"Working Against Gravity": The Uphill Task of Overcapacity Management

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ABSTRACT: While most health systems have implemented interventions to manage situations in which patient demand exceeds capacity, little is known about the long-term sustainability or effectiveness of such interventions. A large multi-jurisdictional study on patient flow in Western Canada provided the opportunity to explore experiences with overcapacity management strategies across 10 diverse health regions. Four categories of interventions were employed by all or most regions: overcapacity protocols, alternative locations for emergency patients, locations for discharge-ready inpatients, and meetings to guide redistribution of patients. Two mechanisms undergirded successful interventions: providing a capacity buffer and promoting action by inpatient units by increasing staff accountability and/or solidarity. Participants reported that interventions demanded significant time and resources and the ongoing active involvement of middle and senior management. Furthermore, although most participants characterized overcapacity management practices as effective, this effectiveness was almost universally experienced as temporary. Many regions described a context of chronic overcapacity, which persisted despite continued intervention. Processes designed to manage short-term surges in demand cannot rectify a long-term mismatch between capacity and demand; solutions at the level of system redesign are needed.

KEYWORDS: Emergency department crowding, patient flow, overcapacity, full-capacity protocol, bed meetings, hospital operations, qualitative research

Background

Many health systems struggle with Emergency Department (ED) congestion, which may reflect mismatches between capacity and demand at any point along the continuum of care. Most systems have introduced a wide range of interventions to prevent capacity from exceeding demand; such approaches may add capacity at the point(s) where it is deemed most necessary or redesign systems and processes to make maximally efficient use of the capacity available.[1,2] Nonetheless, there are likely to be times when, despite such efforts, demand for ED spaces, inpatient beds, or both exceeds capacity. A distinct family of interventions (hereafter "overcapacity management" [OCM]) has been developed to manage overcapacity situations when they occur. The diverse interventions in this category—ranging from full-capacity protocols[3] to the use of alternate beds,[4] bed huddles,[5] and discharge lounges[6]—are all based on the central logic of moving patients to an alternative location to free up space for incoming patients.

OCM interventions, especially full-capacity protocols, have been advocated by expert organizations,[1,7,8] yet their evidence base remains weak.[9] Most studies reporting improvement in flow outcomes have featured uncontrolled pre-post designs and/or follow-up periods of less than 1 year[3,6,10–16]; note also that the exceptions[17-19] assessed multifaceted or otherwise atypical interventions. Qualitative research on OCM has been limited to one study on the initial implementation of full-capacity protocols[20] and 2 linked studies describing patient and staff perspectives on the practice of off-servicing.[21,22] Little is known about the long-term effectiveness and sustainability of OCM interventions, nor the contexts in which they are most likely to succeed or fail. Such knowledge is urgently needed as OCM increasingly becomes an unquestioned element of organizational efforts to improve patient flow.

The purpose of this study was to describe and understand Western Canadian organizations' ongoing experiences with OCM. We define OCM to include use of formal or informal overflow areas for either ED patients awaiting admission or inpatients awaiting discharge, as well as processes, protocols, and meetings (whether triggered by overcapacity conditions or maintained under all conditions) that govern assignment of patients to different areas. Excluded from this definition were units sometimes used for overflow but designed to provide a subpopulation with better-tailored care (eg, clinical decision units); capacity management activities executed prior to patient arrival (eg, elective slate scheduling); meetings, processes, and targets to facilitate patient discharge; or OCM

activities undertaken at other points along the continuum of care (eg, hastening offloading of ambulance patients).

Methods

This qualitative sub-study belongs to the broader "WeCanFlow" study of patient flow in the 10 urban health regions/zones of Canada's 4 western provinces. In keeping with an integrated knowledge translation approach, the Western Healthcare CEO Forum and decision-makers from each region were involved in identifying relevant research questions, determining methods, and interpreting findings. This large, multijurisdictional study provided a unique opportunity to study flow strategies across multiple and (because health care in Canada is organized at the provincial level) diverse health systems.

Recognizing that a deep understanding of organizations' experiences requires that we ask not merely "what works," but how and why, we were guided by Realistic Evaluation.[23] This approach seeks to discern the causal *mechanisms* by which an intervention exerts its effects and the conditions (*context*) under which these mechanisms can function. A realist approach is well suited for studying a family of interventions (such as OCM) that differ widely in their features but share a similar intent and underlying logic. As we did not directly assess intervention outcomes, we describe our approach as realist analysis rather than evaluation. Our research questions were as follows:

1. What OCM activities are commonly reported?
2. By what mechanisms are these activities understood to decrease ED congestion?
3. To what extent, and under what conditions, are these activities reportedly effective and sustainable?

