Report on the Study of the Acute Hospital Care at Home Initiative

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A Report Required by Consolidated Appropriations Act, 2023

United States Department of Health and Human Services

Centers for Medicare & Medicaid Services

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1 Executive Summary

On November 25, 2020, and in the context of the COVID-19 Public Health Emergency (PHE), the Centers for Medicare & Medicaid Services (CMS) launched the Acute Hospital Care at Home (AHCAH) initiative. Under the authority provided by section 1135 of the Social Security Act (the Act)[1], CMS granted AHCAH waivers for individual hospitals to provide inpatient-level care in the home environment to Medicare fee-for-service and non-managed care Medicaid beneficiaries. In December 2022, Section 4140 of the Consolidated Appropriations Act, 2023[2] (CAA, 2023) (Public Law 117-328) extended the AHCAH initiative beyond the end of the COVID-19 PHE, allowing the initiative to continue through December 31, 2024. The CAA, 2023 also directed the Secretary to evaluate several aspects of the AHCAH initiative, including:

(1) the criteria established by participating hospitals to determine which individuals would qualify for AHCAH services;

(2) socioeconomic information on beneficiaries treated under AHCAH;

(3) the clinical conditions treated and diagnosis-related groups associated with discharges from the inpatient setting, versus under AHCAH;

(4) the quality of care furnished to individuals treated in the inpatient setting, versus individuals with similar conditions and characteristics treated through AHCAH;

(5) patients' experience with care under AHCAH;

(6) the costs incurred by furnishing care in the inpatient setting, versus through AHCAH; and

(7) the quantity, mix and intensity of services furnished through inpatient care, versus AHCAH.

This report provides the results of this statutorily required analysis.

Inclusion Criteria for Individual Hospitals Participating in AHCAH

AHCAH-approved hospitals used a variety of sources and methods to create patient selection criteria, largely rooted in published hospital at home (HaH) literature[3], in addition to the individual hospital's experience and resource capabilities to provide inpatient-level care in the home environment. Participating hospitals indicated that these criteria were developed and utilized with the intent to ensure that eligible patients were willing and able to participate in a HaH program; that such patients were clinically and psychosocially appropriate to safely receive care in the home; and that patients' home and community environments were conducive to the safe and effective provision of acute inpatient care at home. More details concerning the individual eligibility criteria established by AHCAH-participating hospitals, and the limitations

[1] https://www.cms.gov/newsroom/fact-sheets/acute-hospital-care-home-data-release-fact-sheet

[2] H.R.2617 - Consolidated Appropriations Act, 2023. Accessed May 8, 2024. https://www.congress.gov/bill/117th-congress/house-bill/2617.

[3] Clarke DV, Newsam J, Olson DP, Adams D, Wolfe AJ, Fleisher LA. Acute hospital care at home: the CMS waiver experience. *NEJM Catal*. Published online December 7, 2021. https://catalyst.nejm.org/doi/full/10.1056/CAT.21.0338

of the corresponding data and analysis summarized in this report, can be found in **Section 3** of this report.

Demographic Characteristics of Beneficiaries Treated under AHCAH

With respect to beneficiary demographic characteristics, AHCAH patients were found to be meaningfully different from inpatients receiving services furnished by the same hospital facility (hereafter referred to as "brick-and-mortar inpatients"). In general, AHCAH patients were more likely to be White and live in an urban location, and less likely to require additional governmental assistance beyond Medicare. These different characteristics of the AHCAH population may be partially attributable to the inclusion and exclusion criteria developed by participating hospitals for the purpose of identifying patients appropriate for HaH care, as discussed in greater detail in **Section 3** of this report.

Of note, this analysis found that patients were selected for AHCAH when they met all applicable criteria, including: that a patient live within the catchment area of an AHCAH-waiver-approved hospital (the hospital program must be able to respond to a change in the patient's clinical condition within thirty minutes); that a patient be clinically stable and appropriate for treatment in the home setting; that a patient affirmatively elect to be treated in the home, rather than in the brick-and-mortar hospital; and finally, that the psychosocial and home environment for each patient be conducive to the provision of hospital-level care. As a result of these combined selection criteria, the AHCAH patient cohort has different demographic characteristics and is not representative of the overall general inpatient population for similar conditions. More detailed findings on AHCAH patient demographics, and the limitations of the underlying data and analysis, are presented in **Section 4.4** of this report.

Clinical Conditions Treated and Diagnosis-Related Groups (MS-DRGs) Associated with AHCAH Discharges

AHCAH episodes of care, which are defined as the period of time from when the patient is admitted to the hospital as an inpatient until their discharge (identified herein as "episodes"), were tightly clustered around a relatively small set of conditions. The most common MS-DRGs and Major Diagnostic Categories (MDCs) treated through the AHCAH initiative included respiratory (36%), circulatory (16%), renal (16%), and infectious diseases (12%), for a total of 25 "top MS-DRGs" among patients served by hospitals with approved AHCAH waivers. More detailed findings on AHCAH clinical conditions treated, and discussion regarding the interpretation of the underlying data and analysis, are presented in **Section 4.5** of this report.

Quality of Care Comparison: Inpatient vs. AHCAH

The clinical conditions, MS-DRGs, and diagnoses of beneficiaries served by hospitals with approved AHCAH waivers were used to construct comparable brick-and-mortar inpatient episodes originating from the same hospitals. Having constructed comparable episodes of care, three different quality metrics were then calculated across AHCAH and inpatient episodes: 30-day mortality rates; 30-day readmission rates; and hospital-acquired condition (HAC) rates.

This analysis found that beneficiaries who received care under the AHCAH initiative generally had a lower mortality rate than their brick-and-mortar inpatient comparison counterparts, consistent with existing Hospital at Home (HaH) literature. Results of the 30-day readmissions metric analysis demonstrated some differences across the AHCAH and inpatient comparison groups, with readmission rates being significantly higher in the AHCAH group for two MS-DRGs but significantly higher in the inpatient comparison group for three MS-DRGs. HAC rates observed for beneficiaries served by the AHCAH initiative were lower than HAC rates observed in the brick-and-mortar inpatient comparison group for all six types of HACs evaluated, though the difference was not statistically significant. More detailed findings on the quality-of-care impact of the AHCAH initiative, and regarding the interpretation and limitations of the underlying data and analysis, are presented in **Section 4.6** of this report.

Cost and Utilization Comparison: Brick-and-Mortar Inpatient vs. AHCAH

This report focused on select metrics of Medicare spending, rather than costs incurred by hospitals to provide inpatient level care in the home. Similar to the quality-of-care analysis, the clinical conditions, MS-DRGs, and diagnoses of beneficiaries served by hospitals with approved AHCAH waivers were used to construct comparable brick-and-mortar inpatient episodes originating from those same hospitals. Having constructed comparable episodes (from inpatient admission to discharge), three different Medicare spending and utilization metrics were then calculated across the two inpatient groups (AHCAH episodes and brick-and-mortar inpatient episodes): length of stay per episode; the Medicare spending in the 30 days after hospital discharge; and hospital service utilization, including services provided in-person and virtually through telehealth. These metrics were used to analyze and compare inpatient care provided in brick-and-mortar facilities and under the AHCAH initiative.

The analysis showed that AHCAH inpatient episodes had on average, a longer length of stay (but by less than one day) than comparable brick-and-mortar inpatient episodes, while resulting in significantly lower Medicare spending in the 30-days post-discharge. Notably, the data analyzed indicate that Medicare spending for services furnished in 30-day post-discharge period were significantly lower across more than half of the top 25 MS-DRGs in the AHCAH group. However, statistical bias attributable to AHCAH patient selection criteria, and the differences in clinical complexity as measured across the two groups, make it difficult to definitively conclude that beneficiaries served by the AHCAH initiative resulted in lower Medicare spending overall than the brick-and-mortar inpatient care group. More detailed findings on the cost and utilization impact of the AHCAH initiative, and the interpretation and limitations of the analysis, are presented in **Section 4.7** of this report.

Patient Experience of Care Under AHCAH

CMS hosted a series of four virtual listening sessions with various groups of stakeholders, including patients and caregivers who had participated in the AHCAH initiative, to learn about their experiences and gather feedback on ways to improve the program. Additionally, CMS collected anecdotal information through site visits, direct correspondence with patients and hospital program operators, and other means on shared lessons learned, which contributed to the qualitative analysis of beneficiaries' experiences with the AHCAH initiative. Overall, the information collected indicates that patients and caregivers had predominantly positive

experiences with the care provided in the home setting through the AHCAH initiative. While this feedback came from a small number of patients, caregivers, and family members representing a limited set of AHCAH locations, the feedback was generally consistent with evidence concerning patient experience with HaH programs more broadly. Specifically, patients and caregivers interviewed had an overall positive experience with the care provided in the home setting. This positive feedback was mirrored by clinicians' own experiences in providing care to patients under the AHCAH initiative. More detailed findings on the patient experience of care under AHCAH, and the interpretation and limitations of the underlying data and analysis, are presented in **Section 4.8** of this report.

Future Considerations for AHCAH

The current study of the AHCAH initiative made use of the best-available quantitative and qualitative data on AHCAH, subject to the limitations discussed throughout, to draw comparisons between the AHCAH and brick-and-mortar hospital inpatient comparison groups. Many of the results from this study appear consistent with the intentions of AHCAH, including the delivery of safe, quality inpatient care in the home and alleviation of strains on brick-and-mortar hospital capacity for appropriately selected patients. However, the AHCAH initiative was not established for controlled comparisons or as a method to evaluate an innovative care delivery or payment model. There were many data, analytic, and measurement limitations of this study that constrain drawing definitive conclusions about the impact of the AHCAH initiative. A complete list of those limitations can be found in **Section 4.9** of this report.

2 Overview of AHCAH

The AHCAH initiative is rooted in the history of HaH programs implemented and tested around the world for decades. Building on that history, CMS designed a waiver review and monitoring process to ensure that participating hospitals provided high quality and safe care, compliant with the Medicare Hospital Conditions of Participation, to beneficiaries receiving acute inpatient care at home. This overview of AHCAH provides background information on the aspects of HaH care delivery, details on program operations, and information on the participating hospitals.

2.1 Background

This section provides background information about HaH and policies related to HaH, including AHCAH.

2.1.1 Background on Hospital at Home Care Delivery

The delivery of care through a HaH program involves the provision of acute inpatient-level care in patients' homes for clinical conditions that would normally require a hospital stay.[4] HaH provides hospital-level care by bringing critical elements of acute care—physician and nursing services, diagnostics, and therapeutics—to a patient's home.[5] The first trials, held in the United Kingdom (UK) in the late 1970s for patients experiencing acute myocardial infarctions, found that hospitalizations conferred no benefits over home-based acute care.[6] Since then, HaH programs have been established in the UK, Italy, Australia, Canada, Israel, and other countries with government-run health systems.[7]

In the late 1990s, Dr. Bruce Leff and colleagues at Johns Hopkins University started what is likely the first HaH program in the United States, to address the risks of hospitalization among older patients (e.g., hospital-acquired infections, and functional and cognitive decline).[8] A variety of studies and systematic evidence reviews have demonstrated that HaH is similar to or better than in-hospital stays across a variety of measures, including costs, mortality, length of treatment, health care usage, readmissions, long-term care admissions, anxiety and depression,

[4] G. Arsenault-Lapierre, M. Henein, D. Gaid, M. Le Berre, G. Gore, and I. Vedel, "Hospital-at-Home Interventions vs In-Hospital Stay for Patients With Chronic Disease Who Present to the Emergency Department: A Systematic Review and Meta-analysis," *JAMA Netw Open,* vol. 4, no. 6, p. e2111568, Jun 1 2021, doi: 10.1001/jamanetworkopen.2021.11568.

[5] B. Leff, D. Levine, A Siu, "The Acute Hospital Care At Home Waiver And The Future Of Hospital At Home In The US", Health Affairs Forefront, May 3, 2024. DOI: 10.1377/forefront.20240501.647118.

[6] J. D. Hill, J. R. Hampton, and J. R. Mitchell, "A randomised trial of home-versus-hospital management for patients with suspected myocardial infarction," Lancet, vol. 1, no. 8069, pp. 837-41, Apr 22 1978, doi: 10.1016/s0140-6736(78)90190-3.

[7] Has the Time Finally Come for Hospital at Home? Transforming Care, July 7, 2020. Accessed May 13, 2024, https://www.commonwealthfund.org/publications/2020/jul/has-time-finally-come-hospital-home.

[8] B. Leff, L. Burton, S. Guido, W. B. Greenough, D. Steinwachs, and J. R. Burton, "Home hospital program: a pilot study," *J Am Geriatr Soc,* vol. 47, no. 6, pp. 697-702, Jun 1999, doi: 10.1111/j.1532-5415.1999.tb01592.x.

and patient and caregiver satisfaction.[9,10,11] When viewed in the context of the COVID-19 PHE, the HaH model provided a feasible alternative to in-hospital stays at a time when hospital capacity and resources were severely strained.

2.1.2 Background on AHCAH and other HaH policies

Prior to AHCAH, CMS gained experience with acute inpatient services furnished to beneficiaries in the home setting. As part of the Health Care Innovation Awards Round Two, the Center for Medicare and Medicaid Innovation (CMMI) funded the Icahn School of Medicine at Mount Sinai between 2014 and 2017 to create and test the Mobile Acute Care Team (MACT) Services program and develop an associated payment model.[12] Based on the HaH model, MACT provided acute and post-acute care services in patients' homes and aimed to lower costs, improve clinical process and health outcomes, and increase patient satisfaction.[13] A rigorous impact evaluation of MACT was not possible because of the small number of patients who enrolled and the inability to replicate the patient enrollment criteria in claims data.[14] Despite the challenges in conducting a comprehensive and rigorous evaluation, available evidence suggested the awardee delivered services as intended, and patients participated actively and were satisfied with their care.[15]

To address challenges with respect to hospital bed capacity during the COVID-19 PHE, CMS issued waivers under section 1135 of the Social Security Act (the Act),[16] including waivers of specific Medicare Hospital Conditions of Participation (CoP) established in federal regulations, specifically 42 CFR **482.23(b)** and **(b)(1)**. These CoPs, implementing section 1861(e)(5) of the Act, require (a) nursing services to be provided on premises 24 hours a day, 7 days a week and (b) the immediate on-premises availability of a registered nurse for care of any patient.

Released on November 25, 2020, AHCAH was part of a broader Hospital Without Walls initiative, which provided regulatory flexibility allowing certain hospitals to provide health care

[9] G. Arsenault-Lapierre, M. Henein, D. Gaid, M. Le Berre, G. Gore, and I. Vedel, "Hospital-at-Home Interventions vs In-Hospital Stay for Patients With Chronic Disease Who Present to the Emergency Department: A Systematic Review and Meta-analysis," JAMA Netw Open, vol. 4, no. 6, p. e2111568, Jun 1 2021, doi: 10.1001/jamanetworkopen.2021.11568.

[10] G. A. Caplan, N. S. Sulaiman, D. A. Mangin, N. Aimonino Ricauda, A. D. Wilson, and L. Barclay, "A meta-analysis of "hospital in the home"," Med J Aust, vol. 197, no. 9, pp. 512-9, Nov 5 2012, doi: 10.5694/mja12.10480.

[11] J. Conley, C. W. O'Brien, B. A. Leff, S. Bolen, and D. Zulman, "Alternative Strategies to Inpatient Hospitalization for Acute Medical Conditions: A Systematic Review," JAMA Intern Med, vol. 176, no. 11, pp. 1693-1702, Nov 1 2016, doi: 10.1001/jamainternmed.2016.5974.

[12] Health Care Innovation Awards Round Two. Project Profile. Centers for Medicare & Medicaid Services. 2014. Updated September 6, 2023. Accessed May 6, 2024. https://innovation.cms.gov/innovation-models/participant/health-care-innovation-awards-round-two/icahn-school-of-medicine-at-mount-sinai.

[13] Evaluation of the Health Care Innovation Awards, Round 2: Final Report. 2020. Accessed May 6, 2024. https://www.cms.gov/priorities/innovation/data-and-reports/2020/hcia2-round-2-final-eval-report-sept-2020-0.

[14] Ibid.

[15] Ibid.

[16] 42 U.S. Code § 1320b–5 - Authority to waive requirements during national emergencies. Accessed June 25, 2024. https://www.law.cornell.edu/uscode/text/42/1320b-5.

services to patients in locations beyond the hospitals' physical facilities.[17,18] Hospitals paid under the Inpatient Prospective Payment System (IPPS) could request an individual AHCAH waiver (at the CMS Certification Number, or CCN, level), allowing those approved facilities the ability to provide inpatient-level care in the home environment for select Medicare fee-for-service and non-managed care Medicaid beneficiaries.[19] Under AHCAH, hospitals with an approved waiver were paid the same IPPS payment for services furnished to patients at home as would be paid if the patient was treated in the brick-and-mortar facility.

In addition to the CoP-specific waivers, CMS leveraged PHE-related telehealth flexibilities supporting access to virtual care and allowed the home or temporary residence of an individual to serve as an originating telehealth site. The AHCAH initiative allows a hospital to use remote clinician services in combination with in-home nursing services, to provide inpatient-level care in the patient's home.

Additionally, AHCAH waives 42 CFR 482.41 of the CoPs, which define structural and physical environment criteria specific to the hospital setting.[20] Nevertheless, a participating hospital still must demonstrate an ability to meet the other hospital CoPs that were not waived under section 1135 authority. For example, although the on-premises nursing requirement was waived as part of the AHCAH initiative, the immediate availability requirement for 24/7 nursing services for inpatient care was not waived under section 1135 authority. A hospital with an AHCAH waiver must ensure the availability of nursing services (virtual and/or in-person as clinically appropriate) 24 hours each day to patients receiving inpatient care in the home.

Finally, a hospital with an AHCAH waiver cannot admit patients if it does not also comply with existing state licensure requirements. In other words, while CMS approval of an AHCAH waiver request does not require state approval, a hospital that has been granted a waiver may not provide AHCAH services without an appropriate state license. [21]

[17] CMS Announces Comprehensive Strategy to Enhance Hospital Capacity Amid COVID-19 Surge. Accessed July 16, 2024. https://www.cms.gov/newsroom/press-releases/cms-announces-comprehensive-strategy-enhance-hospital-capacity-amid-covid-19-surge.

[18] Additional Background: Sweeping Regulatory Changes to Help U.S. Healthcare System Address COVID-19 Patient Surge | CMS. Accessed July 16, 2024. https://www.cms.gov/newsroom/fact-sheets/additional-backgroundsweeping-regulatory-changes-help-us-healthcare-system-address-covid-19-patient.

[19] Medicare Hospital Conditions of Participation. Accessed May 10, 2024. https://www.ecfr.gov/current/title-42/chapter-IV/subchapter-G/part-482.

[20] Ibid.

