LITERATURE REVIEW

DISPARITIES BY RACE AND ETHNICITY IN ANTIBIOTIC PRESCRIBING

As part of its broader quality strategy, the National Committee for Quality Assurance (NCQA) seeks to promote antibiotic stewardship among health plans reporting Healthcare Effectiveness Data and Information Set (HEDIS® [1]) measures that assess antibiotic prescribing practices. As of Measurement Year (MY) 2026, four HEDIS measures assess the quality of care related to antibiotics: *Avoidance of Antibiotic Treatment for Acute Bronchitis/Bronchiolitis* (AAB), *Antibiotic Utilization for Respiratory Conditions* (AXR), *Appropriate Testing for Pharyngitis* (CWP) *and Appropriate Treatment for Upper Respiratory Infection* (URI) (see Table 1).

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An important component of promoting judicious antibiotic prescribing and usage involves ensuring that all populations are appropriately prescribed antibiotics, regardless of race or ethnicity. However, members of minoritized racial/ethnic groups may experience gaps in the receipt of antibiotic prescriptions. HEDIS antibiotic measures currently lack an equity component such as a race/ethnicity stratification that would allow for transparency into where inequities exist by race/ethnicity. NCQA believes that modifying these measures to capture performance by race/ethnicity could be a powerful way to advance health equity in antibiotic prescribing. Such a change would also follow the direction NCQA has taken in recent years with the introduction of the HEDIS race/ethnicity stratification to select measures; as of MY 2026, NCQA stratifies 22 HEDIS measures by race/ethnicity to highlight where gaps exist in certain clinical areas and monitors the closure of those gaps over time at the health plan level.

NCQA conducted a literature review to examine the prevalence of gaps in antibiotic prescription events and usage by race/ethnicity. Findings were then used to determine that stratifying the HEDIS antibiotic measures by race/ethnicity would be a meaningful tool for identifying and addressing disparities in antibiotic prescribing. The rest of this document summarizes findings from the evidence review as well as conclusions regarding the potential to stratify the four HEDIS antibiotic measures by race/ethnicity.

TABLE 1. HEDIS Antibiotic Measures and Descriptions

MEASURE NAME	MEASURE DESCRIPTION
Avoidance of Antibiotic Treatment for Acute Bronchitis/Bronchiolitis (AAB)	The percentage of episodes for persons 3 months of age and older with a diagnosis of acute bronchitis/bronchiolitis that did not result in an antibiotic dispensing event.
Antibiotic Utilization for Respiratory Conditions (AXR)	The percentage of episodes for persons 3 months of age and older with a diagnosis of a respiratory condition that resulted in an antibiotic dispensing event.
Appropriate Testing for Pharyngitis (CWP)	The percentage of episodes for persons 3 years and older where the person was diagnosed with pharyngitis, dispensed an antibiotic and received a group A streptococcus (strep) test for the episode.
Appropriate Treatment for Upper Respiratory Infection (URI)	The percentage of episodes for persons 3 months of age and older with a diagnosis of upper respiratory infection (URI) that did not result in an antibiotic dispensing event.

BACKGROUND:

Antibiotics are some of the most prescribed medications in the United States.[6] According to the Centers for Disease Control and Prevention (CDC), approximately 47 million excess antibiotics are prescribed each year for situations that do not require antibiotic use, such as viral infections.[12] While antibiotic prescribing is a critical component of healthcare, there are serious concerns regarding the potential for inappropriate prescribing and overuse, which can contribute to antibiotic resistance. In addition to antibiotic resistance, inequities related to inappropriate antibiotic prescribing can lead to poor health outcomes or antibiotic-associated adverse events in some populations. The undertreatment of infections is also a concern that could disproportionately affect certain populations and increase the risk of other complications.[4,6]

METHODS:

A literature review was conducted to explore disparities in antibiotic prescribing practices. The review focused on studies published in the last five years that were based in the United States. Literature was accessed through PubMed, Google Scholar and EBSCOhost using various criteria including combinations of search strings (Table 2). Each search string pulled various results which were reviewed for relevance based on article title and abstract. After eliminating articles that were not relevant or were duplicates, 11 articles were selected for thorough review. Two additional articles that met the inclusion criteria were reviewed from the reference lists of initially found articles for a total of 13 articles reviewed. The synthesized findings provide a summary of existing research on how antibiotic prescribing varies by race and ethnicity and highlight areas where improvements may be needed to ensure equitable antibiotic prescribing practices.

