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Using Machine Learning to Benchmark Hospitals Reveals Dissimilarities Among the Most Renowned U.S. Hospitals

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Key Takeaways

- The top five renowned U.S. hospitals are not necessarily peers, as evidenced by the variation in the results of the Aggregate SimilarityIndex™.
- Existing hospital benchmarking methodologies based on objective data are limited to quality measures, which restricts their ability to make complete comparisons.
- The subjective nature (e.g., reputation surveys) and data limitations of existing hospital benchmarking sources results in a false sense of perceived prestige among the nation's "top" hospitals.

Historically, health economy stakeholders **could not accurately identify relevant hospital peers with traditional hospital benchmarking resources**, which rely primarily on quality measures coupled with subjective criteria. The existing benchmarking resources have received criticism from both clinicians and academics in past years, with one group of researchers citing prevalent issues across lists, including limited data, lacking data audits, and varying methods for compiling and weighting measures.¹

To address this gap in the health economy, we recently introduced SimilarityIndex $^{\text{m}}$ | Hospitals and its accompanying visualizer. Instead of *ranking* hospitals based on a mix of objective and subjective criteria, the SimilarityEngine $^{\text{m}}$ *compares* them using objective and diverse datapoints, allowing users to find the hospitals that are true peers.

Background

Most existing hospital rankings and ratings provide ordinal scores or ordered lists (i.e., best to worst) based in part on a variety of quality-centric measures, including HCAHPS, 30-day risk-adjusted mortality rate, and readmission rates. Over time, the "best" or "top" hospital lists have become an element in strategic planning even though they are targeted to consumers (Figure 1). Whereas the *U.S. News & World Report* rankings aim to help consumers understand the "best" place to receive certain types of healthcare services, Leapfrog Group scores hospitals on patient safety. A Healthgrades provides a review of clinical outcomes across multiple conditions to identify the hospitals with the "best" outcomes. While CMS Care Compare is intended to educate patients and provide consumer-curated scores, it also is used to incentivize performance, with Federal reimbursement levels (i.e.,

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Medicare, Medicaid) subject to change based on a hospital's rating score. Merative, comparatively, is intended to educate healthcare executives on organizational improvement initiatives.

	BEST HOSPITALS USNEWS	HOSPITAL SAFETY GRADE	AMERICA'S 250 Best HOSPITALS' Whealthgrades	CMS Total refusion as settle and settle Five-Star Quality Rated	TOP 100 SOCIAL RESPONSIBILITY TOTAL HER RESTRUCT HER REST	100 Top Hospitals	SIMILARITY INDE
MEASURE(S)	Outcome, Process, Structure, and Patient Experience	Safety grades, Process and Structure, Outcomes	Mortality and In-Hospital Complication	Mortality, Safety of Care, Readmission, Patient Experience, and Timely and Effective Care	Equity, Value, and Outcomes	Inpatient Outcomes, Extended Outcomes, Operational Efficiency, Financial Health, and Patient Experience	Quality, Outpatient Service Line, Financial, Patient Mix, and Market Share
GOAL(S)	To help consumers understand the "best" place to obtain certain types of healthcare services (e.g., cancer care)	To inform value based purchasing and improved decision making by advocating for transparency in healthcare when collecting, analyzing, and disseminating data	To provide an objective review of clinical outcomes across multiple conditions to identify the hospitals with the "best" outcomes	To equip patients with quality and safety information to inform decision making; to incentivize hospitals to perform well given reimbursements levels from the federal government can decline if ratings drop	To highlight the hospitals that provide socially responsible healthcare in the communities they serve and encourage other hospitals to follow their example	To identify top performing hospitals and offer insights to health economy stakeholders to inform organizational improvement	To equip healthcare decisionmakers with the tools to identify their most relevant peers and accurately benchmark similar hospitals
TARGET AUDIENCE	Consumers & Patients	Consumers & Patients	Consumers & Patients	Consumers & Patients	Consumer & Patients	Healthcare organizations & Executives	Healthcare organizations & Executives
STRENGTH(S)	Uses a variety of qualitative and quantitative data sources for consideration of rankings.	The only existing rank or rating list that focuses exclusively on hospital safety.	Evaluates hospital performance for 31 procedures and conditions.	Patient medical record information allows consumers to compare provider performance; Transparency in hospital and consumer usability.	The only list to take social responsibility and health equity into consideration.	Ranks more than just the nation's "renowned" hospitals, by ranking major and non-major teaching hospitals, as well as large, medium, and small community hospitals	Enables users to identify their true peers based on chosen measures, not what is deemed the 'best.
LIMITATION(S)	Three specialty rankings are determined based exclusively on subjective 'expert opinion'.	Uses secondary information for hospitals that do not participate in the survey	Ratings can only account for risk factors that are coded into the billing data	Comparison against non-comparable hospitals; Discrepancies in relative vs. absolute scoring	Data anomalies and assumptions based on zip code level data	Hospitals that are missing data are required to calculate performance measures; Different parameters for hospitals by category	Lack of patient experience measure

For a more detailed version of Figure 1, click here.

As Figure 1 reveals, the existing ranking and ratings methods lack comparative elements, do not holistically benchmark hospitals beyond limited quality-based metrics, and rely heavily on subjective data and reputation-based surveys. As a result, hospitals and health systems make arbitrary and incomplete parallels between themselves and some of the nation's "top" hospitals. In contrast, SimilarityIndex[™] | Hospitals uses Euclidean geometry to compare hospitals nationally based on quality, outcomes, safety, financial performance, market share, hospital capacity, and distribution of services rendered. These categories can also be aggregated to provide a comprehensive comparison.

Analytic Approach

As an illustrative example, we identified five renowned U.S. hospitals that often appear at the top of existing hospital benchmarking lists. Leveraging the **Aggregate SimilarityIndex**, we identified the five most similar hospitals to each renowned healthcare facility.

Findings

The same renowned hospitals appear on the *U.S News & World Report* year after year, leading stakeholders to incorrectly assume that they are peers. Applying Euclidean principles to objective data reveals that the five highest ranked hospitals in the 2022-2023 Best Hospitals Honor Roll are *dissimilar* in many respects. Conversely, William P. Clements, Jr. University Hospital, which is not on the Best Hospitals Honor Roll, is similar to Cedars-Sinai, NYU Langone Health, and Johns Hopkins Hospital.

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While many well-known hospitals such as Mayo Clinic, Cleveland Clinic, and Cedars Sinai may be reputational peers, they are not relevant peers for thousands of other acute care hospitals. By leveraging a diverse range of metrics and methods, sourced from both proprietary and secondary data, SimilarityIndex™ | Hospitals enables decision makers to holistically compare hospitals beyond quality and outcomes alone. Accounting for factors such as services rendered, the hospital's capacity, financial standing, overall market share, and patient mix affords is critical for identifying true hospital peers.

Use <u>SimilarityIndex™ | Hospitals visualizer</u> to select a benchmark hospital of your choice to index.

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