[21] States and hospitals also have non-discrimination obligations under Section 1557 of the Affordable Care Act, 42 U.S.C. § 18116 and its implementing regulations at 45 C.F.R. Part 92 and Section 504 of the Rehabilitation Act of 1973, 29 U.S.C. § 794, and its implementing regulations at 45 C.F.R. Part 84. Both contain requirements to serve individuals with disabilities in the most integrated setting. The AHCAH Initiative can support states and hospitals to meet these requirements to ensure individuals have options to return to their homes following an acute hospitalization with adequate supports. To read more about the final rules promulgated by OCR, please visit the Section 1557 and Section 504 webpages as well as the OCR Community Living and Olmstead webpage at https://www.hhs.gov/civil-rights/index.html.

On December 23, 2022, Congress passed the Consolidated Appropriations Act, 2023[22] (CAA, 2023) (Public Law 117-328). Section 4140 of Division FF of the CAA, 2023, created a new section 1866G of the Social Security Act which extended the AHCAH initiative, and its affiliated waivers of specific CoPs, through December 31, 2024.

AHCAH was established quickly in response to the COVID-19 PHE; therefore, initially, there was not a unique billing code that hospitals could use to distinguish inpatient care provided through AHCAH from inpatient care provided through a traditional brick-and-mortar inpatient episode. However, on July 1, 2022, the National Uniform Billing Committee approved two new codes for use on claims for HaH care.[23] The Committee approved Occurrence Span Code 82 ("Hospital at Home Care Dates") to capture the from/through dates of a period of HaH care provided during an inpatient hospital stay. The Committee also approved a new Room and Board (R&B) Revenue Code Subcategory 0161, "Hospital at Home, R&B/Hospital at Home." The new codes enabled the identification and tracking of inpatient claims submitted for care provided under an AHCAH waiver, as discussed further in **Section 4**.

2.2 Waiver Request and Review Process

For individual Medicare-participating hospitals to obtain approval for the AHCAH waiver, CMS implemented a process that involves four main steps: 1) waiver request submission; 2) waiver request review; 3) hospital interview; and 4) CMS leadership approval. CMS designed the process to ensure that each hospital's HaH care team has both the capacity and capability to provide safe, quality care in the home. This section describes the CMS AHCAH waiver request and review process.

2.2.1 Submission

First, each IPPS Medicare-certified hospital that seeks a waiver is required to submit such a waiver request through the CMS waiver portal.[24] Hospitals are identified in their waiver request by their CMS Certification Number (CCN). Because some hospitals have been delivering HaH care for varying periods of time, CMS divides waiver requests into two categories: Expedited Waivers (Tier 1) for experienced programs that have treated at least 25 patients meeting inpatient admission criteria (using national standard admission and leveling criteria); and Detailed Waivers (Tier 2) for all other submitters. Hospitals that submit as a Tier 1 that do not meet the Tier 1 experience requirements are required to resubmit their request as a Tier 2 waiver.

[22] H.R.2617 - Consolidated Appropriations Act, 2023. Accessed May 8, 2024. https://www.congress.gov/bill/117th-congress/house-bill/2617.

[23] The NUBC has approved two codes used in claims for "hospital-at-home" care. Accessed May 6, 2024. https://www.nubc.org/nubc-has-approved-two-codes-used-claims-hospital-home-care.

[24] Acute Hospital Care at Home. Accessed May 6, 2024. https://qualitynet.cms.gov/acute-hospital-care-at-home/waiver.

2.2.2 Review

Second, CMS conducts three levels of review for each submission, including a review (1) for completeness, (2) of past compliance with regulatory requirements, and (3) of responses to questions posed in the waiver submission form. The purpose of these reviews is to ensure the ability of the facility/CCN to meet waiver requirements, provide specific services, and maintain appropriate safeguards. The AHCAH waiver team—currently consisting of three clinicians (nurses and physicians) with expertise in Medicare hospital CoPs, payment models, quality metrics, and section 1135 waivers—conducts the reviews. Details of the review process are provided below.

- **Completeness review:** CMS reviews each request to ensure that all components of the request are complete based on the category of waiver request submitted (Tier 1 or Tier 2).
- **Regulatory compliance review:** CMS reviews hospital compliance, (within the most recent two-year period), with regulatory requirements for any serious threats of harm or injury to patients ("immediate jeopardy") to identify areas of potential concern related to patient safety. Previous immediate jeopardy citations do not necessarily disqualify a hospital from waiver participation; nevertheless, hospitals are expected to describe corrective actions taken to address previous citations, along with any policies put in place to prevent serious harm or threats to patient safety in the future.
- **Waiver requirements review:** CMS reviews the hospital responses to the waiver requirements. Tier 1 and Tier 2 waiver requests require the same elements and are approved by CMS leadership, but the way in which hospitals in each tier provide written responses to each question posed in the waiver submission form differs. Tier 1 hospitals are only required to provide written attestation that specific services and safeguards are in place; Tier 2 hospitals are required to give detailed written explanations of how each service and safeguard are provided. The **required elements** of the waiver are provided in Appendix B.

2.2.3 Interview

Third, the CMS team holds at least one meeting with the requesting hospital (regardless of Tier level) as an interview component of the waiver review process. Requesting hospitals are provided an opportunity to discuss their waiver request, to explain the operational aspects of the program, and to describe program policies and processes which fulfill the requirements of the AHCAH waiver. Additionally, hospitals have the opportunity to clarify any aspects of their written responses to specific elements of their waiver submission and to identify potential safety concerns. CMS also seeks to ensure that any HaH workflow or care protocol developed by the hospital does not establish a different standard of care for inpatients receiving care in the home, as compared to those inpatients receiving care in the brick-and-mortar hospital. These discussions provide the opportunity for both parties to ensure adherence to the requirements of the AHCAH waiver and the non-waived Medicare Hospital CoPs. Details regarding the topics addressed during these meetings are provided in **Appendix B**.

The interviews between representatives of the requesting hospital (hospital leadership overseeing the program, clinicians providing care in the home, and representation from the respective disciplines participating in care delivery) and CMS generally occur within 14 days of the submission. When needed, technical assistance is provided through additional meetings to ensure all issues are addressed appropriately. Although Tier 1 hospitals already have a HaH program in place, these discussions provide an opportunity to identify areas in which their existing workflows and protocols may need to be altered to meet the specific requirements of the AHCAH waiver, which would be extended to beneficiaries not previously treated in the home. CMS uses these discussions as an opportunity to ensure hospitals safely and effectively provide acute care at home for consenting patients. The team provides suggestions and technical assistance based on lessons learned, discussions with other requesting hospitals, and proven processes for addressing identified gaps. Based on the interview discussions, hospitals may be required to update their waiver requests to incorporate the CMS team's guidance.

2.2.4 Approval

CMS provides technical assistance to all hospitals seeking waiver approval. Senior leadership in the CMS Center for Clinical Standards and Quality (CCSQ) provides final approval of all waiver requests (Tiers 1 and 2).

2.3 Monitoring the AHCAH Initiative

After hospitals are approved for an AHCAH waiver, CMS continues to monitor and provide oversight through the collection of hospital-reported data on patient admissions and discharges, unanticipated mortalities (i.e., patients not on hospice and whose death was not otherwise anticipated by the hospital's care team) and escalations (the return of a patient from home back to the brick-and-mortar facility). The review of unanticipated mortalities is an especially important aspect of monitoring within the AHCAH initiative, as it enables CMS to use these events as an opportunity to learn, identify potential unexpected consequences, and support the continuous quality improvement of the initiative for all AHCAH participants. Information that is gleaned from the required patient safety committee review, and lessons learned through these events, are shared anonymously with other hospitals and are used to further inform and improve the CMS waiver review process.

CMS uses a standard operating procedure (SOP) for review of unanticipated mortalities as they arise (Table 1); to date there have been 68 unanticipated mortalities under the AHCAH initiative (mortality rate of 0.24%). First, CMS reviews each critical alert identifying an unanticipated mortality within 24 hours of receipt and contacts the hospital with a specific request for supplemental clinical information. This information includes a summary of the case, to understand when the patient was admitted, the course of care during the inpatient episode, and how the program's processes worked to assess the patient when clinical conditions changed. This information discloses how the care team responded to the patient's change in clinical condition, along with the ultimate course of care through their passing. CMS does not evaluate the clinical response of the care team; rather, the review focuses on the workflows and processes used to

ensure that the patient received timely care that met the expected standard as if the patient were physically located within the facility itself for the duration of their admission.

CMS then evaluates the circumstances surrounding when the patient was treated after a change in clinical condition. CMS holds a discussion with the hospital team to review a series of questions designed to identify any gaps in communication, lapses in urgent/emergency response protocols, or fragmentation in care processes which may have contributed to the outcome of the case. CMS looks at whether the program maintained compliance with the AHCAH waiver requirements, including response time, coordination with Emergency Medical Services/911 services, and communication with the receiving hospital to ensure a seamless transition of care (as applicable). CMS also offers the hospital team the opportunity to describe how the patient safety committee or other hospital group (e.g., morbidity and mortality committee or quality assurance team) reviewed the case, and to share any conclusions. With each case evaluated, CMS seeks to identify lessons learned by participating hospitals that may be incorporated into the existing CMS review process to avoid a similar outcome in the future. If a concern for patient safety is uncovered, a participating hospital is subject to CMS enforcement actions (e.g., a complaint investigation).

Table 1. Standard Operating Procedure for CMS Evaluation of Unanticipated Mortalities

Step	Action
1. Unanticipated Mortality Alert Received	CMS team member reviews within 24 hours Hospital POC contacted for supplemental information and details of the case
2. Supplemental Information Reviewed	Details of supplemental information reviewed via a call with the hospital's HaH program team; questions discussed during the call include: • What were the circumstances in which the patient was escalated back to the brick-and-mortar facility? • If the patient was not escalated back to the facility, what details informed the decision? • How long did it take to get the patient back to the brick-and-mortar facility? • How did the HaH program team communicate with hospital staff about the return to the brick-and-mortar facility? • Did the hospital safety committee, or other workgroup, review the case? • What, if any, were the lessons learned by the program that could have affected the outcome?
3. CMS Team's Review Completed	CMS' case file identifies key lessons learned and an assessment of whether, overall, the HaH team: • Communicated well and addressed changing needs in a timely fashion • Appropriately escalated their patient (if applicable) • Followed their established protocols • Have any concerns about the patient being an inappropriate admission to the HaH program • Have any concerns about the way the HaH team worked to honor patient and family wishes during the course of care (if appropriate)

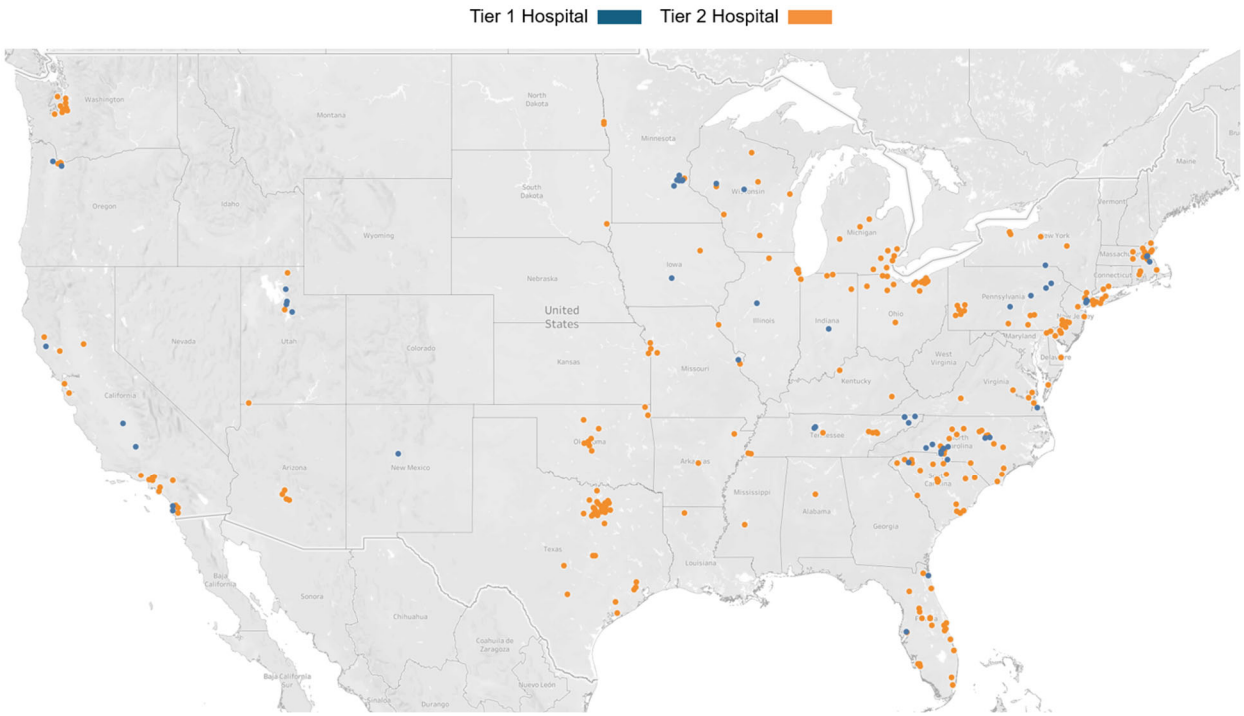
2.4 Participating Hospitals

As of July 24, 2024, CMS had approved 54 Tier 1 CMS Certification Numbers (CCNs), or acute care hospitals/facilities, and 278 Tier 2 CCNs for a total of 332 participating hospitals across 38 states. Ninety-three percent of patients admitted to AHCAH-approved hospitals are in urban areas (Table 2). Beneficiaries were considered 'urban' if they lived in a census tract that was part of RUCA that was designated as 'metropolitan' or 'urban'; beneficiaries were considered rural if they lived in a census tract that was not designated 'metropolitan' or 'urban.' Figure 1 illustrates the geographic distribution of these hospitals, according to hospital tier.

Table 2. States with AHCAH-approved Hospitals

State	Number of Tier 1 Hospitals	Number of Tier 2 Hospitals	Total
AL	0	1	1
AR	0	2	2
AZ	0	4	4
CA	5	16	21
CT	0	2	2
DE	0	2	2
FL	2	21	23
GA	0	1	1
IA	1	1	2
IL	1	5	6
IN	1	4	5
KS	0	1	1
KY	0	2	2
LA	0	1	1
MA	3	7	10
MD	0	1	1
MI	0	10	10
MN	6	1	7
MO	1	4	5
MS	0	1	1
NC	9	18	27
ND	0	2	2
NJ	0	14	14
NM	1	0	1
NY	4	22	26
OH	0	19	19
OK	0	10	10
OR	2	3	5
PA	4	12	16
RI	0	3	3
SC	1	18	19
SD	0	1	1
TN	6	7	13
TX	0	37	37
UT	4	3	7
VA	1	6	7
WA	0	10	10
WI	2	6	8
Total	**54**	**278**	**332**

Figure 1: AHCAH-Participating Hospitals



3 Analysis and Results of Patient Selection Criteria for AHCAH Participation

As required by Section 1866G(b)(1)(A) of the Act, Section 3 of this report examines the patient selection criteria established by AHCAH-approved hospitals. The analysis includes the identification and categorization of the patient selection criteria proposed by the Tier 2 hospitals. While some criteria align with specific CMS requirements for the AHCAH waiver, many of the criteria summarized in this section reflect what individual hospitals developed independently to best meet the needs of their patients.

3.1 Methods

This analysis examines responses provided to question 19 in the Tier 2 waiver request form,[25] which asks: "Please describe the criteria you use to select patients for acute hospital care at home. Do you use or have you adapted published selection criteria, or do you use criteria developed on your own? Please give complete details including all inclusion and exclusion

[25] Acute Hospital Care at Home. Accessed May 6, 2024. https://qualitynet.cms.gov/acute-hospital-care-at-home/waiver.

criteria." (Tier 1 hospitals were only required to attest to meeting this requirement.[26]) CMS extracted a sample of 169 AHCAH-approved Tier 2 hospitals that submitted requests from November 2020 to January 2024. The review and analysis of the responses from the subset of responses primarily consisted of four steps.

1. Filtered the extracted data for the responses to question 19 from the 169 AHCAH-approved Tier 2 hospitals. Eliminated duplicates when hospitals that were part of the same health system submitted identical criteria. Identified 151 unique sets of patient selection criteria in this subset of application data.
2. Used a large language model (LLM) tool (ChatGPT) to identify and summarize the constituent elements of the patient selection criteria. Grouped the criteria according to type (e.g., clinical, social, and environmental).
3. Conducted a manual review of a sample of the criteria to validate the ChatGPT output, and to account for any additional selection criteria or details not identified by the tool.
4. Two clinicians (a physician and a nurse) conducted a review of the summary of the criteria to clinically validate how the various types of criteria were categorized and described.

3.2 Results

Based on the review and analysis of the patient selection criteria submitted by requesting Tier 2 hospitals, Section 3.2 summarizes and describes the resources hospitals used to develop their criteria and the criteria they proposed to identify patients' relevant clinical factors, diagnoses, social and environmental factors, patient engagement and technology, and other criteria that informed hospitals' AHCAH eligibility determinations.

3.2.1 Resources Leveraged by Hospitals to Develop Criteria

In their waiver requests, Tier 2 hospitals identified several resources that served as the basis for their patient selection criteria, including (but not limited to):

- Published medical literature
    - David M. Levine, Kei Ouchi, Bonnie Blanchfield, et al. Hospital-Level Care at Home for Acutely Ill Adults: A Randomized Controlled Trial. Ann Intern Med.2020;172:77-85. [Epub 17 December 2019]. doi:10.7326/M19-0600
- Existing screening/leveling criteria or tools
    - Industry: InterQual criteria; Milliman Care Guidelines (MCG) criteria
    - HaH programs: Johns Hopkins Hospital at Home criteria, Mount Sinai Hospital at Home criteria
    - Health system tools: Adventist Health, Cleveland Clinic Foundation, Contessa Health, Presbyterian Healthcare Services, Prisma Health, ProMedica, Saint Luke's East Hospital
- Input from provider teams/experience from local admission patterns

[26] Hospitals submitted requests as either Tier 1 or 2 facilities: Tier 1 Expedited Waivers for experienced programs that had treated at least 25 patients meeting inpatient admission criteria, using national standard admission and leveling criteria; and Tier 2 Detailed Waivers for all other submitters.

- Legacy HaH operators/experts (including medical directors of HaH programs)
- CMS resources website

3.2.2 Clinical Criteria

Approved Tier 2 hospitals established a variety of clinical criteria for patient selection. As described above, the AHCAH waiver allowed for care of Medicare fee-for-service and (in certain states) non-managed care Medicaid beneficiaries. Hospitals cared for a variety of Medicare and Medicaid patients through their individual approved waivers, and often simultaneously offered HaH services outside of the AHCAH initiative to patients that were not beneficiaries of either program. As a result, a hospital's overall HaH program criteria may be leveraged for both AHCAH beneficiaries and non-AHCAH patients. Admitting clinicians have final authority when assessing a patient's clinical appropriateness for admission to the HaH program. The clinical criteria that were commonly used in the evaluation of patients considered for care under AHCAH-waiver approved programs include the following (Table 3).