TABLE 2. Search Strings Used

SEARCH STRINGS
(antibiotic prescription) and (disparities)
(antibiotic prescription) and (race and ethnicity)
(antibiotic use) and (disparities)
(antibiotic use) and (race and ethnicity)
(antibiotic prescribing) and (racial disparities)
(antibiotic use) and (racial disparities)

Of the 13 articles reviewed, four were retrospective cross-sectional studies, seven were retrospective cohort studies, one was a scoping review and one was an exploratory analysis. Study geographies and data sources varied from single clinic analyses to nationally representative surveys. For information on key study characteristics, reference Table 3.

TABLE 3. Characteristics of Studies

STUDY	SAMPLE SIZE (N)	POPULATION	GEOGRAPHY	DESIGN	COMBINED RACE & ETHNICITY	RACE/ETHNICITY GROUPS	
Daga et al. (2022)	298 free clinic visits	Adult and Pediatric	Single clinic in North Central Florida	Retrospective pooled cross-sectional study	Yes	• Black or African American • Other • White	
Dantuluri et al. (2020)	805,332 children enrolled in Medicaid	Pediatric (2 months - 5 years old)	Single State – Tennessee	Retrospective cohort study	Yes	• Black • Hispanic • Other/unknown • White	
Dilworth et al. (2022)	63,051 outpatient discharges	Adult	Single Midwestern US health-system: 15 emergency departments; 33 urgent cares; 129 clinics	Retrospective cohort study	Yes	• Asian • Black non-Hispanic • Hispanic • Other • White non-Hispanic	
Gilmore et al. (2023)	1,608 patients	Adult	National dataset: All of Us	Retrospective cohort study	No	**Race** • Black • Non-Hispanic White • Other or Not Indicated	**Ethnicity** • Hispanic • Not Hispanic or Latino • Other or Not Indicated

STUDY	SAMPLE SIZE (N)	POPULATION	GEOGRAPHY	DESIGN	COMBINED RACE & ETHNICITY	RACE/ETHNICITY GROUPS
Howard et al. (2020)	3,452,011 ambulatory ED encounters	Pediatric (0 - 18 years old)	National dataset: Children's Hospital Association's Pediatric Health Information System (PHIS)	Retrospective cross-sectional study	Yes	• Asian • Black • Hispanic • Other • White
Kim et al. (2023)	Included 34 observational studies, 21 cross-sectional survey studies, 4 intervention studies, and 2 systematic reviews	Varied by study	All studies focused geographically in the US	Scoping review	Yes	• Varied by study
Klein et al. (2024)	147,401 ED encounters	Adult and Pediatric	EDs at 5 hospitals in Johns Hopkins Health Systems in Baltimore, Maryland/ Washington, DC	Retrospective cohort study	Yes	• American Indian or Alaska Native • Asian • Black • Hispanic • Multiracial • Native Hawaiian or Other Pacific Islander • Other • White
Moorthy et al. (2024)	The rate of antibiotic prescriptions per 1,000 children among pediatric patients enrolled in NC Medicaid: 2013 = 719 2014= 643 2015 = 639 2016 = 638 2017 = 627 2018 = 575 2019 = 613 Overall = 636	Pediatric (0 - 18 years old)	Single State – North Carolina	Retrospective cohort study	Yes	• Hispanic • Non-Hispanic Black • Non-Hispanic White • Other
Murcia et al. (2023)	1,882 patients	Adult	Single urgent care in Denver, Colorado	Retrospective cohort study	No	**Race** • American Indian/ Alaska Native • Asian • Black or African American • Native Hawaiian • Other Pacific Islander • Other/ Unknown • White **Ethnicity** • Hispanic • Not Hispanic • Other/ Unknown
Rahman et al. (2020)	1,753 ambulatory care visits	Adult and Pediatric	National dataset: National Ambulatory Medical Survey	Retrospective cross-sectional study	Yes	• Asian • Black • Hispanic • Other • White