Data

The WeCanFlow study took a mixed-methods approach, incorporating quantitative analysis of flow performance. Its qualitative methods, which have been fully described elsewhere,[24] included 288 in-depth interviews with 300 participants (~20-45 per region/zone), supplemented by document review and some non-participant observation of flow meetings/events. Interview participants, purposively sampled based on their responsibility for or involvement in flow, included senior, middle and frontline managers, and quality improvement staff; they were recruited by e-mail and interviewed in person or, where necessary, by phone. Most interviews were individual, but occasionally 2 to 3 colleagues chose to participate together. Interviews, typically lasting 45 to 60 minutes, covered participants' involvement in current and past flow initiatives, perspectives on what had (not) worked well, and reflections on broader flow-related issues (system design, organizational context). Owing to the way the site visits had to be scheduled, we could not use data saturation as a criterion for sampling; however, we did observe thematic saturation in the sub-study dataset.

Interviews were audio-recorded and transcripts entered in NVIVO 11, along with documentary sources and field notes from observation.

Analysis strategy

In a preliminary round of analysis, 4 coders identified OCM as a distinct family of interventions, discussed in 161 interviews. Field notes from bed meetings in 2 regions provided important contextual information; no documents were germane to this sub-study.

Having isolated the data relevant to OCM, we applied thematic analysis[25] (a process led by the principal investigator with frequent discussion of emerging codes and themes among a 5-member team). Transcripts were coded inductively, with an effort to capture semantic content (eg, "time-consuming"; "mitigating risks"); then, codes were (re)categorized and elaborated, using the Realistic Evaluation constructs of mechanism and context as sensitizing concepts. Deviant cases (ie, data inconsistent with emerging interpretations) were actively explored. Feedback on emerging interpretations was solicited from all coders and then from the full study team (comprising 31 health system decision-makers and 17 researchers).

Ethics

The project received approval from the University of Manitoba Health Research Ethics Board (H2015:232), University of British Columbia Providence Health Care Research Ethics Board (H15-02062), University of Calgary Conjoint Health Research Ethics Board (REB15-3026), and University of Saskatoon Behavioural Research Ethics Board (BEH-15-377). Participants provided written informed consent.

Results

OCM strategies used

Participants described a variety of OCM strategies, which we categorized as: (a) overcapacity protocols, (b) locations for emergency patients, (c) locations for discharge-ready inpatients, and (d) meetings to guide redistribution of patients.

Overcapacity protocols (rules stating that once an ED reaches a certain degree of congestion, inpatient units are required to accept the admitted patients whether or not funded beds are available) had been embraced by all but one region and appeared to be accepted practice. Such protocols typically involved using unfunded (eg, hallway) beds and admitting patients off-service.

All regions had some experience of using alternative locations for admitted emergency patients. All used off-servicing to some extent, and were making use of over-complement (eg, hallway) spaces, or had done so in the past. Less commonly reported was the maintenance of a holding unit for admitted

emergency patients (eg, "hurry up beds"); while this strategy had been attempted in most regions, it had been abandoned by all but a few.

The strategy of designating locations for discharge-ready inpatients was less common. Participants from 3 regions reported the use of discharge lounges, plus the requirement for each inpatient unit to identify a daily quota of discharge-ready patients by a certain hour (eg, "two by nine") and move them to a lounge or hallway. However, other regions reported trial and subsequent discontinuation of discharge lounges.

Hospitals in all regions reported that "bed meetings" or "huddles" to guide the redistribution of patients occurred at least daily; these involved unit managers and, in many regions, middle and sometimes senior managers. While bed meetings may conceivably occur in the absence of overcapacity pressures, we classified them as an OCM practice because their main reported function was to guide the "juggling" of patients when the desired unit was unable to accept further admissions. Most regions also reported daily system-wide phone calls to plan redistribution of patients among sites.

In addition to these 4 categories of strategies, participants in most regions reported that OCM was supported by daily monitoring and reporting of key metrics; this sometimes involved predictive occupancy modeling. Several regions used bed management software to keep track of bed availability in each unit.