Table 3. Clinical Selection Criteria

Clinical Area	Criteria
Hemodynamics[27]	• Hemodynamically stable for care in a non-telemetry setting • Vital signs demonstrating suitability for acute care at home
Mental Health	• Demonstrate medical decision-making competency or invoke healthcare proxy • No altered mental status • No active substance use/not under the influence of substances • Ability and willingness to adhere to treatment protocol • Not on methadone
Safe Discharge	• Low risk of complications • No need for Intensive Care Unit (ICU) level care • No need for advanced diagnostic in first 48 hours • No need for advanced therapy in first 48 hours • No need for emergent/urgent surgical intervention in first 48 hours • Intravenous (IV) treatments needed less than every 8 hours
Functional Status	• Ambulatory • Ability to complete activities of daily living (ADL), e.g., feeding, toileting
Maternal Status	• Not pregnant[28]

3.2.3 Diagnostic Criteria for Patient Selection

Approved Tier 2 hospitals indicated to CMS that they would utilize diagnostic criteria for patient inclusion in the AHCAH initiative, including the following (Table 4), which represent the most commonly used diagnostic selection criteria across AHCAH participating hospitals.

[27] Hemodynamics is the movement and the forces involved in the movement of the blood through the cardiovascular system (National Library of Medicine, Accessed 6/14/2024, https://www.ncbi.nlm.nih.gov/mesh/68006439).

[28] This did not apply to all waiver approved hospitals - some hospitals were devoted to antepartum acute care in the home.

Table 4. Diagnostic Selection Criteria

Diagnostic Category	Diagnosis
Cardiac	• Newly diagnosed congestive heart failure (CHF) • Need for continuous diuretic infusion • Decompensated CHF
Pulmonary	• Acute asthma exacerbation • Acute chronic obstructive pulmonary disease (COPD) exacerbation
Endocrine	• Hyperosmolar hyperglycemic states • Diabetic ketoacidosis (DKA)
Infectious Disease	• Urinary tract infection (UTI) with suspected sepsis • Pneumonia • Cellulitis • Acute COVID – 19 • Pyelonephritis • Gastroenteritis • Febrile illness not otherwise specified (NOS) • Bronchitis
Nephrology	• Acute kidney injury (AKI)
Hematology	• Deep venous thrombosis (DVT) • Pulmonary embolism (PE)

3.2.4 Social and Environmental Criteria

Approved Tier 2 hospitals indicated to CMS that they would utilize criteria designed to ensure a home environment is safe and conducive to acute hospital care at home, including (but not limited to) the following (Table 5).

Table 5. Social and Environmental Criteria

Area of Interest	Status
Utilities	• Running water • Electricity with grounded outlets • Climate control • Functioning bathroom • Refrigeration • Smartphone and Internet availability • Sufficient data plan or allowance to communicate with providers on smartphone
Patient Safety	• Daily reliable caregiver/support person • No domestic violence, elder abuse, or active substance use in the home • Weapons (if present) secured safely
Space and Location	• Not unhoused • Home located where timely transport to an acute care facility if needed (distance to hospital varied from 5–30 miles and/or within 30 minutes driving) • Resources in the area should be able to supply required medical equipment in a timely manner • Adequate space for medical equipment and medical care team visits
Medical Team Safety	• Not in police custody • Pets are contained during home visit(s) • Safety from neighborhood criminal activity • No bedbugs or other pest infestation

3.2.5 Patient Engagement and Technology

Approved Tier 2 hospitals also indicated to CMS that they would utilize criteria designed to ensure patients could successfully participate in their care at home, including criteria shown in Table 6.

Table 6. Patient Engagement and Technology Selection Criteria

Area of Interest	Status
Willingness to Engage	• Willing and able to actively participate in care plan • Acceptance of virtual and in-home visits multiple times per day
Ability to Engage	• English-speaking (other languages as the hospital can accommodate) • Agreeable to the use of technology for monitoring, communication, and delivering care • Able to use and operate necessary technology either independently or with assistance from an available caregiver/support person • Has fine motor skills • Ability to engage in self-care activities either independently or with assistance from an available caregiver/support person

3.2.6 Insurance-related Criteria

Finally, some approved Tier 2 hospitals proposed the following additional criteria to address insurance requirements.

- Meets billing and insurance requirements including specific mention of Medicare or Medicaid (as applicable by state) as a payor for insurance coverage
- Not residing in a long-term care facility (e.g., skilled nursing facility, hospice)[29]
- Not currently receiving care that requires specialized Registered Nursing (RN) monitoring (e.g., chemotherapy, dialysis)
- Age equal to or greater than 18 years[30]

3.3 Summary

AHCAH-approved hospitals have indicated to CMS that they rely on a variety of sources and methods to create patient selection criteria, largely rooted in published HaH literature. These criteria reflect the intent to ensure that patients are willing and able to participate in the HaH program, that they are clinically and psychosocially appropriate to safely receive care in the home, and that their home environments are conducive to the provision of acute care.

[29] This is consistent with CMS's waiver requirements – acute care would be delivered in the patient's home, not in long-term care or assisted living facilities.

[30] According to post-approval communications with CMS, some hospitals modified their age requirements to 16 years or older after CMS approval to allow for care of younger patients.

This analysis has some limitations stemming from the fact that it is based on Tier 2 hospital waiver requests and may not fully reflect the sets of patient selection criteria used currently or historically by all approved hospitals. It is possible that Tier 1 and Tier 2 hospitals may have modified their criteria after their interviews to reflect CMS guidance and input. While it is possible that Tier 2 hospitals updated their waiver request to reflect those modifications, the extent to which that may have been done is unknown. It is also possible that Tier 1 and Tier 2 hospitals modified their criteria after receiving CMS approval as they gained experience with their programs and applied lessons learned. Because hospitals are not required to submit updated inclusion or exclusion criteria to CMS after approval, any such data would not be available for incorporation into this analysis.

Furthermore, as previously described, this analysis did not include patient selection criteria from the Tier 1 hospitals. Tier 1 hospitals were expected to use appropriate patient selection criteria as part of their established HaH programs; thus, for the purposes of the waiver request process, they were only required to attest to the existence and use of criteria, rather than providing written information in the request form. This allowance was made in recognition that some requesting hospitals had established HaH programs; it also addressed the need to expedite waiver approval during the COVID-19 pandemic for experienced hospitals. CMS discussed patient selection criteria with the Tier 1 hospitals during the interview process to verify and confirm that the attested inclusion/exclusion criteria included the required elements, however Tier 1 hospitals were not required to provide their inclusion/exclusion criteria in writing, and as such those criteria were not incorporated into this analysis.

4 Analysis and Results of AHCAH and Comparison Group

4.1 Overview

This section details the main findings of the report, focusing on the Congressionally mandated comparisons between AHCAH and brick-and-mortar inpatient hospital care. The section provides background information about the construction of AHCAH episodes using data in multiple datasets, as well as information about the comparison between AHCAH and care provided in the brick-and-mortar facility.

The rest of this section examines a series of research questions designed to compare AHCAH inpatient care and care provided to a comparison group of brick-and-mortar hospital inpatients through the dimensions outlined by Congress. Table 7 summarizes these research questions, briefly describing the analytic approaches and corresponding data sources.

Table 7. Research Questions, Analytic Approaches, and Data Sources

Research Question	Analytic Approach	Data Source(s)
1. What are the characteristics of the AHCAH beneficiary population?	Linked Medicare entitlement and claims data	Medicare entitlement and claims in the CMS Integrated Data Repository (IDR), rural-urban commuting areas (RUCA), and AHCAH Patient and Hospital Research Identifiable Files (RIF)
2. What are the clinical conditions and diagnoses treated through AHCAH?	Linked AHCAH episodes to ICD-10 diagnosis and procedure codes in Medicare claims	Medicare claims in IDR
3. Does the quality of care differ for similar care furnished through AHCAH versus brick-and-mortar inpatient settings?	Calculated quality-of-care metrics based on relevant variables in Medicare claims	Medicare entitlement and claims in IDR
4. Does the cost, mix, and intensity of services differ for similar care furnished through AHCAH versus brick-and-mortar inpatient settings?	Calculated utilization of care metrics based on variables of interest in Medicare claims	Medicare entitlement and claims in IDR
5. What are the AHCAH patient and caregiver experiences of care?	Testimonials, anecdotal feedback and a series of listening sessions to understand the AHCAH experience of care	Emails, interviews, and transcripts of three listening sessions conducted with clinicians, patients and caregivers involved in AHCAH

Although it is possible to draw some conclusions about the AHCAH initiative based on readily available data, it is not practicable to conduct a controlled comparison analysis relative to brick-and-mortar-based services. Each research question will describe, in more detail, the limitations of this study and implications of the results provided; **Section 4.9** discusses several Future Considerations that could support more rigorous data collection and analysis going forward.

The following approach was used to construct episodes of care for the AHCAH beneficiary group and the comparison inpatient group for brick-and-mortar facilities for Research Questions 1 – 4.

4.2 Data Sources

The study used the following data sources to conduct the analyses.

- Medicare claims and enrollment data available in the IDR, including CMS Hierarchical Condition Categories (HCC) scores;
- The AHCAH RIF available in the CMS Chronic Conditions Data Warehouse (CCW); and
- RUCA codes produced by the U.S. Department of Agriculture to geolocate hospitals and beneficiaries.

As discussed in Section 2, from the point the initiative was established in November 2020 through July 2022, a billing code specific for AHCAH episodes did not exist, which makes claims analysis more difficult in terms of being able to specifically identify AHCAH episodes. Therefore, the study devised the following approach to construct AHCAH episodes.

- Prior to July 1, 2022: the AHCAH RIF was used to identify AHCAH episodes that correspond to Medicare Part A claims in the IDR. The RIF contains beneficiary identifiers associated with admissions dates that were cross walked to Part A claims data in order to identify the care episode; AHCAH episodes were included in the study sample if the Medicare Part A claim date occurred within three days of the date in the CCW RIF file.
- After July 1, 2022: Medicare Part A claims that include the AHCAH billing code were used and considered valid even if they did not match the dates in the AHCAH RIF. Claims used to construct the AHCAH episodes and the comparison episodes were pulled on April 10, 2024.

While receiving inpatient care at home through AHCAH, a patient may transition to the brick-and-mortar facility or move back and forth between the facility and the home. For the sake of simplifying the comparison, all care provided between a patient's admission/transfer to AHCAH and their date of discharge from the inpatient episode was attributed to the AHCAH episode, regardless of the physical location in which it was provided. Although it is not practicable for this study, it may be possible for future studies to identify when care was provided at home from care provided in the hospital for AHCAH episodes that occurred before July 1, 2022. However,

for the purposes of this report, because no AHCAH-specific billing code existed before that date, it is not possible to capture such events at this time.

Due to technical challenges related to data access and interpretation, it is not practicable to study AHCAH in the Medicaid population. State Medicaid agencies address AHCAH differently, and there were difficulties interpreting the data that carried the risk of reporting inaccurate information. In addition, only a few state Medicaid programs provide coverage of AHCAH,[31] and the number of Medicaid episodes is small relative to the number of Medicare episodes.

4.3 Approach to the Comparison

The approach for this study compares care provided through AHCAH to facility-based care provided by the same hospital, for the same Medicare Severity Diagnostic Related Groups (MS-DRGs). First, the study compares AHCAH episodes to brick-and-mortar inpatient episodes provided by the same hospitals because hospitals participating in the AHCAH initiative are a subset of IPPS hospitals across the country. Hospitals self-select into the AHCAH initiative and must be approved by CMS; they have significant operational capabilities; they are commonly teaching hospitals; and they are commonly (but not exclusively) located in urban areas. Comparing AHCAH episodes to brick-and-mortar inpatient episodes in the same hospitals therefore minimizes the amount of variation attributable to hospital characteristics. Second, this study focuses on the 25 most common MS-DRGs under AHCAH (representing 80% of total AHCAH claims), and it compares those episodes of care to care for the same MS-DRGs in the brick-and-mortar facility. This is because care provided through AHCAH is appropriate for a relatively small subset of all the conditions treated in a brick-and-mortar inpatient setting. As a result, limiting the study to only those most common MS-DRGs avoids introducing comparisons to care that is inappropriate for AHCAH.

By limiting the comparison to location of care within hospitals and within MS-DRGs, this study takes steps to control the comparison between AHCAH and care provided in a brick-and-mortar facility. Because the AHCAH initiative was initially set up as a time-limited emergency response to respond to the COVID-19 PHE, its focus from the outset has been to expand hospital capacity and ensure patient safety and quality of care. AHCAH was not intended or designed to evaluate an innovative care delivery model; as a result, there are inherent limitations in the current requirements in terms of what can and cannot be known about how the program operates and its impacts.

[31] https://extendhospitalathome.com/medicaid-coverage-of-hospital-at-home-care/

4.4 Research Question #1: What are the characteristics of the AHCAH beneficiary population?

In Brief: Beneficiaries participating in the AHCAH initiative were significantly more likely to be White, live in urban locations, and not receive Medicaid or low-income subsidies.

4.4.1 Overview

The AHCAH waiver initiative was originally intended as a short-lived initiative to increase hospital capacity during the COVID-19 pandemic, by ensuring that patients could receive high quality care at home during the public health emergency. Under those circumstances, CMS did not establish a set of beneficiaries with a predetermined set of characteristics that would ultimately participate in AHCAH. Rather, CMS gave hospitals requesting an AHCAH waiver discretion over which patients were eligible to receive care through the waiver. Hospital policies regarding which types of patients received AHCAH care were based on the hospital's operational and resource capabilities, as well as experience providing inpatient-level care in the home. These patient inclusion criteria were subject to review from CMS to ensure patient safety when hospitals initially requested an AHCAH waiver. As described in Section 3, hospitals used these criteria to conduct assessments of individual patients to determine their suitability for AHCAH. Eligible patients had the option of participating; an unidentifiable subset of patients may have been eligible for AHCAH but declined to participate.

This study found that the hospital patient inclusion/exclusion criteria and suitability decisions made by hospitals and patients impacted the demographic makeup of the AHCAH population, such that these beneficiaries were significantly more likely to be White, live in an urban location, and not receive Medicaid or low-income subsidies. Beneficiaries currently served by hospitals with AHCAH waivers are also located in predominantly urban areas with a significant number of academic hospitals participating in the initiative, which likely also influenced patient demographics.

To assess beneficiaries' clinical complexity, this study used CMS-Hierarchical Condition Category (CMS-HCC) scores as a proxy. HCCs are sets of medical codes that are linked to specific clinical diagnoses and demographic factors in a risk-adjustment model to calculate a score that is predictive of patients' future health care costs.[32] This study found that the AHCAH population had significantly lower HCC scores, on average, which generally suggests they were less clinically complex overall.

[32] Pope, G.C., Kautter, J., Ellis, R.P., et al.: Risk Adjustment for Medicare Capitation Payments Using the CMSHCC Model. Health Care Financing Review 25(4):119-141, Summer, 2004.

4.4.2 Methods

To determine beneficiary characteristics in the AHCAH and comparison group within the same hospitals, this study linked beneficiary identification information (ID) found in the Medicare Part A claims to Medicare enrollment data for the same IDs. This allowed a determination of the following demographic characteristics of AHCAH and comparison group beneficiaries at the time of the claim:

- Gender
- Geography (based on RUCA; CMS uses this data source to determine urban vs. rural location for a given zip code)
- Dual-Eligibility (Medicare and Medicaid) Status
- Part D Low-Income subsidy (LIS) status
- Beneficiary resolved, finalized CMS HCC scores (CMS uses the HCC to estimate future health care costs, and it is commonly used as a proxy for clinical complexity)
- RTI Race and Ethnicity (CMS uses this variable to impute race and ethnicity based on surname and what the beneficiary reported when applying for Medicare)[33]
- Age

4.4.3 Results

Exhibit 1 illustrates the number of episodes of care and beneficiaries represented in the AHCAH and comparison group samples. Notably, while both samples drew from the same cohort of 151 hospitals, the comparison group represented a much larger sample of patients, claims, and episodes, because the number of brick-and-mortar admissions vastly exceeded the number of AHCAH admissions in these hospitals.

The AHCAH patient population was statistically different from the brick-and-mortar inpatient population in the following respects:

- AHCAH patients were 5% (83% vs 78%) more likely to be White ($p < 0.001$).
- AHCAH patients were 8% (93% vs 85%) more likely to live in an urban location ($p < 0.001$).
- AHCAH patients were 10% (12% vs 22 %) less likely to receive Medicaid ($p < 0.001$) and 0.4% (1.6% vs 2%) less likely to receive low-income subsidies ($p < 0.001$).

The AHCAH patient population did not vary significantly from the comparison sample with respect to patient gender. Additionally, patients included in this study ranged in age from 21 to 107, with a mean of 77; there are no limitations on age if the patient has Medicare Fee-for-Service, non-managed Medicaid, or dual coverage under both Medicare and Medicaid. This study did not conduct statistical analyses on age because it was limited to the Medicare population.