STUDY	SAMPLE SIZE (N)	POPULATION	GEOGRAPHY	DESIGN	COMBINED RACE & ETHNICITY	RACE/ETHNICITY GROUPS	
Shaver et al. (2019)	461,647,174 patient visits	Adult and Pediatric	National dataset: Medical Expenditure Panel Survey (MEPS)	Retrospective cohort study	Yes	• Asian • Black • Other • White	
Siebert et al. (2022)	122,930 encounters	Adult	Single Mountain West US health-system: 38 urgent care clinic	Exploratory analysis	No	**Race** • Non-White • White	**Ethnicity** • Hispanic • Non-Hispanic
Young et al. (2023)	Over 7.0 billion patient visits	Adult and Pediatric	National dataset: National Ambulatory Medical Survey	Retrospective cross-sectional study	No	**Race** • Black only • More than one race • Other • White only	**Ethnicity** • Hispanic • Non-Hispanic

FINDINGS:

The studies included in our review generally support the idea that there are differential antibiotic prescribing practices across racial and ethnic groups; however, these differences in prescribing are not uniform in their direction and definition. Twelve out of 13 studies reviewed either explicitly define their measured outcomes as "inappropriate" antibiotic use or imply through their primary objectives that they are investigating "inappropriate" prescribing. Inappropriate, or unnecessary, antibiotic prescribing as referred to in all mentioned studies involves prescribing patients with antibiotics against current clinical prescribing guidelines, such as prescribing antibiotics for viral infections.[1] Guidelines and methodologies for classification of inappropriate prescribing varied between studies, but all studies defined the presence of a prescription against guidelines as an inappropriate prescription, without consideration of antibiotic course duration or dosage. Studies noted that course duration and dosage, while an important consideration for antibiotic stewardship, were not available to researchers due to the limitations of prescription identification through administrative claims analysis. **Going forward in this review, any discussion of receiving a prescription should be considered inappropriate and an indication of lower quality care, unless stated otherwise. Dantuluri et al., Moorthy et al. and Young et al. measured inappropriate prescribing separately from overall prescribing and reported findings on both.** A summary of findings can be found below in Table 4.

TABLE 4. Summary of Studies' Primary Findings

PRIMARY FINDINGS	STUDIES
Racial and Ethnic Minority Patients Experience Increased Prescribing	• Dilworth et al. (2022) • Shaver et al. (2019) • Young et al. (2023)
White Patients Experience Increased Prescribing	• Howard et al. (2020) • Kim et al. (2023) • Klein et al. (2024) • Moorthy et al. (2024) • Seibert et al. (2022)
Mixed Findings on Increased Prescribing by Race and Ethnicity	• Dantuluri et al. (2021) • Gilmore et al. (2023) • Rahman et al. (2020)
No Differences in Prescribing by Race and Ethnicity	• Daga et al. (2020) • Murcia et al. (2022)

Racial and Ethnic Minority Patients Experience Increased Prescribing[2-4]

Dilworth et al. investigated the impact of demographic factors on antibiotic prescribing and found that Black adults were more likely to receive an oral antibiotic prescription written on discharge for a primary diagnosis of bronchitis or upper respiratory tract infection with 29% higher odds than White adults (OR, 1.29; 95% CI, 1.22–1.38).[2] Shaver et al. evaluated the patient- and prescriber-level variables associated with inappropriate antibiotic prescriptions for acute respiratory tract infections (ARIs) and found that Black patients were more likely to receive an antibiotic for an ARI diagnosis with 51% higher odds than White patients (OR 1.51; 95% CI, 1.25-1.84).[3] Young et al. did not evaluate patient level prescribing but evaluated national disparities in overall antibiotic prescribing rates as well as disparities in inappropriate antibiotic prescribing. This study defined antibiotic prescribing rates as the number of visits that included at least 1 prescription per 1,000 total outpatient visits by subgroup. The authors found that the overall prescribing rate and the inappropriate prescribing rate were highest among Black patients (122.2 and 78.0 per 1,000 patient visits, respectively) and Hispanic patients (138.5 and 79.8 per 1,000 patient visits, respectively).[4] All studies noted that their findings of non-White patients receiving more antibiotics contrasted with previous literature, where it was believed that White patients in a variety of settings were more likely to receive any antibiotics.