Perceived benefits, risks, and mitigation strategies

The principal benefit associated with OCM interventions was the freeing-up of space for new arrivals. The most significant risks identified were related to the use of hallway or off-service beds (in general or as part of an overcapacity protocol): patients may not receive appropriate care, and elective surgeries may be canceled as a result of the use of surgical beds for overflow. Strategies to mitigate these risks included committing to protect the elective slate ("We made very declarative statements [that] we would not be cancelling surgeries because of beds" [1116]) and attempting to achieve the best possible "fit" between patients and units when the most ideal unit was unavailable:

> First we will off-service like to like; so if it's a surgical patient, to any surgical unit. Then if we can't achieve that, we will off-service the best like to unlike [such as] a surgical patient that is lower acuity onto a medical unit. [1110]

Furthermore, participants generally felt that it was less risky to use non-traditional spaces than to let "un-triaged, undifferentiated" patients languish "in the Emerg waiting room where they had no care" [5210]. However, some participants advocated that alternative locations be used for discharge-ready inpatients only, not for emergency admissions ("So move your stable patient out of the bed . . . and pull the sick one out of Emerg" [4110]).

Only one participant identified a risk associated with discharge locations such as discharge lounges, namely that waiting patients may be stranded without access to needed medications. Far more commonly, discharge lounges were de-implemented due to a dearth of eligible patients (which suggests a need to consider opportunity costs).

The primary risk of meetings to guide patient redistribution is that they may be highly time-consuming, especially if poorly managed:

> [The] bed meeting, which at the time was 45 minutes of pain and suffering first thing in the morning, with not a lot of action or organization. And then another afternoon bed meeting which was another 30 minutes. And I don't know about you, but I don't have that kind of time in my day. [1201]

> Twice a day they have a bed capacity meeting [with] all the managers . . . I think if you have twenty of those people sitting around a room for even fifteen minutes or half an hour, it's a lot of money on a daily basis. [5212]

While many participants emphasized strategies used to keep meetings brisk and efficient, most who reported short bed meetings noted that these were preceded by such preparatory activities as a "pre-bed meeting" [9103]; there was also an apparent tendency for the number of daily meetings to increase over time ("we've also added an afternoon meeting . . ." [4106]).

Mechanisms of OCM

The most obvious mechanism by which overcapacity practices operate is the *provision of a capacity buffer*: establishment of overcapacity spaces provides hospitals with additional capacity to meet surges in demand. A second mechanism noted was the *promotion of action by inpatient units* to accommodate patients. Participants drew a contrast between effective OCM practices, which were action-oriented, and ineffective ones, which were not:

> So when we went to put [bed meetings] back in, [people] said, "Oh, they're useless, that's why we stopped doing them." Well they were useless because they didn't have structure and they didn't have expectations and deliverables attached. . . . So once that was put in people now see the value. [9207]

> Flow calls: there's a fascinating exercise . . . we report a lot of numbers and we tell our sorry tale, but we don't make a plan for how we're going to fix that sorry tale. [10121]

Participants' accounts of how such action was produced suggested 2 sub-mechanisms: *accountability* (staff feel it is incumbent on them to accept more patients from the ED) and *solidarity* (staff perceive overcapacity as a shared problem and desire to do their part):

> So, the reason it works is because . . . it's an accountability model of improving flow . . . [Our] approach is that as long as there's admitted patients down there, [the inpatient units] need to be

accountable . . . and that accountability creates the pressure to either get people home quickly or make space . . . whether there's an empty bed upstairs or not. [5219]

I think the main benefit of doing the bed meetings is to share what the system looks like . . . because you get caught up in your own silo . . . But when you get together every single morning and try to do a plan for the organization it just broadens everyone's thinking, and over time we've developed a relationship . . . [1115]

The majority of overcapacity interventions included both a capacity buffer and a mechanism for encouraging inpatient units to take action.

Effectiveness and sustainability of OCM strategies

Although most participants characterized OCM practices as effective, they almost universally described that effectiveness as temporary. Few examples were provided in which overcapacity practices retained effectiveness over the years, and in general, more recently implemented strategies were described more positively than older ones. The most common explanations for lack of sustained effectiveness were that overcapacity spaces eventually became saturated with patients and that staff ceased to pay attention to overcapacity alerts:

What happened very quickly is . . . we just ended up with a bunch of institutionalized hallway beds. [3104]

This overcapacity protocol [is] the equivalent of shooting a flare in the fog. The coast guard is not going to come . . . We do that every single day. [2105]

Because once those spaces were filled . . . we were full . . . So people get used to having two or three [additional patients] up on the floor, and Emerg then thinks that they're blocking, and I tell the Emerg docs to go up to the floor and see where people are sleeping. [5204]

Even though some systems developed rules for time-limited use of overcapacity spaces (eg, stipulating that hallway beds could no longer be used overnight), participants reported that as capacity pressures mounted, such rules and processes ceased to be followed.