[33] Lisa Lines and Jamie Humphrey. Imputing Race & Ethnicity: Part 1. The Medical Care Blog. January 1, 2022. Accessed July 19, 2024. https://www.themedicalcareblog.com/imputing-race-ethnicity-1/

Exhibit 1: Patient Demographics

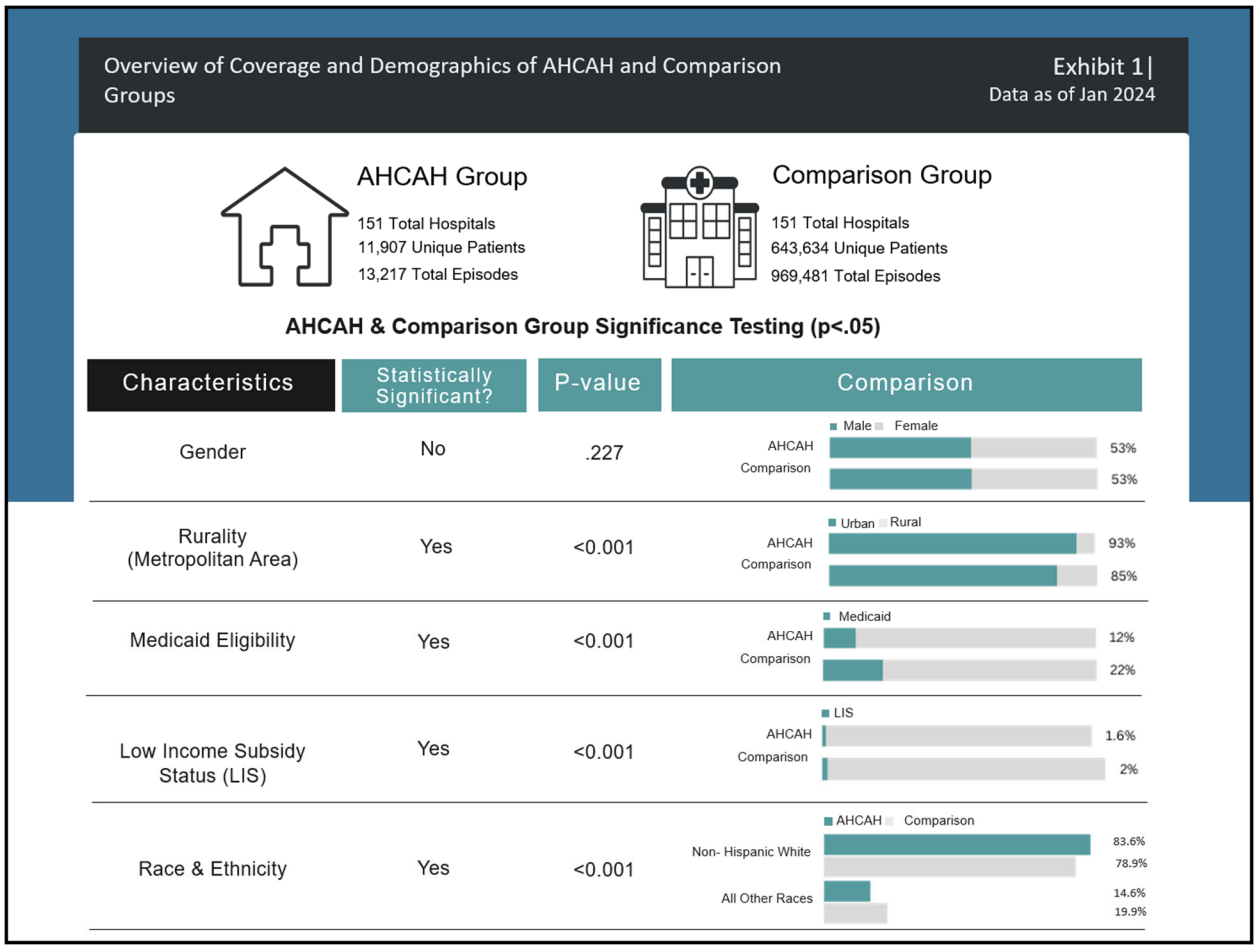


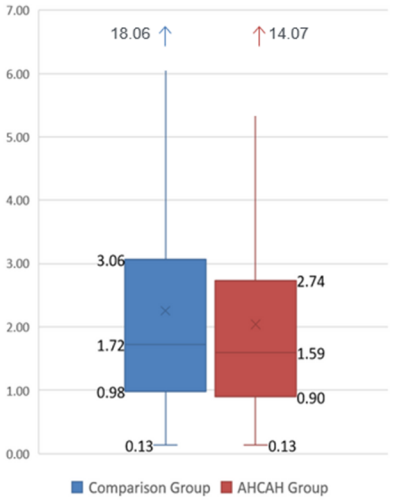
Exhibit 2 addresses the HCC scores of beneficiaries in the AHCAH and comparison group samples. The overall distributions of the two groups' HCC scores were similar, although HCC scores for some AHCAH patients were lower than the corresponding HCC scores in the inpatient comparison group sample. The difference between the median of both groups is statistically significant ($p < 0.001$). There are four MS-DRGs (189, 193, 194, and 603) where the inpatient comparison group HCC scores were significantly higher than those for the AHCAH beneficiary group, and eight MS-DRGs (177, 178, 280, 291, 602, 638, 682, and 689) where the AHCAH beneficiaries' HCC scores were significantly higher than those for the inpatient comparison group. Because the average HCC score was lower in the AHCAH beneficiary group, and there were more MS-DRGs with significantly lower HCC scores in the AHCAH group, it is reasonable to assume that AHCAH beneficiaries are generally (but not universally) less clinically complex than patients in the comparison group.

Exhibit 2: Risk Scores

Comparison of Distribution and Statistical Significance for HCC Risk Scores for the Top 25 AHCAH Diagnosis Related Groups (DRG)

Exhibit 2| Data as of Jan 2024

HCC Risk Score Distribution



	Comparison HCC Risk Score	AHCAH HCC Risk Score
Max	18.06	14.07
75th Percentile	3.06	2.74
Average	2.26	2.04
Median	1.72	1.59
25th Percentile	0.98	0.90
Min	0.13	0.13

HCC Significance Testing (p-value <0.05)

8 DRGs where AHCAH risk scores were significantly higher than Comparison group

DRG	Description	Comparison HCC Risk Score	AHCAH HCC Risk Score	P-Value (Diff in Avg Risk)
177	Respiratory Infections And Inflammations With MCC	1.73	1.85	0.0001
178	Respiratory Infections And Inflammations With CC	1.89	2.17	0.0001
280	Acute Myocardial Infarction, Discharged Alive With MCC	1.84	2.28	0.0006
291	Heart Failure And Shock With MCC	2.22	2.43	0.0000
602	Cellulitis With MCC	2.15	2.53	0.0210
638	Diabetes With CC	2.04	2.42	0.0351
682	Renal Failure With MCC	2.07	2.45	0.0081
689	Kidney And Urinary Tract Infections With MCC	2.02	2.33	0.0010

4 DRGs where AHCAH risk scores were significantly lower than Comparison group

DRG	Description	Comparison HCC Risk Score	AHCAH HCC Risk Score	P-Value, (Diff in Avg Risk)
189	Pulmonary Edema And Respiratory Failure	2.12	1.94	0.0334
193	Simple Pneumonia And Pleurisy With MCC	1.99	1.88	0.0257
194	Simple Pneumonia And Pleurisy With CC	1.95	1.72	0.0002
603	Cellulitis Without MCC	1.80	1.62	0.0004

HCC Risk Score by Gender Across Top 25 DRGs

Element	AHCAH Male	Comparison Male	AHCAH Female	Comparison Female
Average Risk Score	1.82	2.03	1.72	1.95
Minimum Average	.017	0.13	0.27	0.21
Maximum Average	10.56	14.65	8.57	15.46

4.4.4 Limitations

Overall, there are few limitations to data and analyses related to beneficiaries' demographic and clinical characteristics. However, four limitations are noteworthy. First, previous studies have argued that the RTI Race and Ethnicity variable "undercounts" Hispanic or Latino populations.[34] However, because this would likely impact both the AHCAH and comparison groups similarly, it is unlikely the source of the observed demographic differences. Second, the HCC score is a proxy for, not an indicator of, clinical complexity, so HCC scores may not reflect patients' actual clinical condition(s). Nevertheless, this would also impact both groups of patients in the same way and is unlikely to be the source of the observed clinical differences. A third limitation of this study is that it is unable to identify patients that hospitals considered for AHCAH but did not choose to admit to the home, nor is it able to identify how often different selection criteria disqualified patients for the initiative. This could be important for particular groups vulnerable to health disparities, including those individuals with disabilities who may be suitable for

[34] "Validity of Race and Ethnicity Codes in Medicare Administrative Data Compared With Gold-standard Self-reported Race Collected During Routine Home Health Care Visits," Olga Jarrin et al., *Medical Care* (Vol. 58, No. 1), January, 2020.

participation in AHCAH but for whom this analysis is limited due to lack of available identifying demographic data. Another area of particular concern is how often patients are unable to participate due to unsuitable conditions in the home, because this could introduce disparities. Knowing which patients did not qualify for AHCAH for this reason, and how often, could provide more actionable information about barriers to participation and how to address them. Finally, this study is unable to identify individuals whom hospitals deemed eligible to participate in AHCAH, but who decided not to participate. Knowing the volume, demographic and clinical characteristics of this population could provide useful information about the population who were eligible to participate in AHCAH, independent of personal preference.

4.4.5 Implications

Several factors could explain the findings described in this study that the AHCAH population is significantly more likely to be White, urban, and not receiving key federal subsidies. First, a patient must live in the catchment area of an AHCAH-waiver-approved hospital that is actively administering a HaH program. As noted in Section 2.4, a majority of AHCAH-approved hospitals are in urban areas. In addition to that geographical constraint, HaH programs must also be able to respond rapidly to a patient's change in clinical condition within thirty minutes (per AHCAH waiver requirements). Second, a patient must be clinically appropriate for treatment in the home setting, insofar as they have a condition that the HaH team has the capability and capacity to manage while the patient is admitted to the hospital at home service. Section 3 summarizes the selection criteria that hospitals use for this purpose. Third, a patient must elect to be treated in their home, and some patients may prefer to be treated in the hospital due to convenience, accessibility to nursing staff, or other reasons. Finally, the social and home environment must be conducive to the provision of hospital-level care, which includes certain requirements about the condition of the home itself and its functionality, as well as consideration for the impact on patient care of people and animals living in the home. Patients were only selected for AHCAH if they met all four of these considerations, which may help to explain why the AHCAH population is demographically different than the comparison group. Patients ineligible to participate in AHCAH, or who choose not to participate in AHCAH, receive traditional inpatient care within the brick-and-mortar facility (which the hospital has determined to be the safest place to provide the care, or the patient has determined is their preferred place to receive care, given the patient's individual circumstances).

The results of the analysis of beneficiary characteristics suggest that AHCAH beneficiaries and patients in the comparison group are not categorically different with respect to clinical risk, given that HCC scores in the two groups are similarly distributed. It is notable that, for certain DRGs, HCC scores are higher in the AHCAH population than in the comparison group. Nevertheless, AHCAH beneficiaries overall have lower HCC scores on average and this difference is statistically significant. This is likely attributable to the fact that AHCAH is not designed for patients who require more intensive care. Thus, HaH programs with approved AHCAH waivers would select for inclusion patients who were less likely to have high HCC scores and/or be clinically unstable, and therefore more suitable for care in the home environment. The difference between the two groups does not tend to indicate that hospitals are

inappropriately triaging patients to AHCAH; being clinically unstable is an *exclusion* criterion for AHCAH.

Additional research could be conducted to address the limitations discussed above. A closer review of hospital data on decisions related to AHCAH would reveal how often household conditions and/or clinical complexity prevent patients from participating in AHCAH. This information could help identify opportunities for hospitals to take additional steps to help make homes more conducive for inpatient-level care, as well as opportunities to adjust patient selection criteria without jeopardizing patient safety. Finally, additional qualitative research on why AHCAH-eligible patients might elect not to participate could point to ways that HaH programs could anticipate and address those concerns, such as through patient education.

4.5 Research Question #2: What are the clinical conditions and diagnoses treated through AHCAH?

In Brief: Hospitals used the AHCAH waiver to treat patients with a relatively small number of respiratory, circulatory, renal and infectious diseases.

4.5.1 Overview

The decision to treat any given patient under an approved AHCAH waiver may be based on a variety of factors. For example, such a decision may be influenced by the hospitals' clinical and operational capabilities. In addition, certain diagnoses may be easier to treat at home if there is less clinical complexity. However, in some cases, hospitals may make strategic investments in operational capabilities to treat more complex patients in the home, particularly if the hospital has specialized clinical expertise and operational capabilities to do so.

This study found that hospitals used the AHCAH waiver to treat patients who were concentrated in a relatively small number of clinical conditions, i.e., respiratory, circulatory, renal, and infectious disease. The three most common MS-DRGs were 291 (Heart failure and shock with major complication or comorbidity MCC[35]), 177 (Respiratory infections and inflammations with MCC), and 871 (Septicemia or severe sepsis without mechanical ventilation (mv) > 96 hours with MCC[36]). This study did not collect direct information about what made it feasible for hospitals to use the AHCAH waiver to focus on these conditions.

[35] MCC refers to "major complication or comorbidity"

[36] mv refers to "mechanical ventilation"

4.5.2 Methods

To analyze the conditions treated under the AHCAH waiver, this study constructed AHCAH episodes of care as described in Sections 4.1 and 4.2. Medicare Part A claims in the IDR associated with AHCAH episodes were then used to identify the MS-DRGs, Major Diagnostic Categories (MDCs), the primary and admitting ICD-10-CM diagnoses, and the ICD-10-PCS procedures associated with each episode of care.

From this sample of AHCAH claims, this study examined the distribution of clinical conditions, diagnoses and services provided to determine the most commonly occurring MS-DRGs, admitting and primary diagnoses, and ICD-10-PCS codes reported during AHCAH episodes. In addition to an examination of the most commonly occurring individual diagnoses, diagnosis codes were also examined in relation to their ICD-10-CM groupings that define the type of injury or disease they document. The following metric (Table 8) was used to calculate rates for AHCAH and the comparison groups.

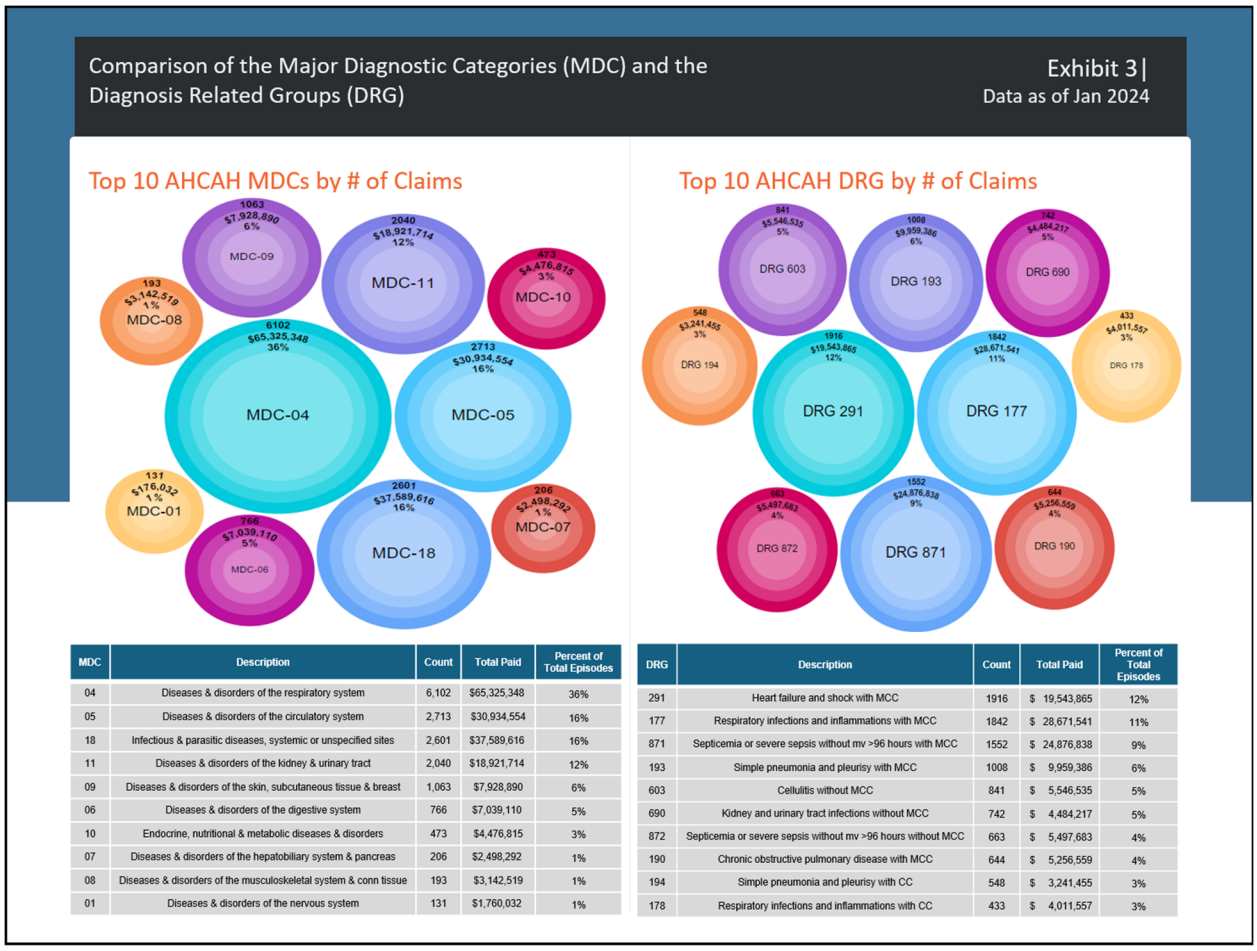
Table 8. Clinical Condition Rate Measure, Key Specifications, and Data Source(s)

Measure	Key Specifications	Data Source(s)
Percent of episodes	Calculated as the percent of total episodes, (not just episodes among the top 25 MS-DRGs), occurring in the AHCAH and comparison groups	Medicare Part A claims

4.5.3 Results

Exhibit 3 illustrates the most common MS-DRGs and MDCs treated through the AHCAH initiative, along with corresponding claims counts. At the MDC level, these conditions include a range of respiratory (36%), circulatory (16%), renal (16%), and infectious diseases (12%). There were a total of 25 MS-DRGs most commonly associated with the AHCAH initiative (referred to as the "top 25 MS-DRGs"). Additionally, the distribution of conditions indicates that episodes were tightly clustered: the top four MDCs accounted for 80% of all AHCAH episodes, and the top ten MS-DRGs accounted for 62% of all AHCAH episodes, as shown in Exhibit 3.

Exhibit 3: Clinical Conditions



MDC	Description	Count	Total Paid	Percent of Total Episodes
04	Diseases & disorders of the respiratory system	6,102	$65,325,348	36%
05	Diseases & disorders of the circulatory system	2,713	$30,934,554	16%
18	Infectious & parasitic diseases, systemic or unspecified sites	2,601	$37,589,616	16%
11	Diseases & disorders of the kidney & urinary tract	2,040	$18,921,714	12%
09	Diseases & disorders of the skin, subcutaneous tissue & breast	1,063	$7,928,890	6%
06	Diseases & disorders of the digestive system	766	$7,039,110	5%
10	Endocrine, nutritional & metabolic diseases & disorders	473	$4,476,815	3%
07	Diseases & disorders of the hepatobiliary system & pancreas	206	$2,498,292	1%
08	Diseases & disorders of the musculoskeletal system & conn tissue	193	$3,142,519	1%
01	Diseases & disorders of the nervous system	131	$1,760,032	1%

DRG	Description	Count	Total Paid	Percent of Total Episodes
291	Heart failure and shock with MCC	1916	$ 19,543,865	12%
177	Respiratory infections and inflammations with MCC	1842	$ 28,671,541	11%
871	Septicemia or severe sepsis without mv >96 hours with MCC	1552	$ 24,876,838	9%
193	Simple pneumonia and pleurisy with MCC	1008	$ 9,959,386	6%
603	Cellulitis without MCC	841	$ 5,546,535	5%
690	Kidney and urinary tract infections without MCC	742	$ 4,484,217	5%
872	Septicemia or severe sepsis without mv >96 hours without MCC	663	$ 5,497,683	4%
190	Chronic obstructive pulmonary disease with MCC	644	$ 5,256,559	4%
194	Simple pneumonia and pleurisy with CC	548	$ 3,241,455	3%
178	Respiratory infections and inflammations with CC	433	$ 4,011,557	3%

4.5.4 Limitations

It is reasonable to assume the MS-DRGs used in this study provide an accurate but incomplete depiction of the clinical conditions treated under the AHCAH waiver. Medicare hospital claims include MS-DRGs for billing purposes, and this information is thoroughly reviewed because it is directly tied to payment. Nevertheless, there are two notable limitations to the data and analysis provided in this subsection. First, there are no available data on why hospitals selected patients with these particular MS-DRGs over others for care under AHCAH, and there are no available data on which combination of clinical and operational factors influenced site of service decisions. Second, this study does not differentiate COVID-19 diagnoses from other diagnoses under MS-DRGs with which COVID-19 is associated.

