Review Article on Latest Research on COVID-19

Geographic cohorting by clinical care team: a narrative review

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Background and Objective: Geographic cohorting refers to localization of inpatients to designated hospital areas (typically a unit or a set of beds) based on specified criteria. One such criterion that has been commonly discussed and studied since the early days of the hospitalist movement in the US is a patient's assigned clinical care team. Because implementing cohorting of this type requires substantial operational investment, it is important to understand the benefits and the tradeoffs associated with bringing patients into closer spatial proximity with their full team of providers and allowing clinicians to work within a defined clinical space.

Methods: We conducted a narrative review of the evidence around geographic cohorting of patients by clinical care team. We performed a comprehensive search of the PubMed, Embase, Cinahl and Scopus databases, identifying relevant English language articles. We used an inductive approach to developing thematic domains for categorization of article content.

Key Content and Findings: We reviewed eighteen articles published between 2008 and 2022, and identified four thematic outcomes domains: patient-centered outcomes, communication, efficiency, and satisfaction. The existing literature demonstrates associations with improved communication and staff satisfaction. The data regarding patient outcomes and overall work efficiency, on the other hand, are equivocal and, in general, limited by study methodology.

Conclusions: Geographic cohorting of inpatients according to clinical care team offers some promise for improved workplace culture. More rigorously designed studies are needed, however, to understand its impact on patient outcomes, and there should be added attention paid to throughput metrics and tradeoffs that often limit its implementation.

Keywords: Geographic cohorting; localization; inpatient rounding

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Introduction

The COVID-19 pandemic disrupted hospital operations around the world, forcing health systems to rethink and restructure the organization and delivery of patient care. While many of these changes were temporary adaptations to surging caseloads, these disruptions also afforded health systems the opportunity to explore innovative and novel care delivery models (1-4).

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Geographic cohorting is one such model of inpatient care delivery. Cohorting, broadly defined, is localization of patients to designated hospital areas based on certain criteria. The most common criteria considered are shared diagnoses, whereby patients are placed on specialty or needs-defined units with the goal of matching patient needs with unit staff skills and competencies (5-8). An additional criterion that may be considered—and the focus of this review—is the patient's assigned clinical care team (attending physician, housestaff, and advanced practice providers), such that all patients assigned to a particular team are housed in a narrow geographical area (often a particular unit or set of beds) (9). While these criteria are very often linked—diagnosis frequently dictates clinical team assignment—it is possible to be cohorted by one definition and not the other.

Cohorting along both of these dimensions is frequently employed on intensive care units (ICUs), surgical services, and internal medicine subspecialties. It has been associated with improved clinical outcomes and process measures (10,11), although dispersion is common when hospitals reach capacity (12). Cohorting is inconsistently applied, however, to general medicine services. Cohorting by shared diagnoses and nursing needs is made challenging by the heterogeneity of the patient population, and, very often, the relatively low allotment of general medicine-designated beds. In the field of hospital medicine, where the volume of patients and number of clinical care teams is greatest, the discussion and focus of study has frequently centered around cohorting by team (13).

Prior to the COVID-19 pandemic there was sparse evidence to suggest that cohorting in hospital medicine was a limited but growing practice (13,14). The COVID-19 pandemic briefly afforded new opportunities for cohorting, with one survey finding that 93% of respondents planned for geographic cohorting in response to the pandemic, and 85% of departments having continued the practice by the time of the survey (2). This has prompted a renewed look at the practice (15).

In this article we will review the evidence around geographic cohorting of patients by clinical care team. The goal is to understand the impact of bringing patients and their care teams into closer spatial proximity. In particular, does this practice improve clinical outcomes, efficiency, resource utilization, or patient and provider satisfaction? This synthesis of the available data should serve as a resource for those considering implementing cohorting of this type at their own institutions, as well as those considering contributing to the study of this important topic. We present this article in accordance with the Narrative Review reporting checklist (available at https://apm.amegroups.com/article/view/10.21037/apm-22-1400/rc).