Leadership was identified as key in fostering the requisite accountability and/or solidarity:

It's about the leadership team being aware of it, monitoring it and ensuring that there are checkpoints and check-ins to make sure that correct results are being achieved and the system's being optimized. [2112]

So groups came together every day [for] a bed meeting . . . but there was no . . . leadership in place that really drove responsibility for the system as a collective . . . [So] as a senior leadership team . . . we basically declared . . . that we are all responsible . . . and we are calling on you to rally around and support the Emergency Department. [1116]

Even in the presence of strong leadership, however, the effectiveness of OCM was reported to decline over time:

And then probably a couple of years after implementation it started to fail. Very differently at different sites; so, completely at [one] and almost not at all at [another] and everywhere [else] in-between. And probably mostly site culture and also probably because of a failure in communication—and it's working against gravity, right? It's going against all of the natural incentives and the work drives of people in the system. And so . . . people on the inpatient units gradually just say, "This is stupid . . . Why are we solving this Emergency problem?" [5232]

Not surprisingly, participants commonly reported that OCM required constant active management, as well as periodic reinvention ("so we did do a refresh" [1105]). While a few participants raised questions about whether directors ought to spend their time at bed meetings, most described the ongoing day-to-day involvement of middle and senior managers as critical to success:

And even now, two and half, three years later we are still having to get in there and coach people . . . just that constant monitoring, supporting and coaching . . . [I]t's a lot of effort . . . but I think that this is what has made us successful. [9104]

The only thing I can say in summary would be, it's daily work. And if there is not energy put into it, it will stop. It'll cease to exist. It's like blowing air into a balloon—but the balloon is always open. As soon as you stop it, it just deflates. [1215]

A context of chronic overcapacity

Across regions, participants described a context in which overcapacity interventions were being used to cope with a constant state of excess demand. At least one facility in each jurisdiction was reported to be in a perpetual state of overcapacity:

Our normal state is in surge, and so that means when we have a hyper need, we've already spent our surge capacity. [10116]

All of my sites are running at or over 100% occupancy for acute care; in fact one of them some days is up to 140%. [6119]

[Years ago] we were [already] over capacity relative to funded beds, but now it's really bumping up against the physical space. [1117]

Under these circumstances, a substantial proportion of managers' time was taken up by the daily tasks of "juggling," the "bed shuffle," or solving "the Sudoku puzzle" of OCM:

So . . . because our beds are well over capacity at 104%, you can imagine every single day the first thing I do when I come into work is to see what happened overnight and how many [admitted patients] are in Emerg. And then the bed managers come in . . . and they get together twice a day for meetings; if necessary they'll get together more, and Medicine . . . will have their huddle, Surgery will have their huddle etcetera and then they come together at 9 in

the morning and they come together at 2. In between them are the zone meetings. [6106]

Even the experience of routine capacity-management activities, such as monitoring of occupancy levels, reflected the stress of overcapacity:

> I mean, all of us senior leaders wake up in the morning and we go on our phones and we look at our capacity in the morning. I guarantee there's people sitting on the toilet looking at capacity . . . it's all-consuming. [5225]

Several participants noted that OCM practices merely treated the symptoms of chronic overcapacity and urged that the system tackle the "root cause" of overcapacity. However, there was no agreement on what the root cause might be.

Discussion

This study offered a window on the practice of OCM, the mechanisms of overcapacity interventions, and the context in which these mechanisms are—seemingly unrealistically—expected to operate on an ongoing basis. OCM figured prominently in each region's array of flow strategies and was widely reported to have achieved improvement, however temporary. Of the 2 key mechanisms identified, one (providing a capacity buffer) is intrinsic to OCM interventions; the other (prompting action, via the submechanisms of accountability and solidarity) relies on strong leadership and active management. Although most studies of OCM have left intervention mechanisms implicit, the themes of action orientation, accountability, and/or solidarity have appeared in several studies[5,14,15,19] and commentaries[26,27] on OCM interventions, as well as in a qualitative study focusing on implementation.[20] Leadership/management factors are known to be key to the successful execution of flow strategies more generally; indeed, a multihospital study found that such factors predicted performance more strongly than did the specific interventions chosen.[28] Prior studies have also engaged with the potential risks of OCM, offering varying assessments from different perspectives.[4,20-22,29-31] While our findings did not lend themselves to conclusions about patient-level risks, they did suggest that the "all-consuming" work of OCM may have unmeasured system-level costs. What other patient care and system-management activities are not accomplished due to the constant time demands and stress of "juggling"? What risks does directing so much effort into a non-curative "solution" present to the health system?