4.5.5 Implications

The types of conditions treated under the AHCAH initiative are likely influenced by two factors: hospital operations and disease prevalence based on communication with participating hospitals and study findings. In the first case, hospitals participating in the AHCAH initiative typically began by treating patients with a limited set of conditions during the PHE, such as COVID-19,

and then expanded to treating patients with additional conditions as they gained operational experience and capabilities. Hospitals reported that they made deliberate decisions to invest in the operational capabilities needed to safely treat patients with specific conditions in the home and likely focused on clinical conditions that were less likely to pose a risk to patient safety. Second, specific conditions— including those falling under MS-DRG 177 (Respiratory Infections and Inflammations with MCC)— were inclusive of, but not exclusively, patients diagnosed with COVID-19, which was common during the timeframe this study examines (i.e., November 2020 through January 2024). Therefore, the occurrence and frequency of the conditions treated through the AHCAH initiative appear likely to have been influenced by the prevalence of disease in the population at the time.

Additional research to address the limitations discussed above would improve our understanding of the conditions treated – and potentially treatable – under the AHCAH initiative. First, better understanding about why hospitals may have selected particular conditions for initial AHCAH implementation, and what made these specific conditions appealing to hospitals, could inform programmatic refinements to expand the range of clinical conditions safely treated under AHCAH and could potential help identify best practices for hospitals considering participating in AHCAH. Second, better understanding of how the AHCAH initiative was used to treat COVID-19 in the home could offer additional insights into how the initiative supported the overall health system response to the COVID-19 PHE, as intended.

4.6 Research Question #3: Does the quality of care differ for similar care furnished through AHCAH versus brick-and-mortar inpatient settings?

In Brief: There was no statistically significant difference in the occurrence of Hospital Acquired Conditions (HACs) between AHCAH patients and those in the brick-and-mortar comparison group during the study period, although AHCAH patients experienced fewer HACs overall. AHCAH patients had variable rates of readmission depending on their clinical condition, and had lower mortality rates compared to the brick-and-mortar comparison group.

4.6.1 Overview

A number of indicators reflect the quality of care provided during an inpatient stay.[37] These include certain patient outcomes such as (1) whether a patient contracted a hospital-acquired condition (HAC) during their inpatient episode of care; (2) whether the patient was readmitted

[37] Ayabakan S, Bardhan I, Zheng Z (Eric). Triple Aim and the Hospital Readmission Reduction Program. *Health Services Research and Managerial Epidemiology*. 2021;8. doi:10.1177/2333392821993704

for an inpatient stay within 30 days of being discharged from the hospital; and (3) whether the patient lived for more than 30 days following discharge from an inpatient stay. Using Medicare claims, this study examined performance on these three outcomes, to compare the quality of care provided by hospitals through the AHCAH initiative to care provided in the same brick-and-mortar facilities. This study concludes that, overall, AHCAH beneficiaries fared as well or better than comparable brick-and-mortar inpatients, across all three outcomes.

It is important to note that the findings reported here are based on an analysis of claims, and the patient outcomes reported in this study are not calculated using the quality measure methodology used for CMS quality and reporting programs, as quality measures used in those programs were not incorporated into this analysis. Notwithstanding limitations related to the robustness of the comparison (discussed below at Section 4.6.4), these results indicate that inpatient-level care is being safely provided in patients' homes under the AHCAH initiative.

4.6.2 Methods

To determine if there were differences in quality of care, this study compared AHCAH inpatient stays to brick-and-mortar inpatient stays within the same hospital, categorized by MS-DRG. To construct comparable episodes, the study used the clinical conditions, MS-DRGs, and diagnoses of beneficiaries served by AHCAH waiver-approved programs, as described above in Section 4.4.2. Having constructed comparable episodes, this study assessed performance on the following metrics (Table 9) for the AHCAH and comparison groups.

Table 9. Quality of Care Metrics, Key Specifications, and Data Sources

Metric	Key Specifications	Data Source(s)
Hospital Acquired Conditions (HAC) rate	The rate at which HACs occur during an inpatient stay; HACs are conditions (e.g., catheter-associated UTIs; pressure ulcers; poor glycemic control; vascular catheter-associated infections; falls; iatrogenic pneumothorax) that were not present at time of admission that occurred over the course of the stay, as reported on claim form CMS-1450.	Medicare Part A claims
30-day readmissions rate	The rate at which patients are readmitted to inpatient-level care, at any facility, within 30 days of being discharged from an inpatient stay; time to readmission is calculated as time between index discharge and subsequent readmission.	Medicare Part A and Part B claims

Metric	Key Specifications	Data Source(s)
30-day mortality rate	The rate at which patients die within 30 days of being discharged from an AHCAH or brick-and-mortar episode; time to mortality calculated as time between index discharge and subsequent mortality.	Medicare Part A claims for data of discharge; Medicare enrollment data for date of death

4.6.3 Results

Overall, patients served by AHCAH-waiver approved hospitals experienced fewer HACs during the study period, had either higher or lower rates of readmission depending on their clinical condition, and had lower mortality rates compared to the brick-and-mortar inpatient comparison group.

Exhibit 4 provides a visual representation of all three outcomes evaluated in this study. AHCAH patients generally experienced fewer catheter associated urinary tract infections (a type of HAC), with some exceptions (notably MS-DRG 291 describing Heart Failure with Shock and MCC). Mortality rates were also lower for the AHCAH population across all top ten MS-DRGs as depicted below, while results for the readmission metric were more mixed. AHCAH patients with relatively less complex respiratory and infectious conditions (MS-DRGs 190, 193, 194, 603, 872) had lower 30-day readmission rates compared to the brick-and-mortar inpatient comparison group. For patients with a diagnosis of heart failure with shock (MS-DRG 291), readmission rates for both AHCAH inpatients and their brick-and-mortar counterparts were relatively similar, while those AHCAH inpatients with more complex clinical conditions related to respiratory infection (MS-DRGs 177 and 178) had higher rates of readmission following their initial inpatient episode of care.

Exhibit 4: Quality of Care Summary: Mortality, Readmissions and CAUTI Rates for AHCAH and Brick-and-Mortar Inpatient Groups

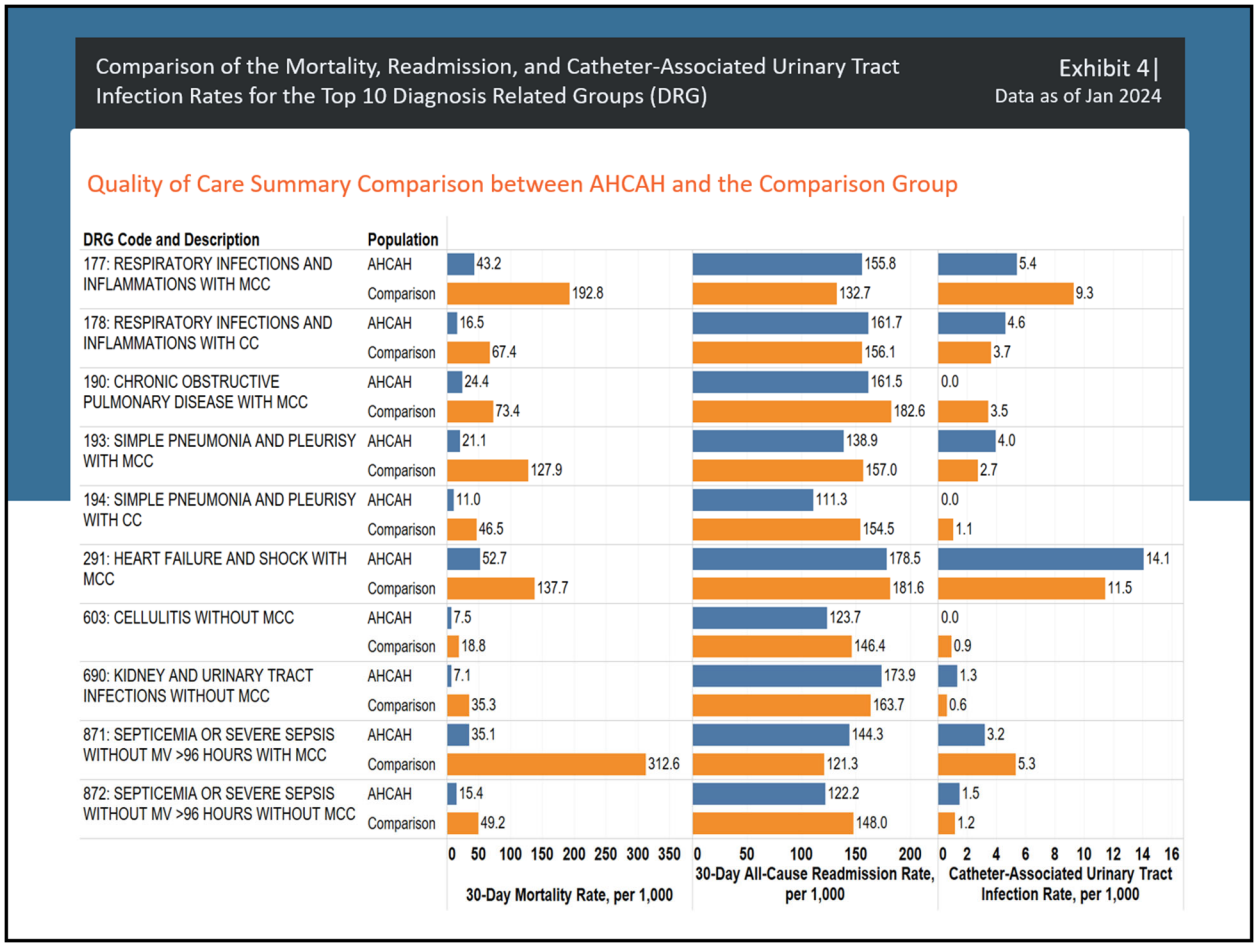


Exhibit 5 illustrates the mortality rate for AHCAH patients in more detail. As shown below, the mortality rate for AHCAH inpatients was lower for all top 25 MS-DRGs, and for 11 of those top 25 MS-DRGs this difference was statistically significant. For 7 of these 11 statistically significant groupings (MS-DRGs 177, 178, 280, 291, 602, 682 and 689), the HCC scores were significantly higher in the AHCAH group, suggesting a more clinically complex subset of AHCAH patients had a significantly lower mortality rate than the brick-and-mortar inpatient comparison group.

Exhibit 5: Mortality and HCC Comparison

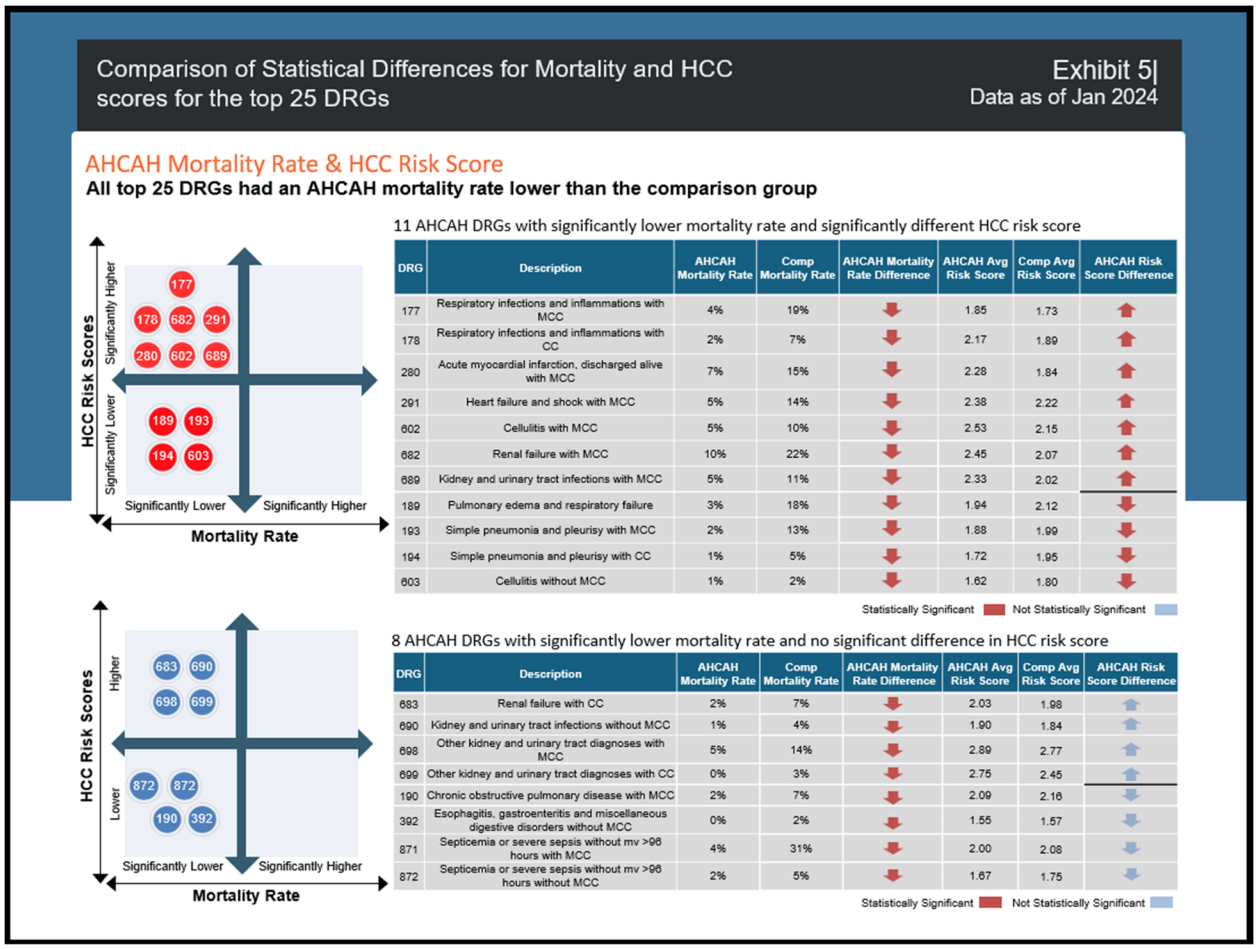


Exhibit 6 presents the results of the readmissions analysis in more detail. As discussed above, readmission rates for AHCAH inpatients were sometimes lower, sometimes comparable to, and sometimes higher than readmission rates for the brick-and-mortar inpatient comparison group. Readmission rates were statistically significantly higher in the AHCAH inpatient group for two MS-DRGs (177 and 871), while for three others (MS-DRGs 191, 194 and 195), readmissions were significantly higher in the brick-and-mortar inpatient comparison group. Within these five MS-DRGs, HCC scores were only significantly different for MS-DRGs 177 and 194. In the case of MS-DRG 177 (Respiratory infections and inflammations with MCC), AHCAH patients had HCC scores and readmission rates which were both significantly higher than the brick-and-mortar comparison group. In the case of MS-DRG 194 (Simple pneumonia and pleurisy with CC), AHCAH patients had HCC scores and readmission rates both significantly lower than their brick-and-mortar counterparts.

Exhibit 6: Readmissions and HCC Comparison

DRG	Description	AHCAH Readmissions Rate	Comparison Readmissions Rate	AHCAH Readmission Difference	AHCAH HCC Risk Score	Comparison HCC Risk Score	AHCAH Risk Score Difference
177	Respiratory infections and inflammations with MCC	16%	13%	↑	1.85	1.73	↑
194	Simple pneumonia and pleurisy with CC	11%	15%	↓	1.72	1.95	↓
191	Chronic obstructive pulmonary disease with CC	14%	20%	↓	2.25	2.23	↑
195	Simple pneumonia and pleurisy without CC/MCC	6%	13%	↓	1.10	1.26	↓
871	Septicemia or severe sepsis without mv >96 hours with MCC	14%	12%	↑	2.00	2.08	↓

Statistically Significant Not Statistically Significant

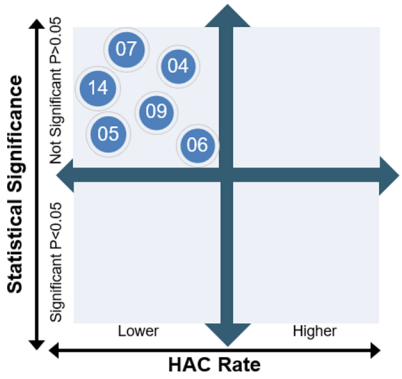
As illustrated in Exhibit 7, rates of HACs for patients participating in AHCAH were lower than rates in the comparison group for all six HACs that are tracked on claims, but none of the differences were statistically significant. Urinary tract infections were by far the most common hospital acquired condition in both groups, and for this condition, AHCAH rates were 16% lower, which was not statistically significant.

Exhibit 7: Hospital Acquired Conditions Comparison

Comparison of the Statistically Significant Differences for Hospital Acquired Conditions (HAC) for the Top 25 Diagnosis Related Groups (DRG)

Exhibit 7 | Data as of Jan 2024

Hospital Acquired Conditions



All HAC reported in the AHCAH group were lower than the comparison group with HAC 06 approaching statistical significance at the 0.05 level

HAC	Definition	AHCAH Rate	Comparison Rate	AHCAH HAC Difference	P-Value
06	Catheter-associated urinary tract infection (UTI)	0.74%	0.90%	↓	0.051
04	Stage III and IV pressure ulcers	0.02%	0.05%	↓	0.228
09	Manifestations of poor glycemic control	0.02%	0.05%	↓	0.102
07	Vascular catheter-associated infection	0.01%	0.03%	↓	0.777
05	Falls and trauma	0.01%	0.04%	↓	0.098
14	Iatrogenic pneumothorax W/ venous catheterization	0.00%	0.02%	↓	0.121

Statistically Significant Not Statistically Significant

4.6.4 Limitations

There are several limitations to what this study can conclude about differences in the quality of care provided through AHCAH and in brick-and-mortar facilities. First, this initiative was not designed with a control group, so it not possible to draw a strong causal conclusion that the quality of care is superior in AHCAH compared to care provided in the brick-and-mortar facility, based on this study.

