found elsewhere in healthcare. Examining how being bumpable works in ICUs offers a means to discover how practitioners produce resilient performance in ICUs and other healthcare settings.

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