Methods

We developed a comprehensive search strategy for the PubMed, Embase, CINAHL and Scopus databases in collaboration with a health services librarian (*Table 1*). We searched for peer-reviewed articles using the keywords/phrases: "geographic(al) cohorting", "geographic rounding", "geographical assignment hospitalists", "geographically localized", "geographic dispersion", "cohorting", "regionalization", "regionalized care", or "localized medical teams". We additionally used pearling (a.k.a. citation mining or snowballing) to identify articles from included studies' citations, to ensure all relevant articles were captured. We limited our search to English language studies. There were no restrictions on location or date of publication. Databases were initially searched in March 2022 and again in November 2022. A total of 484 resulting articles were reviewed for relevance by a single reviewer. Titles were initially screened for relevance, followed by abstracts, and then the full text if necessary. We included quantitative and qualitative original research that reported on outcomes related to and experiences with cohorting on general medicine and general pediatric wards. In addition to dedicated, full length articles, this could include brief research reports and studies of models of care in which cohorting was a major (but not the only) feature. We excluded conference abstracts, case reports that did not report on outcomes, and simulation studies. We also excluded studies that exclusively assessed cohorting by unit specialty, which have been reviewed elsewhere (6). We used an inductive approach to developing thematic domains for categorization of article content.

Results

We reviewed eighteen articles (Available online at https://cdn.amegroups.cn/static/public/10.21037apm-22-1400-1.pdf). Articles were published between 2008 and 2022. All studies were based in the US. Thirteen were quantitative, 2 were qualitative, and 3 applied a mixed-method approach. We identified four thematic outcomes domains including patient-centered outcomes, communication, efficiency, and satisfaction. Eleven articles reported on outcomes in multiple domains. Certain outcomes [e.g., length of stay

Table 1 Search strategy summary

Items	Specification
Date of search	March and November 2022
Databases searched	PubMed, Embase, CINAHL and Scopus
Search terms used	"geographic[al] cohorting", "geographic rounding", "geographical assignment hospitalists", "geographically localized", "geographic dispersion", "cohorting", "regionalization", "regionalized care", or "localized medical teams"
Timeframe	No restriction
Inclusion and exclusion criteria	Inclusion: • English language studies • Quantitative and qualitative original research that reported on outcomes related to and experiences with cohorting on general medicine and general pediatric wards • Brief research reports and studies of models of care in which cohorting was a major (but not the only) feature Exclusion: • Conference abstracts, case reports that did not report on outcomes, and simulation studies • Studies that exclusively assessed cohorting by unit specialty
Selection process	Single reviewer Order of screening process: • Titles • Abstracts • Full text

(LOS) and cost of care] could plausibly fit in more than one domain, but have only been described in a single section for simplicity. We reviewed the evidence within each of these domains.

Patient-centered outcomes

A central question in multiple studies is whether cohorting clinical teams to care for patients in one clinical space (e.g., one hospital unit instead of spread across several) meaningfully impacts outcomes. These include adverse clinical events (including mortality); hospital readmissions; LOS; and the cost of care.

Adverse clinical events and mortality

Williams *et al.* found a significant decrease in rapid responses called for patients on the general medicine service [odds ratio (OR) 0.30, 95% CI: 0.16–0.56] (16). Qualitative work has supported this finding with reported perceptions of improved provider response time to decompensating patients (17).

Mueller *et al.*, on the other hand, found no significant association of cohorting with preventable adverse events [adjusted odds ratio (aOR) 1.37, 95% CI: 0.69–2.69] (18). Olson *et al.* found no change in the number of rapid responses (19). In a larger cohort study designed to compare care on a teaching versus non-teaching service, where geographic cohorting was just one distinguishing feature, Roy *et al.* found no significant associations of cohorting with rates of ICU transfer (aOR 1.4, 95% CI: 0.8–2.4) or inpatient mortality (aOR 0.8, 95% CI: 0.3–1.8) (20). Klein *et al.* (21) found no association with 6-month mortality (3.1% pre-intervention *vs.* 3.9% after; OR 1.13; 95% CI: 0.99–1.30; P=0.083).

Readmissions

No study has demonstrated an association of geographic cohorting with hospital readmission rates (19-25).

Length of stay (LOS)

Findings related to LOS have been mixed. Singh *et al.* analyzed 1,826 hospital admissions, using both concurrent and historical controls. They found that LOS was 11% higher (95% CI: +1% to +22%, P=0.038) in the geographically cohorted group when compared to historical controls, but was not statistically significant when compared with concurrent controls (+9%, 95% CI: −3% to +21%, P=0.14) (23).

Several studies have found no change in mean LOS (19,21,22).

Coates *et al.*, on the other hand, found a decrease in adjusted LOS of 0.98 days associated with cohorting (95% CI: 0.50–1.47) (25). In a study of a broader accountable care team model, of which geographic cohorting was one part, Kara *et al.* found an association with a decrease in the LOS index (a ratio of observed to expected LOS) (24).