Second, the validity of the underlying data used to calculate the quality metrics in this study is high, and so we can be reasonably confident that the reported rates reflect actual patient outcomes. However, the outcome measures used in this study were not calculated using the measure methodology for similar measures used in CMS hospital quality reporting programs and so the conclusion drawn may be limited.

Finally, these results pertain to a specific moment in time, when early adopters first began to operate HaH programs at scale, during a global pandemic. Given the circumstances under which this care was provided – both in the home setting and in brick-and-mortar facilities – some

caution is warranted when extrapolating these results into the future when public health circumstances are likely to be different.

4.6.5 Implications

This study found that beneficiaries who received care in the home under the AHCAH initiative had a lower mortality rate than the comparison group. This is consistent with published research on HaH that has shown that patients receiving acute hospital care at home experience mortality rates similar to or lower than patients receiving care in the hospital.[38,39,40,41,42,43] Although it is not possible to attribute this result solely to the care provided under AHCAH, the results of this study demonstrate that providing inpatient-level care in the home does not appear to result in increased mortality in this select inpatient population.

Results on the readmissions metric were mixed; of the five MS-DRGs with significant differences (as described above), readmission rates for AHCAH inpatients were sometimes lower, sometimes comparable to, and sometimes higher than readmission rates for the brick-and-mortar inpatient comparison group. While there were not categorically significant differences between groups with respect to the HCC scores, there was a significant difference in that the overall HCC score for the AHCAH population was lower, and we describe that in the results above. Higher average HCC scores could be a factor to explain the higher readmission rates for MS-DRGs 177 and 198. Lower average HCC scores could similarly be a factor to explain the lower readmission rates. The readmissions associated with MS-DRGs 191 and 871 should be further investigated because given the current analysis, a higher readmission rate is associated with AHCAH patients with lower, on average, HCC scores. This study cannot explain this result, nor draw conclusions, based on the currently available data.

Results from the analysis of hospital acquired conditions demonstrate that AHCAH beneficiaries experience lower rates of HACs in general, although these results are not statistically significant. Notably, AHCAH inpatients had fewer Catheter Associated Urinary Tract Infections (CAUTIs) than patients in the comparison group. It is not possible to conclude that care under AHCAH is better at preventing HACs than care in the brick-and-mortar facility because the results are not statistically significant. However, these results suggest that AHCAH patients are receiving care

[38] Arsenault-Lapierre G, Henein M, Gaid D, Le Berre M, Gore G, Vedel I. Hospital-at-Home Interventions vs In-Hospital Stay for Patients With Chronic Disease Who Present to the Emergency Department: A Systematic Review and Meta-analysis. JAMA Network Open. Jun 1 2021;4(6):e2111568. doi:10.1001/jamanetworkopen.2021.11568

[39] Caplan G, Sulaiman N, Mangin D, Aimonino Ricauda N, Wilson A, and Barclay L, "A meta-analysis of "hospital in the home"," Med J Aust, vol. 197, no. 9, pp. 512-9, Nov 5 2012, doi: 10.5694/mja12.10480

[40] Conley J, O'Brien CW, Leff BA, Bolen S, Zulman D. Alternative Strategies to Inpatient Hospitalization for Acute Medical Conditions: A Systematic Review. JAMA Intern Med. Nov 1 2016;176(11):1693-1702. doi:10.1001/jamainternmed.2016.5974

[41] Levine DM et al., "Hospital-Level Care at Home for Acutely Ill Adults: A Randomized Controlled Trial," Ann Intern Med, vol. 172, no. 2, pp. 77-85, Jan 21 2020, doi: 10.7326/M19-0600

[42] Qaddoura A, et al., "Efficacy of Hospital at Home in Patients with Heart Failure: A Systematic Review and Meta-Analysis," PLoS One, vol. 10, no. 6, p. e0129282, 2015, doi: 10.1371/journal.pone.0129282

[43] Shepperd S, et al., "Avoiding hospital admission through provision of hospital care at home: a systematic review and meta-analysis of individual patient data," CMAJ, vol. 180, no. 2, pp. 175-82, Jan 20 2009, doi: 10.1503/cmaj.081491

that is sufficient to prevent HACs, and that HACs are not a substantial issue for AHCAH patients at present.

Future analyses could address the empirical and data limitations discussed in Section 4.6.4, to enable a better understanding of the quality of care provided under AHCAH. However, new data sources and collection approaches will likely be required to capture and analyze data across more quality-of-care dimensions. Nevertheless, the results of this study are consistent with existing HaH literature that finds inpatient-level care can be provided safely in the home.

4.7 Research Question #4: Does the cost, mix, and intensity of services differ for similar care furnished through AHCAH versus brick-and-mortar inpatient settings?

In Brief: AHCAH episodes of care were longer (by less than one day), but 30-day post-discharge Medicare spending was significantly lower; services provided through AHCAH were similar to services provided in brick-and-mortar facilities.

4.7.1 Overview

Section 4.6 discussed quality outcomes related to inpatient episodes; this Section discusses three cost and utilization outcomes. Given the data limitations discussed further below, there are three outcomes that reflect how efficiently and effectively care is provided during an episode of care, whether it takes place at home or in the brick-and-mortar facility (upon which inferences may be made regarding the costs associated with providing care):

1) How long does the patient remain under inpatient-level care?
2) What types of services were provided to the patient, and at what frequency, during the episode of care?
3) How much Medicare spending does the patient incur in the 30 days after they are discharged?

AHCAH beneficiaries accounted for lower Medicare spending during the 30-days post-discharge period. Additionally, while beneficiaries treated under the AHCAH initiative received the same types of services as patients in the brick-and-mortar facility, AHCAH beneficiaries used fewer of those same services. The post-discharge care and services utilized suggest that hospitals may incur lower costs over time for the provision of care to AHCAH patients.

The study also found that, overall, AHCAH episodes during the time period analyzed were longer than episodes in the brick-and-mortar setting, but only by less than a day. This result could mean that hospitals incur higher costs for the longer length of stay. This study did not

attempt to assess the relative contribution of how the post-discharge and services utilized metrics that might lower hospital incurred costs for AHCAH patients might be offset by a less than one day longer length of stay for AHCAH patients.

4.7.2 Methods

To determine if there were differences in the cost, mix, and intensity of services, this study compared AHCAH inpatient stays to brick-and-mortar inpatient stays, broken down by MS-DRG and within the same hospitals. Having constructed comparable episodes of care as discussed in Sections 4.1 and 4.2, this study used the following metrics to calculate rates for the two inpatient care groups (Table 10).

Table 10. Utilization Measures, Key Specifications, and Data Sources

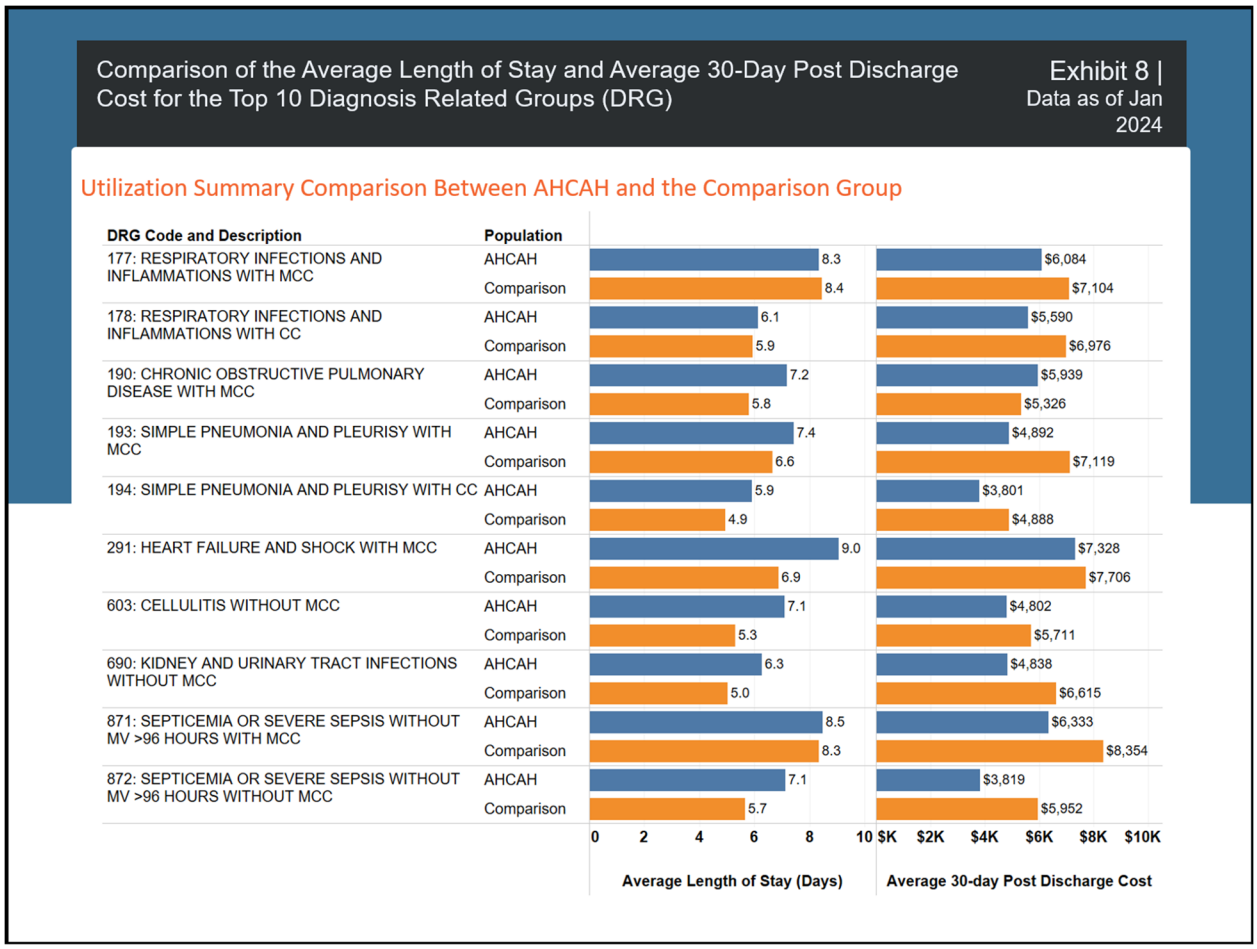
Measure	Key Specifications	Data Source(s)
Length of stay per episode	Length of stay calculated as time between admission and discharge	Medicare Part A claims
30-Day Post-Discharge Medicare Spending	Part A and B spending starting from discharge for 30 days	Medicare Part A and Part B claims
Service Utilization	Service utilization categories determined as reported on Part A revenue codes	Medicare Part A claims

This study also examined the discharge status reported on Medicare Part A claims to further investigate what might be driving utilization of services in the 30 days after discharge. Finally, this study examined a sample of hospital self-reported data to determine the percent of services provided virtually and in-person.

4.7.3 Results

Exhibit 8 summarizes rates for average lengths of stay per episode of care and post 30-day discharge Medicare spending for the top ten MS-DRGs. The post 30-day discharge Medicare spending is for post-acute care services furnished within the 30 days following discharge from the episode of inpatient care. Overall, the length of stay was longer under AHCAH for nine of the top ten-MS-DRGs, the one exception being MS-DRG 177 (Respiratory infections and inflammations with MCC). Similarly, 30-day post discharge Medicare spending under AHCAH was lower for nine of the top ten MS-DRGs, the one exception being MS-DRG 190 (Chronic obstructive pulmonary disease with MCC).

Exhibit 8: Utilization Summary



As illustrated in Exhibit 9, the average length of stay per episode was significantly higher for the AHCAH inpatient group for 22 of the 25 top MS-DRGs. For these 22 MS-DRGs, the average length of stay for AHCAH patients per episode overall was significantly higher ($p<0.0001$), although by less than a day (0.79 days, or 11.4%).

These comparisons are based on the same sample of patients for both AHCAH and the comparison group and their relative HCC scores.

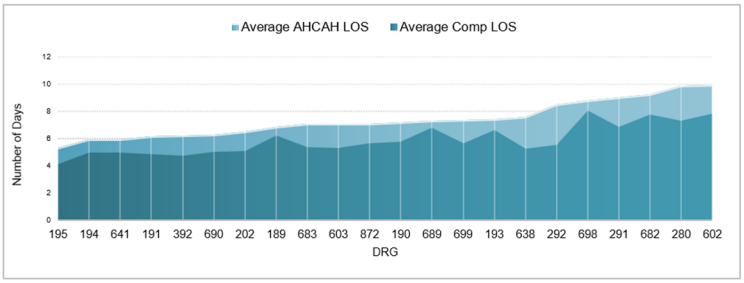
Exhibit 9: Length of Stay

Comparison of the Statistically Significant Differences for Length of Stay (LOS) for the Top 25 Diagnosis Related Groups (DRG)

Exhibit 9| Data as of Jan 2024

Length of Stay (LOS)

22 AHCAH DRGs with significantly higher LOS



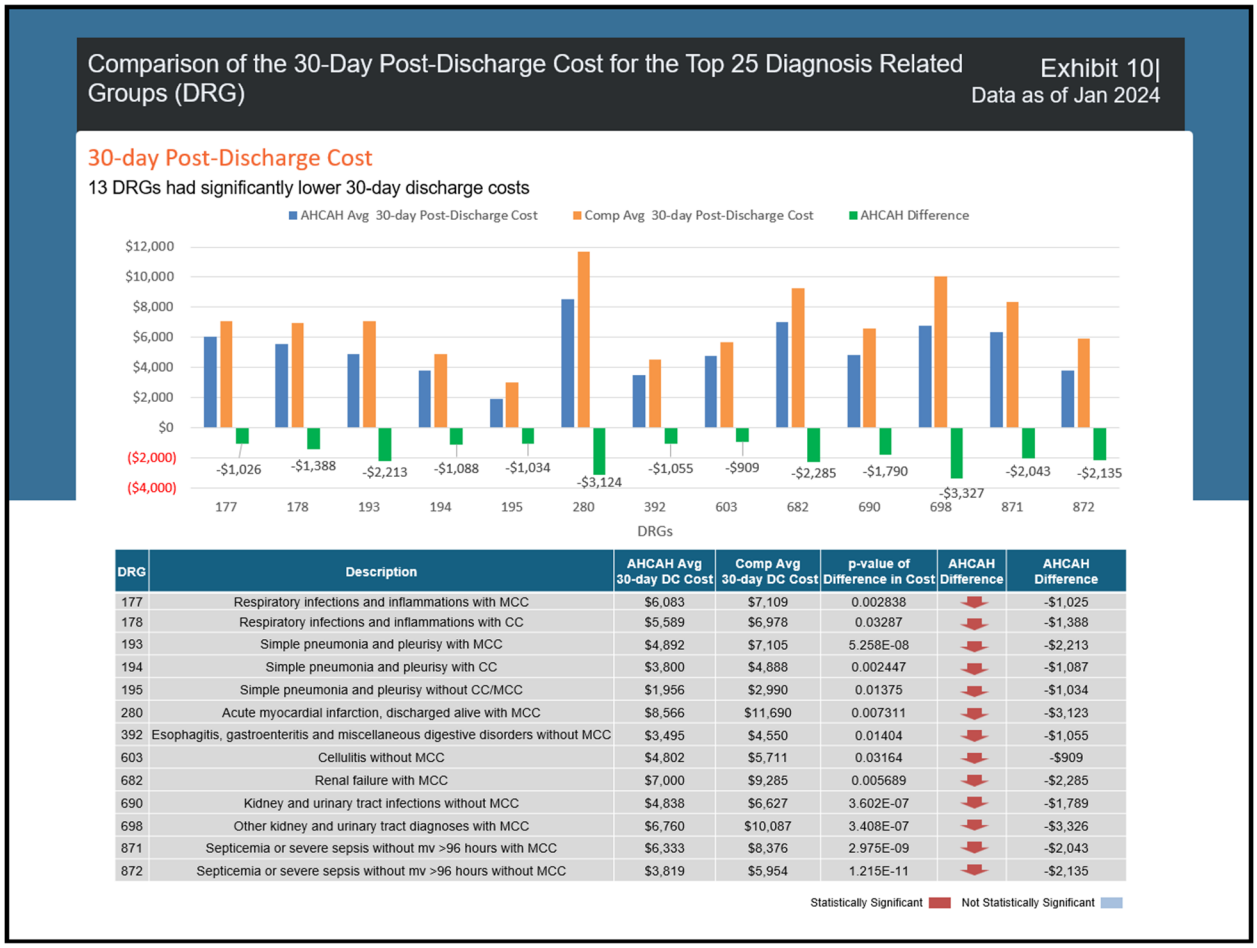
Summary of Top 25 DRGs	
AHCAH Average LOS	7.68
Comparison Average LOS	6.89
Number of Days AHCAH is Higher	0.79
P-Value of Difference in LOS	<0.0001
Percent Difference (to Comp Average LOS)	11.42%

Statistically Significant Not Statistically Significant

DRG	Description	AHCAH Avg LOS (Days)	Comparison Avg LOS (Days)	AHCAH LOS Difference (Days)
189	Pulmonary edema and respiratory failure	6.86	6.21	0.65
190	Chronic obstructive pulmonary disease with MCC	7.17	5.79	1.38
191	Chronic obstructive pulmonary disease with CC	6.16	4.88	1.28
193	Simple pneumonia and pleurisy with MCC	7.43	6.65	0.78
194	Simple pneumonia and pleurisy with CC	5.92	4.94	0.98
195	Simple pneumonia and pleurisy without CC/MCC	5.31	4.10	1.21
202	Bronchitis and asthma with CC/MCC	6.51	5.07	1.44
280	Acute myocardial infarction, discharged alive with MCC	9.87	7.30	2.57
291	Heart failure and shock with MCC	9.04	6.88	2.16
292	Heart failure and shock with CC	8.54	5.52	3.02
392	Esophagitis, gastroenteritis and miscellaneous digestive disorders without MCC	6.23	4.75	1.48
602	Cellulitis with MCC	9.96	7.81	2.15
603	Cellulitis without MCC	7.09	5.29	1.80
638	Diabetes with CC	7.61	5.28	2.33
641	Miscellaneous disorders of nutrition, metabolism, fluids and electrolytes without MCC	5.96	4.97	0.99
682	Renal failure with MCC	9.26	7.75	1.51
683	Renal failure with CC	7.07	5.39	1.67
689	Kidney and urinary tract infections with MCC	7.34	6.81	0.52
690	Kidney and urinary tract infections without MCC	6.27	5.01	1.26
698	Other kidney and urinary tract diagnoses with MCC	8.80	8.05	0.75
699	Other kidney and urinary tract diagnoses with CC	7.37	5.66	1.71
872	Septicemia or severe sepsis without mv >96 hours without MCC	7.11	5.66	1.45

As illustrated in Exhibit 10, 30-day post-discharge Medicare spending was significantly lower in AHCAH for 13 of the top 25 MS-DRGs, and there were no MS-DRGs in which the 30-day post-discharge Medicare spending was higher (significantly or otherwise) in the AHCAH group. The average 30-day post discharge Medicare spending was significantly lower by $1,640.43, or 22.1% for the AHCAH group (p<0.001).