White Patients Experience Increased Prescribing[5-9]

Howard et al. studied the prevalence of parenteral antibiotic use (those administered intravenously or intramuscularly) among children treated in the emergency department. While the authors were not able to directly determine if antibiotic use was inappropriate based on ICD-10-CM codes (as they grouped codes into larger clinical condition categories), they found that Black children were less likely to receive parenteral antibiotics with 13% lower odds compared to White children (OR, 0.87; 95% CI, 0.84-0.90). The difference with Hispanic children was even larger, as these children were less likely to receive parenteral antibiotics with 21% lower odds compared to White children (OR, 0.79; 95% CI, 0.76-0.81).[5] Klein et al. evaluated whether there was a difference in prescribing rates for ARIs across races and ethnicities in the emergency department of a single hospital system. They found White patients had a 32% increase in risk to receive an antibiotic prescription compared to Black patients (RR, 1.32; 95% CI, 1.26-1.38). Additionally, Hispanic patients and Asian patients had a 19% and 20% increase in risk to receive an antibiotic prescription compared to Black patients, respectively (Hispanic RR, 1.19; 95% CI, 1.11-1.27; Asian RR, 1.20; 95% CI, 1.10-1.31). When stratifying their analysis by age, they found larger effect size racial and ethnic disparities amongst children than adults; however, the overall differences in antibiotic prescribing rates in adults were larger.[7] Moorthy et al. aimed to describe the rates of appropriate and inappropriate antibiotic prescribing and identify disparities and risk factors of inappropriate prescribing amongst a population of pediatric patients in North Carolina Medicaid. They found that overall, non-Hispanic White children had the highest rate of antibiotic prescriptions, with 753 prescriptions per 1,000 children compared to 524 and 451 prescriptions per 1,000 children for non-Hispanic Black and Hispanic children, respectively.[8] Non-Hispanic White children also received an inappropriate prescription 22% of the time, compared to 26% for non-Hispanic Black children and 23% for Hispanic children. Non-Hispanic Black children had a 24% increase in risk to receive an inappropriate antibiotic compared to non-Hispanic White children (RR, 1.24; 95% CI, 1.23-1.24), and Hispanic children had a 3% increase in risk to receive an inappropriate antibiotic compared to non-Hispanic White children (RR, 1.03; 95% CI, 1.03-1.04).

Of note in these studies is that the term "disparity" has no single, agreed-upon definition. Many studies indicate statistically significant differences as evidence of disparities, but Siebert et al. address this lack of uniformity and indicate any absolute percentage difference greater than 5.0% between groups as a potential disparity in antibiotic prescribing practices. They found that White adults more frequently received antibiotics than non-White adults (50.1% vs 39.5%) and more frequently received inappropriate prescriptions (22.8% vs 14.9%). Non-Hispanic adults also more frequently received antibiotic prescriptions than Hispanic adults (50.0% vs 43.9%).[9]

A scoping review by Kim et al. of health equity in antibiotic prescribing practices between 2000 and 2022 found that generally, people of racial and ethnic minority groups were less likely to be diagnosed with a condition warranting antibiotics and were less likely overall to receive antibiotics compared to White groups. The authors noted that only a few studies explicitly assessed inappropriate prescribing by race and ethnicity and that overall lower prescribing of antibiotics does not equate to higher quality care if those antibiotics are inappropriately prescribed.[6]

Mixed Findings on Increased Prescribing by Race and Ethnicity[10, 12, 13]