Cost of care

Singh *et al.* found no differences in total charges among cohorted versus non-cohorted [+2% compared to historical controls (95% CI: −6% to +11%); −4% compared to concurrent controls (95% CI: −12% to +5%)] (23). Roy *et al.* and Kara *et al.* both reported marginally lower cost associated with larger reorganizations of care delivery that included cohorting as one component (20,24).

Communication

Bringing clinicians and patients into close geographic proximity has the potential to improve communication between the clinician team and both the patients and the interdisciplinary care team.

Cohorting has been associated with increased frequency of nurse-physician communication, including discussions of the daily care plan, and the proportion of time nurses spend on team rounds (9,18,22,26). Huang *et al.*, for example, found that the percentage of time a nurse was present on rounds increased from 24.1% to 67.8% (P<0.001). This has led to an increased likelihood that clinicians know one another's name, and, in some studies, to improved alignment among clinicians on aspects of the care plan, including planned tests and expected LOS (9,18,27). Olson *et al.* reported a significant improvement in both physicians and nurses reporting good collaboration (19).

Additionally, cohorting has been demonstrated to be associated with increased physician rounding time spent at the bedside, and frequency and duration of visits to the patient's room throughout the day (19,26,28). For instance, Kara *et al.* found that cohorted hospitalists were 1.8 times more likely to visit their patients more than once per day (95% CI: 1.37–2.34; P<0.0001) (28).

Work efficiency

Geographic cohorting has been associated with decreased total rounding time, largely driven by a decrease in time spent travelling between units (17,26,28). It is associated with a decreased frequency of pages in most studies, which are a source of frustration for both the sender and the recipient (17,19,23,27,29-31).

Singh *et al.* reported 1.02 (95% CI: 0.46–1.58) more patient encounters and 1.36 (95% CI: 0.17–2.55) more relative value units (RVUs) generated per day among cohorted attending physicians compared to concurrent non-cohorted controls (23). Coates *et al.* reported a small increase in discharge efficiency (calculated as the number of patients discharged by hospitalist providers divided by the number of patient-hospitalist encounter days) (25). Bryson *et al.* found an association with improved rates of discharge before noon (47.5% *vs.* 54.1%; 95% CI: and P value not reported) (22). Carlson *et al.* (31) found an association with earlier progress note completion [2:30 PM pre- and 2:01 PM post-intervention (P<0.001)] and a lower rate of progress notes being completed after usual work hours (25.1% pre-intervention *vs.* 20% post-intervention (P<0.001).

Multiple studies have also reported that geographic cohorting has been associated with an increased rate of interruptions during the physician workday (13,17,28). For instance, Kara *et al.* found that cohorted hospitalists were interrupted once every 8 minutes in the afternoon, *vs.* non-cohorted hospitalists who were interrupted once every 17 minutes (P value not reported) (28). This has been attributed to increased availability and visibility—physicians are more likely to be present on the unit, making other staff more likely to approach with questions or issues that otherwise might not rise to the level of a page or call. Overall physicians expressed satisfaction with the cohorted model despite these interruptions (see Satisfaction below for more detail) (17).

Satisfaction

Staff satisfaction—and in particular physicians, who have been most frequently surveyed—with cohorting tends to be high. Clinicians report increased perceived quality and safety of care, improved workplace culture as a result of more frequent face-to-face interactions and enhanced communication, and improved patient-centeredness of care (13,17,19,24). Carlson *et al.* found an association with lower rates of symptoms of burnout (31). Perceived downsides include increased patient handoffs (see Competing Priorities below); decreased camaraderie with fellow hospitalists, as they are less likely to sit in a shared workspace; and increased frequency of interruptions, as noted above (13,17).

Patient satisfaction scores, measured via standardized Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) surveys, associated with cohorting have been unchanged (20,21,24,32). No studies have designed and administered surveys to patients to specifically capture their reflections on cohorting.

Discussion

The existing literature around geographic cohorting demonstrates a net positive impact on staff communication and satisfaction. The finding around work efficiency are mixed, with both positive and negative consequences. The data around patient outcomes is methodologically limited (primarily drawing from pre-post study designs), but on the whole suggests a neutral to positive association.