Exhibit 10: 30-Day Post-Discharge Medicare Spending



DRG	Description	AHCAH Avg 30-day DC Cost	Comp Avg 30-day DC Cost	p-value of Difference in Cost	AHCAH Difference	AHCAH Difference
177	Respiratory infections and inflammations with MCC	$6,083	$7,109	0.002838	↓	-$1,025
178	Respiratory infections and inflammations with CC	$5,589	$6,978	0.03287	↓	-$1,388
193	Simple pneumonia and pleurisy with MCC	$4,892	$7,105	5.258E-08	↓	-$2,213
194	Simple pneumonia and pleurisy with CC	$3,800	$4,888	0.002447	↓	-$1,087
195	Simple pneumonia and pleurisy without CC/MCC	$1,956	$2,990	0.01375	↓	-$1,034
280	Acute myocardial infarction, discharged alive with MCC	$8,566	$11,690	0.007311	↓	-$3,123
392	Esophagitis, gastroenteritis and miscellaneous digestive disorders without MCC	$3,495	$4,550	0.01404	↓	-$1,055
603	Cellulitis without MCC	$4,802	$5,711	0.03164	↓	-$909
682	Renal failure with MCC	$7,000	$9,285	0.005689	↓	-$2,285
690	Kidney and urinary tract infections without MCC	$4,838	$6,627	3.602E-07	↓	-$1,789
698	Other kidney and urinary tract diagnoses with MCC	$6,760	$10,087	3.408E-07	↓	-$3,326
871	Septicemia or severe sepsis without mv >96 hours with MCC	$6,333	$8,376	2.975E-09	↓	-$2,043
872	Septicemia or severe sepsis without mv >96 hours without MCC	$3,819	$5,954	1.215E-11	↓	-$2,135

Statistically Significant Not Statistically Significant

Further investigation into discharge status yielded the results presented in Table 11. Overall, these results show that patients in the AHCAH group were more likely to be discharged to home or home health. In contrast, patients in the comparison group were more likely to be discharged to a skilled nursing facility (SNF), to be transferred to hospice, or to pass away.

Table 11. Percentages of Select Discharge Statuses for Patients in the AHCAH and Comparison Groups

Beneficiary Status at Discharge	AHCAH	Comparison Group
Discharged to home/self-care (routine charge)	58%	38%
Discharged/transferred to home care of organized home health service organization	36%	24%
Discharged/transferred to SNF	1.2%	20%
Discharged/transferred to a Hospice home or medical facility	1.1%	5.7%
Discharged/transferred to an inpatient rehabilitation facility including distinct parts units of a hospital	0.22%	2.7%
Expired (patient did not recover)	0.25%	4.9%

As illustrated in Exhibit 11, patients received the same types of services in AHCAH that they did in brick-and-mortar settings, though for every service category except one (respiratory services), utilization rates were significantly lower in AHCAH than in the comparison group. Rates of dialysis and nuclear medicine were particularly low in the AHCAH group.

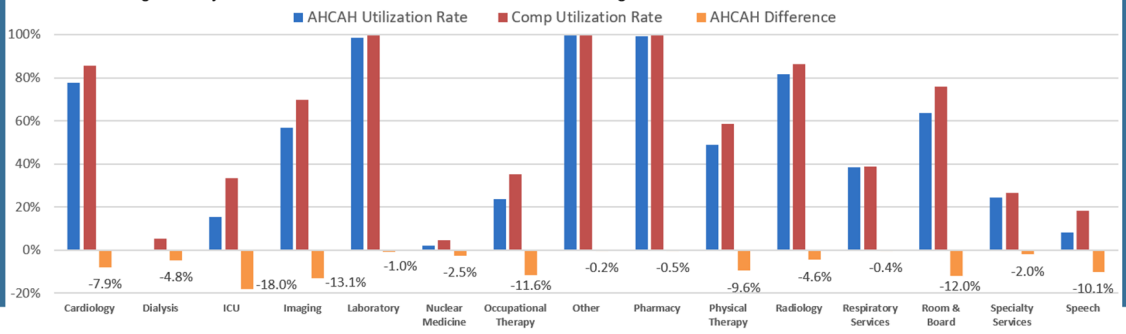
Exhibit 11: Service Utilization

Comparison of the Statistically Significant Differences for Service Utilization for the Top 25 Diagnosis Related Groups (DRG)

Exhibit 11| Data as of Jan 2024

Service Utilization

AHCAH had significantly lower service utilization rates for 14 of the 15 categories

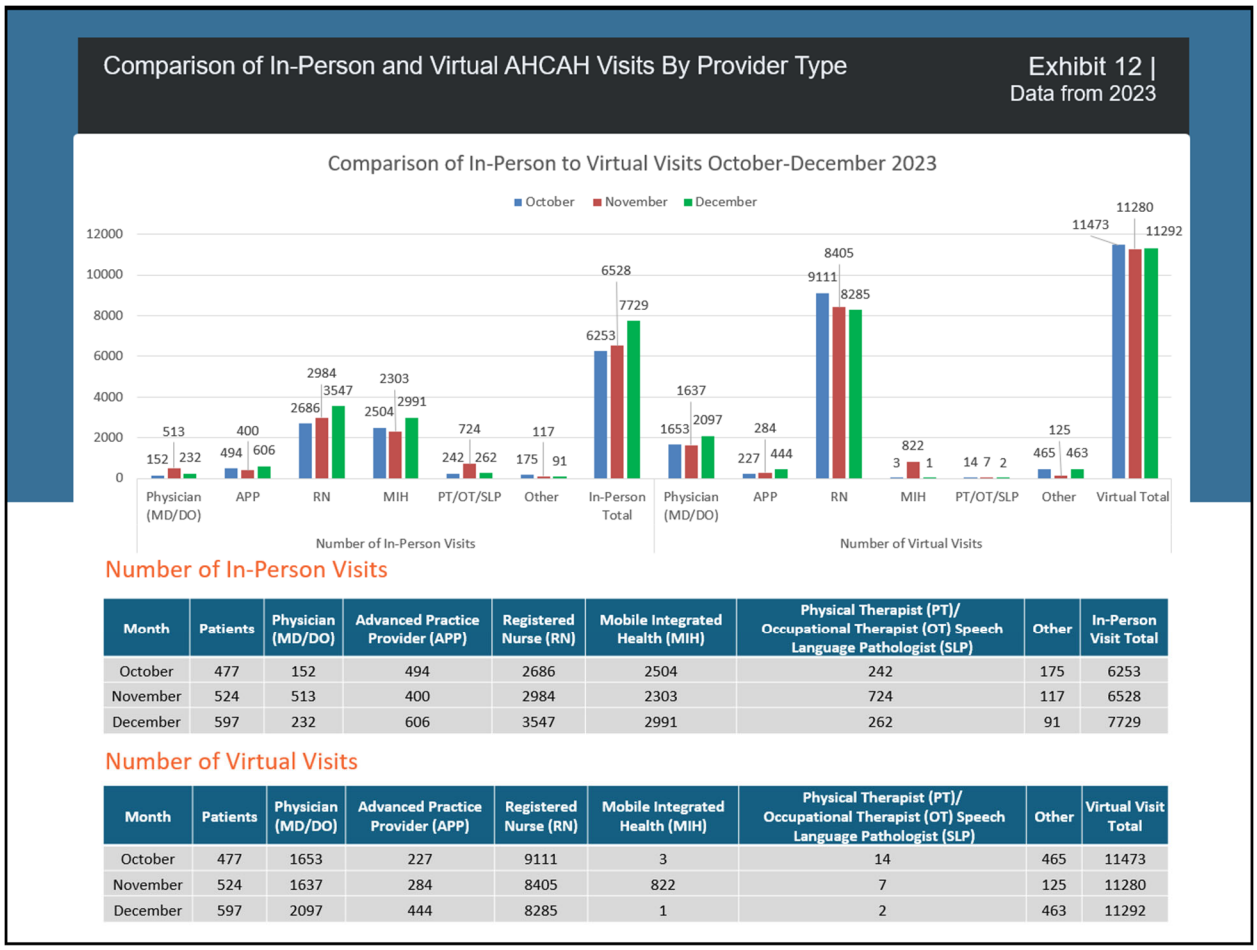


Grouped Service Category	AHCAH Utilization Rate	Comparison Utilization Rate	AHCAH Difference
Cardiology	77.8%	85.7%	-8%
Dialysis	0.4%	5.2%	-5%
ICU	15.5%	33.4%	-18%
Imaging	56.8%	69.9%	-13%
Laboratory	98.7%	99.6%	-1%
Nuclear Medicine	1.9%	4.5%	-3%
Occupational Therapy	23.6%	35.2%	-12%
Other	99.5%	99.7%	-0.2%
Pharmacy	99.1%	99.6%	-0.5%
Physical Therapy	48.8%	58.4%	-10%
Radiology	81.7%	86.3%	-5%
Respiratory Services	38.5%	38.9%	-0.4%
Room/Board	63.7%	75.7%	-12%
Specialty Services	24.4%	26.4%	-2%
Speech	8.2%	18.3%	-10%

Statistically Significant Not Statistically Significant

As illustrated in Exhibit 12, all provider types provided both in-person and virtual care while treating patients under the AHCAH initiative. Nurses and mobile integrated health workers (MIH) provided the most in-person visits, and nurses and doctors both provided more virtual than in-person visits. Overall, 38% of AHCAH visits were in-person and 62% were virtual.

Exhibit 12: In-Person and Virtual Visits in AHCAH



Number of In-Person Visits

Month	Patients	Physician (MD/DO)	Advanced Practice Provider (APP)	Registered Nurse (RN)	Mobile Integrated Health (MIH)	Physical Therapist (PT)/ Occupational Therapist (OT) Speech Language Pathologist (SLP)	Other	In-Person Visit Total
October	477	152	494	2686	2504	242	175	6253
November	524	513	400	2984	2303	724	117	6528
December	597	232	606	3547	2991	262	91	7729

Number of Virtual Visits

Month	Patients	Physician (MD/DO)	Advanced Practice Provider (APP)	Registered Nurse (RN)	Mobile Integrated Health (MIH)	Physical Therapist (PT)/ Occupational Therapist (OT) Speech Language Pathologist (SLP)	Other	Virtual Visit Total
October	477	1653	227	9111	3	14	465	11473
November	524	1637	284	8405	822	7	125	11280
December	597	2097	444	8285	1	2	463	11292

The information displayed in Exhibits 11 and 12, respectively, provide an overall picture of the quantity and intensity of hospital services provided to AHCAH beneficiaries under this initiative. This self-reported data was collected over a period of 3 months (October through December 2023) for a sample of AHCAH participating hospitals across the country that account for the largest proportion of AHCAH admissions. The data show that AHCAH beneficiaries received the same types of services as their brick-and-mortar inpatient counterparts, and AHCAH beneficiaries in the sample received more than the required two in-person nursing visits and one physician visit per day. For example, in the month of October 2023, the data showed for the 477 beneficiaries admitted under AHCAH, each received an average of four (4) virtual visits per day from the physician or advanced practice provider (APP). In addition, the average number of in-person visits from a physician or APP occurred at least once daily, in addition to those four virtual visits per day. There may be some patients that required more visits than others, but the data shows that, on average, AHCAH beneficiaries received more than the required virtual or in-person physician or APP visits per day. This provides further evidence that hospitals are providing care based on the needs of the patient and beyond the requirements of the waiver.

An analysis of the nursing visits for this same time period yielded similar results; AHCAH beneficiaries received an average of five in-person visits and an average of 19 virtual visits per

day. At this time there is not a mechanism to collect comparison data for the number of nursing visits a patient may receive in a day in the brick-and-mortar hospital, but the data demonstrate that on average AHCAH patients received more than the minimum two in-person nursing visits per day required by the waiver. Of note, this data does not suggest that each patient received this level of involvement during each day of their inpatient stay.

As for the services provided in the month of October 2023, for the same 477 patients, 37% of these patients required oxygen and nebulizer therapy in some capacity, 79% of the patients received intravenous infusions and medications, and 97% of the patients required oral medications daily and as frequently as four times per day. Additionally, 83% and 77% received laboratory and radiology services, respectively. And while each hospital is required to offer meal service to all patients, only 16% of AHCAH patients requested to use this service to provide three meals per day.

We note that there is no comparison group for this data, nor is there an established standard number of visits that an inpatient should receive from nursing or providers or volume of services a patient may use during the course of a hospital stay. These data show the quantity and types of visits that AHCAH beneficiaries are receiving from various health care provider types and that hospitals participating in the AHCAH initiative are meeting the waiver requirements of two in-person nursing visits and one physician/APP visit per day.

4.7.4 Limitations

There are several limitations to the cost and utilization results presented in this section. First, this analysis compared Medicare spending for services, rather than costs incurred by hospitals in treating the two cohorts of beneficiaries. Such a comparison does not allow assessment of the relative costs for hospitals treating the two cohorts of beneficiaries. Second, this study did not compare costs incurred by a hospital when delivering an MS-DRG-based episode of care (whether in the brick-and-mortar facility or under AHCAH). Such an analysis might require new data collection from hospitals, the addition of an episode grouper[44] to support further quality and cost analysis, potential reviews of patient-level records, and the application of a methodology to determine episode-level costs based on services provided.

Third, as mentioned throughout, this initiative was not designed with a control group, so it is not possible to conclude that providing inpatient-level care in the home necessarily leads to lower Medicare spending for services furnished in the 30 days post-discharge. Fourth, as mentioned above, this study examined Medicare payments during the 30-day post-discharge period instead of hospital incurred costs per episode. Medicare inpatient payment policies and rates did not change as a result of the AHCAH initiative; as such, Medicare inpatient payments to a hospital for patients cared for in the home setting are the same as they would have been if the care were

[44] C. Peterson, S. Grosse, A. Dunn, "A practical guide to episode groupers for cost-of-illness analysis in health services research," SAGE Open Med, Mar 29, 2019. DOI: 10.1177/2050312119840200.

provided in a traditional inpatient setting under the IPPS. Therefore, any variation in Medicare spending per episode between the home and brick-and-mortar inpatient locations would be due to differences in post-discharge utilization multiplied by those post-discharge payment rates.

Fifth, as mentioned in **Section 4.6.4**, these results pertain to a specific moment in time, when early adopters first began to operate HaH programs at scale, during a public health emergency. Given the circumstances under which this care was provided, some caution is warranted when extrapolating these results into the future, when the operating circumstances for AHCAH will likely be different. Sixth, these results are not adjusted for differences in the patient population between AHCAH beneficiaries and brick-and-mortar patients. For example, the lower acuity of AHCAH patients might be expected to lead to lower costs to treat such patients. Finally, the hospital self-reported data on virtual versus in-person visits was limited to a sample of a three-month period from 10 of the AHCAH hospitals representing 1,598 patients and may not be representative of other points in time.

4.7.5 Implications

The results of this study indicate that AHCAH episodes last longer than comparable brick-and-mortar care episodes, but only by less than a day on average, while leading to significantly lower Medicare spending for services in the 30 days post-discharge. It is also notable that 30-day post-discharge Medicare spending was significantly lower in more than half of the MS-DRGs in the AHCAH group, which may be attributable to the lower average HCC score in the AHCAH population.

The results for length of stay, 30-day post-discharge Medicare spending, and discharge disposition together suggest that hospitals participating in the AHCAH initiative may take steps to prepare patients to be discharged to the home or home health, and that receiving inpatient-level care in the home facilitates that transition. Literature has shown that care transitions are a factor in hospital readmissions; with patients receiving inpatient-level care in the home, the transition from inpatient to home setting post-discharge has less impact.[45] However, because patients in the AHCAH group had lower HCC scores on average, it is possible they were less acute and more likely to be transferred to the home setting regardless.

The lack of data on costs incurred by hospitals, as discussed above, is a significant limitation of this study, because it means that the study cannot speak to comparisons of the incurred costs by hospitals for furnishing services to patients treated in the brick-and-mortar setting versus in the home. Although this study does not present results on hospital incurred costs, findings gleaned from various data sources analyzed in conducting this study – including external literature review – tend to suggest that providing inpatient-level care at home can be cost-effective for hospitals in certain circumstances. First, hospital savings for HaH has been addressed in the published literature, which suggests that across multiple types of diagnoses and health care

[45] Rammohan, R., Joy, M., Magam, S. G., Natt, D., Patel, A., Akande, O., Yost, R. M., Bunting, S., Anand, P., & Mustacchia, P. (2023). The Path to Sustainable Healthcare: Implementing Care Transition Teams to Mitigate Hospital Readmissions and Improve Patient Outcomes. Cureus, 15(5), e39022. https://doi.org/10.7759/cureus.39022

settings, the cost of care is lower for HaH patients compared to those treated in traditional inpatient settings.[46,47,48,49,50] Second, as discussed in **Section 4.5.5**, hospitals typically gain operational experience providing inpatient-level care at home incrementally, condition by condition.[51] Because AHCAH hospitals voluntarily request a waiver that may impact their costs, it would be reasonable to assume that hospitals expected that participating in the initiative would deliver a return on investment over time, even if not initially. Finally, treating a lower acuity patient at home under AHCAH would increase capacity in the brick-and-mortar hospital which could plausibly be used to treat a higher acuity patient in that facility. Therefore, using the AHCAH initiative creates additional capacity for hospitals, which could create another source of revenue and increase Medicare spending.

The analysis of service utilization rates presented in this study show that AHCAH inpatients received the same types of services, though at a lower intensity, than comparable inpatients in the brick-and-mortar facility. This is significant because it suggests that AHCAH patients have access to the same types of hospital services as those in the brick-and-mortar facility. The AHCAH beneficiaries tend to have lower HCC scores which may explain the lower rates of utilization of such services during their inpatient stay. Additionally, the hospital-reported data suggest that AHCAH patients received virtual and in-person visits at high rates, and that being able to conduct virtual visits in patients' homes is critical for hospitals operating HaH programs.

Additional steps can be taken to address the limitations discussed in **Section 4.7.4**, especially regarding additional research on hospital costs. In the timeframe afforded for this study to be conducted, CMS was constrained by a lack of practicable reporting approaches to allow for the direct collection and analysis of detailed costs incurred by hospitals furnishing services under the AHCAH. In order to conduct such an analysis in the future, CMS might need to set up new reporting requirements for hospitals participating in the AHCAH initiative, and a data collection reporting system to collect such information from AHCAH hospitals, potentially including individual hospital cost reports and any cost for contracted services used in providing inpatient level care under AHCAH.