Dantuluri et al. primarily investigated whether rates of ARI-related inappropriate antibiotic use among children enrolled in Tennessee Medicaid varied by rurality of residence. The authors classified antibiotic prescriptions according to a mutually exclusive, three-tiered system published by Fleming-Dutra et al.[11] This system categorizes ARI diagnoses into groups where antibiotics are "almost always indicated," "sometimes indicated" or "almost never indicated." Inappropriate antibiotic use was defined as a prescription with an associated diagnosis in which antibiotics are almost never indicated, and the absence of other appropriate diagnoses. They additionally stratified their findings between children residing in mostly rural and mostly urban counties by race and median household income. Overall, by race, the authors found that Black children had a 1.262 times lower rate of receiving an ARI diagnosis (Adjusted Incidence Rate Ratio [aIRR], 0.792; 95% CI, 0.789-0.795), a 1.297 times lower rate of being prescribed an antibiotic related to an ARI diagnosis (aIRR, 0.771; 95% CI, 0.768-0.774), and a 1.238 times lower rate to be prescribed an inappropriate ARI-related antibiotic (aIRR, 0.808; 95% CI, 0.802-0.814) than White children. In racial subgroup analysis, the authors found the strength of the association between rurality and incidence of study outcomes varied by race. The authors found the incidence of ARI, ARI-related antibiotic use, and ARI-related inappropriate antibiotic use was higher among Black children compared to White and Hispanic children across all three levels of rurality (completely rural counties, mostly rural counties and mostly urban counties). Gilmore et al. studied whether disparities existed between adults receiving guideline-concordant antibiotic treatment for community-acquired bacterial pneumonia (CABP) across several characteristics. They found that non-Hispanic White adults were more likely to receive guideline-concordant antibiotic prescriptions with 36% higher odds compared to Black adults (OR, 1.36; 95% CI, 1.02-1.81), and that non-Hispanic White adults were less likely to receive guideline-concordant antibiotic prescriptions with 34% lower odds compared to Hispanic adults (OR, 0.66; 95% CI, 0.48-0.91).[12] Rahman et al. assessed influenza rates across patient demographic characteristics and identified potentially inappropriate prescribing practices using the National Ambulatory Medical Care Services (NAMCS) database. They reported significant differences between race groups across frequency of appropriate and inappropriate prescribing (X^2 = 0.0032), with an overall 63.6% of their sample receiving an inappropriate prescription.[13] Two of the articles reviewed found no significant differences in antibiotic prescribing across racial and ethnic groups.[14,15] Daga et al. and Murcia et al. analyzed prescribing practices within a single clinic setting and noted that this limitation and small sample sizes may have reduced the authors' capability to identify disparities in prescribing practices.

CONCLUSION AND RECOMMENDATION:

This literature review yielded a limited number of articles (n=13) on the topic of disparities in antibiotic prescribing by race and ethnicity. Most articles focused on inappropriate overprescribing, with 12 articles detailing patient-level identifiers and only 2 providing summary analyses of national data or review of existing literature. Antibiotic prescribing is contextual when determining if a prescription qualifies as value-adding care. Higher or lower antibiotic prescribing rates and likelihoods do not necessarily equate to better or worse care. Rather, guideline-concordant and appropriate prescriptions are markers of value-adding care. While many articles used similar definitions of "inappropriate" prescribing, there was deviation in outcome definitions and reporting.

Across articles, many authors noted the current consensus is that White patients were more likely than racial minority groups to receive prescriptions for antibiotics. While previous literature beyond the five year observation window was not included for detailed analysis in this review, one commonly cited article was referenced by the study team for more detailed understanding of the notion that White patients are more likely to be prescribed antibiotics. A 2013 study by Gerber et al. concluded that Black patients were less likely to receive antibiotics for ARIs but did not stratify by appropriateness of prescribing, and even indicated that "this discrepancy reflects overprescribing, both for all antibiotics and for the relative proportion of broad-spectrum antibiotics, to nonblack patients, rather than under-prescribing to black patients."[16] Five of our studies showed consistent findings that White patients were more likely to receive an inappropriate antibiotic compared to non-White patients.[5-9] Three articles had mixed findings, with either White patients more likely to receive prescriptions compared to Black patients, but not Hispanic patients, as seen in Gilmore et al., or both Black and White patients receiving more prescriptions than other races, from Rahman et al. Dantuluri et al. had more complex findings, with White patients more likely overall to receive antibiotics and more

likely to receive inappropriate antibiotics; however, when analyzing the interaction between rurality and race, the authors found that rurality was associated with higher overall and inappropriate antibiotic use, and this association was stronger amongst minority groups compared to Whites across levels of rurality. Three articles had findings contrasting existing knowledge, finding that Black patients were more likely to be inappropriately prescribed antibiotics than White patients.[2-4]

A potential modifying factor in the relationship between race and prescribing patterns for future research to investigate could be patient age. In the three studies with only pediatric samples (Dantuluri et al., Howard et al. and Moorthy et al.), overall analyses found that Black children were less likely to receive prescriptions than White children. These studies noted that cultural differences, overdiagnosis of White children, underdiagnosis of racial minority children and parental expectations could account for these differences.