Our own experience with cohorting has reflected these findings—it has had a strongly positive impact on unit culture and staff satisfaction, with providers more likely to know one another's name, improved communication, enhanced rounding efficiency, and more time spent at the bedside. Despite this, it has been challenging to sustainably implement and remains a limited practice within the world of hospital medicine.

Competing priorities

If cohorting has the potential to improve the workplace environment and benefit patients, then why not implement it? The challenges are two-fold: there are tradeoffs in throughput and patient flow, and cohorting requires an operational investment, the costs of which need to be justified.

The tradeoffs are best understood by thinking about a patient's movement through the hospital. Consider a patient admitted from the emergency department (ED) for pneumonia. In a high-volume hospital, a bed may not be available at the time of the ED's decision to admit. In a non-cohorted hospital, an inpatient medicine team will be assigned to take over the patient's care, and the patient will await the first available and appropriate bed. In a cohorted hospital, this is more complicated—if the inpatient team is tied to a specific unit, does the patient wait until a bed becomes available there? Do they hold inpatient team assignment until they know which bed the patient is going to, and if so, who takes care of the patient in the interim—the ED team, or some other ED-hospitalist management team? The tradeoffs typically include increased ED wait times and/or patient handoffs. While these tradeoffs are generally understood by those who have attempted to implement cohorting, and have been explored in simulation studies (33,34), the available real-world studies have not quantified these effects.

From an operational perspective, cohorting may place an added burden on bed management. Beyond their usual considerations—matching patient needs with unit specialization, infection control, etc.—they may need to account for physician team assignment. Even more importantly, it requires an investment of valuable unit real estate that is not always granted to general medicine services (e.g., due to patient heterogeneity, lower revenue generation, etc.). If the number of general medicine patients far exceeds the number of dedicated general medicine beds, geographic cohorting, in the traditional sense, will not be possible.

Future studies

As noted, the majority of geographic cohorting studies—particularly in the domain of patient-centered outcomes—are pre-post designs, making it difficult to draw conclusions about its true impact.

What is most needed are studies with a rigorous methodologic design that will enable more causal inference. While a randomized controlled trial would be ideal, this type of intervention would also be well-suited toward certain quasi-experimental methods of analysis, such as a difference-in-differences or instrumental variable analysis approaches.

These studies can focus less on domains for which we already have compelling observational outcome data (e.g., communication) and more on assessing the potential

clinical benefits (patient-centered outcomes, care utilization measures) and costs (cost of care, throughput, handoffs, wait times) that are most likely to influence institutional leaderships' decision to make the necessary operational investments. This latter set of throughput metrics has been largely absent from real-world studies. A larger trial of this type can be supplemented with qualitative data from not only physicians, but also other staff and patients, who have been relatively under-surveyed in prior studies.

Operational and policy considerations

The major obstacles to implementation of cohorting are operational complexity and bed capacity. Bed management and clinical team assignment are typically handled through a patchwork of computer software and human operators. General medicine services are generally the largest, with the greatest number of teams, and the highest dispersion of patients. Integrating geographic cohorting into bed and team assignment is a complex optimization task that, at high-capacity hospitals, cannot be sustainably handled by individuals. Bed management software should be used to perform these tasks, and different models of cohorting can be tried from the traditional, strict approach (entire teams on a single unit) to more flexible ones (minimizing patient dispersion by assigning teams to a geographic center). There is also opportunity to integrate insights from queueing theory, industrial engineering, and machine learning in order to maximize throughput and optimize placement (34-39).

Bed capacity is often the single greatest limitation to implementing cohorting—there are typically many fewer general medicine beds than there are general medicine patients at any given time, necessitating dispersion to non-medicine units. This is a consequence of clear incentives for hospitals to prioritize capacity for high reimbursement specialty cases. Leaving aside the foregoing discussion of cohorting by clinical team, this type of dispersion alone has been associated with increased LOS (5,40,41). As Accountable Care Organizations (ACOs) and other shared models of payments evolve, consideration should be given to implementing incentives for maintaining a certain share of general medicine bed capacity.

Conclusions

The existing literature on geographic cohorting of patients by clinical care team demonstrates associations with improved communication and staff satisfaction. Data regarding patient outcomes and overall work efficiency are mixed, but these studies have methodological limitations. Hospital leaders should consider these plausible benefits and considerable uncertainties when making decisions about implementing geographic cohorting for general medicine teams with high volume/clinical demand. More rigorously designed studies are needed, with added attention to throughput metrics and tradeoffs that often limit implementation.

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Footnote

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