Unlike many other studies, which have featured short follow-up periods (sometimes as short as 3 months), this study gathered participants' reflections on initiatives both current and up to a decade in the past. We found a clear pattern of early enthusiasm and short-term improvement following implementation of a new strategy. However, sustainment demanded ongoing, intensive managerial support and regular "refreshment" of practice—and even so, it appeared that no system could "work against gravity" indefinitely. In the region that had implemented overcapacity practices most assertively, across multiple hospitals, data monitoring indicated a significant, immediate improvement in ED length of stay, which deteriorated after a few years. Reported impacts in other regions were consistent with this pattern but typically less dramatic and short-lived.

A major underlying problem was that overcapacity interventions were widely relied upon to cope with a perpetual state of excess demand. If demand habitually exceeds capacity, it may be very difficult to prevent the mechanisms of OCM interventions from wearing themselves down; neither augmented processes nor capacity earmarked for short-term use can rectify a long-term mismatch between capacity and demand.[32] It is unclear to what extent this condition has plagued other systems studied. Proponents of OCM practices, even when recognizing that many hospitals operate at close to full occupancy,[27] typically imply that overcapacity situations are to be expected occasionally, not constantly.[5,19] Critics of OCM, on the other hand, tend to portray the problem as chronic.[21,30] We do note that several studies reporting positive results have evaluated "refreshed" or "revamped" interventions, noting that previous versions had failed to produce or sustain improvement.[6,15,19]

While it might be hoped that enforcing inpatient wards' accountability for admitted patients would spur hospitals to innovate,[26] no system in this study appeared to have been (re)designed in such a way as to cure overcapacity. Pressure on inpatient units appeared to ensue primarily in frenetic day-to-day efforts to admit and discharge patients—an activity which subsided as soon as the pressure was relaxed.

A key limitation of our study is that it was restricted to Western Canada, although we note that the participating health systems showed variability along many axes, including organizational structure and bed-to-population ratio.[33] The study was also limited by its reliance on interview data from managers; frontline staff and patients might have provided different perspectives, and further direct observation could have yielded additional insights. We could not verify participants' claims about intervention outcomes, as we did not collect quantitative data and were unable to gather any formal evaluation reports. However, several participants noted that performance monitoring had been undertaken and described its results in highly congruent ways.

Managers' accounts of interventions for which they were responsible may have been tinged with social desirability bias. Indeed, we did find that newer initiatives were more positively reviewed than old ones; and participants on the "referring," as opposed to the "receiving" end of OCM practices, evaluated them more favorably. However, participants showed remarkable consistency in their accounts of the strengths and limitations of OCM.

We were unable to determine to what extent regions' overcapacity woes were attributable to shortfalls in acute and/or nonacute capacity vs inefficient use of capacity.[34] Given the evidence that the policy of cutting inpatient beds has contributed to ED crowding,[35] it would seem premature to rule out capacity increases as part of the solution. However, adding new capacity may result in the release of pent-up demand

or a slackening of discharge-facilitation processes, leaving the system once again in overcapacity.[36] To identify an optimal strategy, it would be necessary to study a sample of health systems in which all organizations maintain an optimal level of utilization[37] and patients flow smoothly across the entire continuum of care; such a sample was not available to us.

Conclusions

OCM interventions, particularly overcapacity protocols, off-servicing, and bed meetings, are heavily used across participating jurisdictions. They are understood to decrease ED congestion by providing a capacity buffer and by spurring inpatient staff to action through a heightened sense of accountability and/or solidarity. These mechanisms work in short bursts; as such, they help systems absorb intermittent surges in demand, but exhaust themselves when used to compensate for chronic capacity–demand misalignment. If problems at the level of system design remain unaddressed, they will eventually—notwithstanding the intensity of daily efforts—drag performance down.

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Author Contributions

SK conceived and designed the study; SK, SH, SW, KJ, SM and MB conducted interviews; SK, NS, SH, SM, MB, MRA, and ZA were involved in data analysis; all authors participated in interpretation of findings. SK drafted the manuscript with contributions from LNG, and all authors provided critical review and feedback.

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