The current evidence highlights disparities in antibiotic prescribing but is not consistent on directionality or magnitude of these disparities. Some studies with differing methodologies in their sample selection and outcome criteria come to similar findings, such as Dilworth et al. and Young et al. Dilworth et al. sampled directly from outpatient discharges with a primary diagnosis of either bronchitis or ARIs amongst a single health-system, while Young et al. included all visits from a large, nationally representative survey (the National Ambulatory Medical Care Survey) and included a variety of appropriate and inappropriate diagnostic outcomes for antibiotic prescribing. Both studies concluded that Black patients were more likely to be prescribed antibiotics, despite differences in methodologies and sample characteristics. Variation in findings may be related to differences in sampling methodologies, source populations, outcome definitions and potential geographic variance in prescribing practices overall. Future confirmatory studies employing standardized outcome definitions and sampling a variety of patient populations can contribute to identifying evidence of prescribing disparities.

Of note, both Rahman et al. and Young et al. utilized the NAMCS database for their studies, but due to differences in methodological approaches, the studies report differing results. Young et al. included all patient visits in the database from 2009 to 2016, as well as identifying diagnoses with the Fleming-Dutra methodology, expanding the possible number of ICD-9 and ICD-10 diagnosis codes for inclusion.[4] Rahman et al. was more limited in scope, only utilizing visits from 2016 and restricting inclusion to patients with influenza identified with "J10" and "J11" ICD-10 codes.[13] These differences in study criteria may partially explain the differences in results, with Young et al. finding that Black and Hispanic patients had the highest overall and inappropriate prescribing rates, whereas Rahman et al. found both Black and White patients to be prescribed more inappropriately compared to other racial groups. Future research utilizing more diverse methodologies and study populations should be conducted to provide more evidence as to the true nature of prescribing disparities by race.

A potentially unknown confounding factor may be associated with disparate antibiotic prescribing amongst populations and diagnostic categories, and because of this, NCQA believes that stratifying the following HEDIS measures by race/ethnicity would be a useful change: *Avoidance of Antibiotic Treatment for Acute Bronchitis/Bronchiolitis, Antibiotic Utilization for Respiratory Conditions* (AXR), *Appropriate Testing for Pharyngitis* (CWP) and *Appropriate Treatment for Upper Respiratory Infection* (URI). ***We recommend adding the race/ethnicity stratification to these measures as doing so will promote transparency into where inequities in health care quality lie and will inform quality improvement efforts aimed at advancing health equity.***

In addition, implementation of the stratification in these measures would allow NCQA to contribute to future research efforts aimed at identifying gaps in this area by race/ethnicity overall, including gaps that impact groups beyond those considered in the available research (Black, Hispanic and White). Nationwide data collection would additionally allow for diversity in geographic regions and variances across the urban-rural spectrum, and provide opportunities to investigate possible modifying effects of these variables on antibiotic prescribing rates across racial groups. As of HEDIS MY 2026, the NCQA race/ethnicity stratification includes the following groups: American Indian or Alaska Native, Asian, Black or African American, Middle Eastern or North African, Native Hawaiian or Pacific Islander, White, Some Other Race, Two or More Races, Hispanic or Latino and Not Hispanic or Latino. ***NCQA recommends stratifying the antibiotic measures in the near future (for instance, in MY 2028 or MY 2029).*** By incorporating these updates into the stratified antibiotic measures, NCQA will put health plans in a much stronger position to identify gaps in care for all populations at a national level, and will improve the ability of health care organizations, health care researchers and policymakers to better understand the challenges experienced by all groups.

This review is subject to limitations. The five year lookback period significantly reduces the breadth of existing literature available for analysis and review. While this short lookback period was intended to only capture the most recent work within the field, many previous studies that are considered foundational to antibiotic stewardship were not included in this analysis. A further limitation is the lack of uniformity in outcome criteria. The already small number of studies included indicates the need for future guidance on developing standards for what outcome measures constitute best prescribing practices and how to identify disparities in appropriate and inappropriate antibiotic prescribing.

Overall, this literature review demonstrates a critical need for a tool that can systematically assess inequities in antibiotic prescribing practices at the national level by race/ethnicity. Stratifying these measures in HEDIS will provide much needed transparency into the gaps in care and will inform health plans as they develop initiatives to address inequities on the ground.

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