[46] Caplan G, Sulaiman N, Mangin D, Aimonino Ricauda N, Wilson A, and Barclay L, "A meta-analysis of "hospital in the home"," Med J Aust, vol. 197, no. 9, pp. 512-9, Nov 5 2012, doi: 10.5694/mja12.10480

[47] Conley J, O'Brien CW, Leff BA, Bolen S, Zulman D. Alternative Strategies to Inpatient Hospitalization for Acute Medical Conditions: A Systematic Review. JAMA Intern Med. Nov 1 2016;176(11):1693-1702. doi:10.1001/jamainternmed.2016.5974

[48] Levine DM et al., "Hospital-Level Care at Home for Acutely Ill Adults: A Randomized Controlled Trial," Ann Intern Med, vol. 172, no. 2, pp. 77-85, Jan 21 2020, doi: 10.7326/M19-0600

[49] Qaddoura A, et al., "Efficacy of Hospital at Home in Patients with Heart Failure: A Systematic Review and Meta-Analysis," PLoS One, vol. 10, no. 6, p. e0129282, 2015, doi: 10.1371/journal.pone.0129282

[50] Shepperd S, et al., "Avoiding hospital admission through provision of hospital care at home: a systematic review and meta-analysis of individual patient data," CMAJ, vol. 180, no. 2, pp. 175-82, Jan 20 2009, doi: 10.1503/cmaj.081491

[51] https://hcp-lan.org/apm-roadmap/

4.8 Research Question #5: What are the AHCAH patient and caregiver experiences of care?

In Brief: The AHCAH initiative was well-received by patients, caregivers, and clinicians, with some identified limitations and opportunities for improvement.

4.8.1 Overview

CMS collected a variety of feedback from providers, clinicians, patients, families and caregivers regarding the patient and caregiver experience of hospital at home care under the AHCAH initiative. CMS gathered this feedback directly through email, letters, site visits, clinician-focused virtual listening sessions, and program interviews. In addition, CMS hosted a virtual listening session intended for beneficiaries and caregivers who participated in the AHCAH initiative themselves, to learn about their experiences with HaH, as well as to gather their feedback on ways to improve the initiative. This study analyzed all feedback to identify key themes, lessons learned, and other insights into the patient and caregiver experience under the AHCAH initiative.

4.8.2 Results

4.8.2.1 Positive Experiences

Patient, family member and caregiver feedback related to receiving care under the AHCAH initiative was overwhelmingly positive. Patients described feeling more relaxed, less anxious, and less depressed at home, which seemed to aid their recovery. During the virtual listening session intended for beneficiaries and caregivers, participants expressed their appreciation for the mutual benefits of patients being at home with family members, particularly for older adult couples. Patients, family members, and caregivers described beliefs that one of the main benefits of receiving care in a familiar and comfortable environment was a better health outcome from the hospitalization. Caregivers emphasized their appreciation for the efforts made by staff to coordinate and maintain continuity of care, which facilitated rapid and easy communication between the beneficiaries, caregivers, and their providers. The use of technology (e.g., iPads, patient portals, patient-monitoring devices) was also noted to be a crucial part of AHCAH programs for caregivers as it facilitated communication during the care experience. Caregivers noted that in-home care allowed them to be more involved in the care process, and they themselves felt more comfortable and less stressed when their loved ones were cared for at home. Finally, patients, family members, and caregivers described the initial orientation to AHCAH, and ongoing education received from clinical staff, to be a critical component supporting the care transition from hospital to home.

This positive feedback was mirrored by clinicians' own experiences in providing care to patients under the AHCAH initiative. During the two listening sessions conducted with physicians, advanced practice providers (APPs) and nurses, participants described their own experience in serving patients through AHCAH as being professionally fulfilling, renewing the joy they experience in providing clinical care. Clinicians also reported patients felt grateful to be at home, in a familiar and more healing environment and identified specific groups of patients that tended to do well in hospital at home programs. For example, one participant stated that in his experience, those with physical disabilities have done particularly well in AHCAH because their home is adapted to fit their needs, and it can be disempowering to be in a hospital room which is not always set up to accommodate their particular disability. Clinicians also shared that families have been much more involved in discussions with the hospitalized patient and the care team in a way that improves communication and care coordination.

4.8.2.2 Lessons Learned and Opportunities for Improvement

Although much of the feedback gathered by CMS suggests an overall positive experience with the AHCAH initiative, additional feedback describes some limitations of the initiative, lessons learned, and potential opportunities for improvement.

One identified concern was related to the potential need for supplemental care (e.g., nursing aides), particularly for those patients with limited mobility. While it is the expectation that an AHCAH waiver-approved hospital will provide all nursing care (including assistance with activities of daily living), CMS did receive feedback that occasionally family members took additional time off to be with their loved one who was admitted to AHCAH, or that the family would hire nursing aide assistance for the same purpose. CMS also received anecdotal information from various clinicians that patients reported feeling anxious about returning to the brick-and-mortar hospital for a higher level of care after receiving some inpatient care in their own home; to address this concern some programs began discussing the potential need for escalation during the initial patient consent process, when staff were assessing patients for admission or transfer to the hospital at home inpatient service.

Feedback from patients, family members, caregivers, and clinicians alike identified a common concern related to the effective implementation of the AHCAH initiative. Specifically, they noted that there is the potential for confusion on the part of clinicians and hospital staff as to what services a given AHCAH program provided, and confusion on the part of patients as to what services were covered (either by Medicare or private insurance). Caregivers also noted a concern about the potential for patient fatigue from overscheduling appointments (e.g., having physical and occupational therapy appointments on the same day). Listening session participants in the clinician-focused sessions suggested a hospital have a plan to familiarize all facility staff with an existing hospital at home program, in order to ensure clinician and support staff are not only aware of the service but to ensure clear lines of communication among staff of those inpatient services who may receive patients escalated from the home back to the facility for a higher level of care. Participants in the patient and caregiver-focused listening session also recommended that programs provide clear, easy-to-understand, printed instructional tools for

patients and caregivers (e.g., a laminated sheet of instructions for using the iPad; a binder with printed records for patients to keep track of their care). Each group of listening session participants recommended providing clear, easy-to-understand information regarding Medicare or insurance coverage for AHCAH and related services for patients and caregivers.

4.8.3 Limitations

Feedback gathered by CMS was predominantly anecdotal and robust conclusions about individuals' experiences with the AHCAH initiative cannot be drawn from this information. Although CMS did conduct a series of virtual listening sessions to better understand the patient and caregiver experience of care under AHCAH, the participation in each session was variable by both number of participants and geographic location. Additionally, participation in the virtual listening session intended for patients and caregivers was particularly minimal, with only with four caregivers participating from New York and Wisconsin. Nevertheless, CMS gained valuable insight into family members' experiences and patients who received inpatient care at home through an AHCAH waiver-approved hospital at home program.

4.8.4 Implications

Feedback on patient and caregiver experience of care under the Acute Hospital Care at Home initiative is consistent with available evidence on HaH programs; patients and caregivers generally view care provided through the AHCAH initiative as safe, effective, and a positive experience.[52] When HaH care is compared to brick-and-mortar inpatient care, patient and caregiver satisfaction is either higher for the HaH group or there is no difference in comparison to patient experience in the brick-and-mortar inpatient group.[53,54,55,56]

There are many elements that may affect patient and caregiver perceptions of hospital at home services. A comprehensive review by Wang et al. (2024) identified a variety of factors that influence those perceptions,[57] several of which were captured in the anecdotal feedback provided to CMS. A home environment that is conducive to the delivery of hospital-level care is a critical factor in the success of HaH services; patients and caregivers who have received HaH services view the home environment as comfortable, convenient, safe, and more likely to promote positive mental health. Additionally, the presence of family and caregivers in the home provides

[52] X. Wang, C. Stewart, and G. Lee, "Patients' and caregivers' perceptions of the quality of hospital-at-home service: A scoping review," *J Clin Nurs,* vol. 33, no. 3, pp. 817-838, Mar 2024, doi: 10.1111/jocn.16906.

[53] G. A. Caplan, N. S. Sulaiman, D. A. Mangin, N. Aimonino Ricauda, A. D. Wilson, and L. Barclay, "A meta-analysis of "hospital in the home"," Med J Aust, vol. 197, no. 9, pp. 512-9, Nov 5 2012, doi: 10.5694/mja12.10480.

[54] J. Conley, C. W. O'Brien, B. A. Leff, S. Bolen, and D. Zulman, "Alternative Strategies to Inpatient Hospitalization for Acute Medical Conditions: A Systematic Review," JAMA Intern Med, vol. 176, no. 11, pp. 1693-1702, Nov 1 2016, doi: 10.1001/jamainternmed.2016.5974.

[55] G. Arsenault-Lapierre, M. Henein, D. Gaid, M. Le Berre, G. Gore, and I. Vedel, "Hospital-at-Home Interventions vs In-Hospital Stay for Patients With Chronic Disease Who Present to the Emergency Department: A Systematic Review and Meta-analysis," JAMA Netw Open, vol. 4, no. 6, p. e2111568, Jun 1 2021, doi: 10.1001/jamanetworkopen.2021.11568.

[56] D. M. Levine et al., "Hospital-Level Care at Home for Acutely Ill Adults: A Randomized Controlled Trial," Ann Intern Med, vol. 172, no. 2, pp. 77-85, Jan 21 2020, doi: 10.7326/M19-0600.

[57] Wang 2024, op. cit.

patients with essential physical and emotional support. Patient selection criteria for admission to the hospital at home service can be modified to assess the presence of family and/or caregiver support, although under the AHCAH initiative hospitals are expected to provide support for all activities of daily living and all nursing care that would otherwise be provided to patients within the brick-and-mortar facility. Patient and family interactions with the hospital at home clinical team shape the experience of care, including the perception of clinicians' competence, and may be a major contributing factor to the success of hospitals providing acute inpatient care in the home.

4.9 Future Considerations

This study made use of the best available quantitative and qualitative data to draw comparisons between the AHCAH and brick-and-mortar inpatient comparison groups. Given time and data limitations, its analytic approach was as rigorous as possible; the results offer new insights for research into the AHCAH initiative.

In the course of studying the work around the AHCAH initiative, there have been multiple lessons learned not only regarding the continuous quality improvement efforts for improving health and safety, but also the need to further develop more targeted measures of cost, quality and utilization.

Ideally, the quality metrics used for this type of study would reflect a wider scope of care dimensions and would use a methodology similar to the measure methodology used in CMS hospital quality reporting programs.

As discussed in **Section 4.7.4**, given the limitations on available cost data, this study offers an analysis of Medicare spending for AHCAH beneficiaries as compared to spending on beneficiaries who received care in the brick-and-mortar inpatient setting. Additionally, claims data only provide limited visibility into the specific services that patients receive when they are treated for an MS-DRG under AHCAH (or brick-and-mortar inpatient for that matter). Additional work is needed to more fully analyze costs incurred by hospitals in furnishing AHCAH care, and a comparison of such costs against those incurred by furnishing comparable inpatient care in the home and brick-and-mortar setting. Depending on the level of analysis, this might require significantly more time and capacity to enable the necessary collection and assessment instruments. CMS remains committed to continue further investigation of the data related to the AHCAH initiative.

Appendix A Guide to Mandated Report Content Requirements

Table A.1 provides a guide as to where in the report CMS addresses the specific analysis requirements delineated in Section 4140 of the Consolidated Appropriations Act, 2023[58] (CAA) (Public Law 117-328).

Table A.1. Guide to Mandated Report Content Requirements

Mandated Analyses and Comparisons	Report Section
‘‘(A) analyze, to the extent practicable, the criteria established by hospitals under the Acute Hospital Care at Home initiative of the Secretary to determine which individuals may be furnished services under such initiative”	3. Patient Selection Criteria for AHCAH Participation
‘‘(B) analyze and compare, to the extent practicable—"	4. Analyses and Results
‘‘(i) quality of care furnished to individuals with similar conditions and characteristics in the inpatient setting and through the Acute Hospital Care at Home initiative, including health outcomes, hospital readmission rates, hospital mortality rates, length of stay, infection rates, and patient experience of care”	4.3.3. Research Question #3: Does the quality of care differ for individuals who chose to utilize at-home care through the AHCAH initiative when compared to inpatient-only patients with similar conditions and characteristics treated at participating hospitals? 4.3.5. Research Question #5: What are the AHCAH patient experiences of care?
‘‘(ii) clinical conditions treated and diagnosis related groups of discharges from the inpatient setting and under the Acute Hospital Care at Home initiative”	4.3.2. Research Question #2: What clinical conditions and diagnoses furnished through AHCAH?
‘‘(iii) costs incurred by furnishing care in the inpatient setting and through the Acute Hospital Care at Home initiative” ‘‘(iv) the quantity, mix and intensity of such services (such as in-person visits and virtual contacts with patients) furnished in the Acute Hospital Care at Home initiative and furnished in the inpatient setting”	4.3.4. Research Question #4: Does the cost, mix and intensity of services differ for similar care furnished through AHCAH when compared to inpatient settings?
‘‘(v) socioeconomic information on beneficiaries treated under the initiative, including racial and ethnic data, income, and whether such beneficiaries are dually eligible for benefits under this title and title XIX.”	4.3.1. Research Question #1: What are the characteristics of the AHCAH beneficiary population?

[58] H.R.2617 - Consolidated Appropriations Act, 2023. Accessed May 8, 2024. https://www.congress.gov/bill/117th-congress/house-bill/2617.

Appendix B Waiver Request Review and Hospital Interviews

CMS designed a waiver request process to ensure that each requesting hospital's HaH care team had both the capacity and capability to provide quality, safe care in the home (see Section 2.2, Waiver Request and Review Process). This appendix provides details regarding the required elements of the waiver requests and the topics addressed during the interviews between the CMS review team and the requesting hospitals.

B.1 Required Elements for Waiver Requests

As part of the waiver process, CMS reviews each hospital's responses to the waiver requirements. Tier 2 hospitals are required to give detailed written explanations of how each service and safeguard are provided. The **required elements** of the waiver request include the following:

- **Administrative Elements:**
  - Hospital point of contact for the waiver
  - Hospital executive leader's Attestation of Approval for waiver request submission
  - Experience providing hospital care in the home
- **COP Regulatory Requirement Elements:** The provision of the following services as needed (either directly or under contract or arrangement):
  - Pharmacy
  - Infusion
  - Respiratory care including oxygen delivery
  - Diagnostics (e.g., laboratory tests, radiology)
  - Monitoring, with at least two sets of patient vital signs daily
  - Transportation between the hospital and the home in both directions
  - Food services, including meal availability as needed by the patient
  - Durable medical equipment
  - Physical, occupational, and speech therapy
  - Social work and care coordination
- **Safety Elements:**
  - At least one daily provider visit by a physician or advanced practice provider (APP), which can be remote after the initial in-person History and Physical Exam are performed in the hospital.
  - At least two in-person daily visits by a registered nurse, mobile integrated health practitioner, or community paramedic. If both in-person visits are performed by

mobile integrated health practitioner or community paramedic, then a daily remote registered nurse visit is needed to develop a daily nursing plan.

- Immediate on-demand remote audio connection with a care team member who can immediately connect the appropriate registered nurse or physician.
- In-home appropriate emergency personnel response to a patient's home within 30 minutes, if needed.
- Use of an accepted patient leveling process to ensure that only patients requiring an acute level of care are treated by the hospital through their HaH program. Such leveling criteria might include InterQual, Milliman, or others.
- Develop and/or use patient selection criteria. The hospital must describe the specific clinical inclusion/exclusion criteria that the care team uses to determine whether the patient is clinically appropriate for acute care in the home, and to ensure the hospital has the clinical capability and the staff capacity to provide safe and quality inpatient care in the alternate setting. Section 3 of this report provides a detailed analysis of the patient selection criteria.
- Address advance-care planning with patient prior to admission to the home.
- Implement a process for actions when a patient is unable to be reached within 15 minutes when arriving for a scheduled in-person or virtual visit.
- In-person registered nurse or mobile integrated health practitioner be present in the home to ensure that durable medical equipment is delivered and set up appropriately on the first home visit.
- Self-report selected data measures. The hospital agreed to provide certain data to CMS on a regular basis, including the number of new patients admitted to the home setting (volume), the number of patient escalations of care from the home to the hospital (escalation rate), and the number of unexpected patient deaths (unanticipated mortality). Tier 1 hospitals were required to report quality metrics monthly; Tier 2 hospitals were required to report weekly. The reporting measures are designed to quickly highlight potential problems or unintended uses of the waiver.
- Establish a local safety committee and attest that all reporting measures are reviewed by a local safety committee prior to being submitted to CMS.

B.2 Hospital Interview Topics

After review of a hospital's waiver request submission, the CMS team holds at least one meeting with the requesting hospital as an interview component. These discussions provide the opportunity for both parties to ensure adherence to the requirements of the AHCAH waiver and the non-waived Medicare Hospital CoPs. In addition to discussing waiver request elements submitted by the hospitals, the following key topics are addressed in depth during the interviews so that the CMS team has a more complete understanding of how the hospitals have designed critical features of their HaH programs.

- Process for discussing expectations of care through a HaH program and obtaining **patient consent**, as well as whether the:

  - Consent process informs the patient that they have the choice to return to the hospital at any time;
  - Patient understands that their medical team may choose to send them back to the hospital to complete their care if conditions change;
  - Hospital explains alternatives in cases where a patient refuses to return to the hospital; and
  - Consent process involves a patient's family member/support person/caregiver.
- Process for securing initial **transportation** to the home, the timeframe for the HaH care team to engage the patient upon arrival at the home, and details of the **setup and orientation** process provided to the patient and any associated family/support persons/caregivers.
- Process for determining which direct **clinical provisions of care** are provided (e.g., pharmacy, lab, diagnostics, dietary, rehab, social work services).
- Process of **communication and coordination** of care among the hospital care team, hospital departments, emergency-response providers, and patients.
- Process of providing oversight for, and ensuring appropriate training backgrounds of, any **contracted services or vendors** used.
- Process for **emergency response and escalations** of care for patients in the home.

Appendix C Support Tables for Exhibits

Appendix C provides detailed tables for the data and analyses presented by each exhibit in Section 4, Analysis and Results.

C.1 Exhibit 1. Patient Demographics

Tables C.1 and C.2 provide details on the data and analyses addressed in Exhibit 1, Patient Demographics.

Table C.1. Number of Patients and Episodes of Care for AHCAH and Comparison Group

Group	Number of Hospitals	Number of Unique Patients	Total Episodes of Care
AHCAH	151	11,907	13,217
Comparison	151	643,634	969,481

Table C.2. Demographic Comparisons, AHCAH versus Comparison Group

Characteristic	AHCAH	Comparison Group	P-Value	Statistically Significant?
Gender	53% Male	53% Male	.227	No
Rurality	7% Rural	15% Rural	<0.001	Yes
Medicaid Eligibility	12% Eligible	22% Eligible	<0.001	Yes
Low Income Subsidy Status (LIS)	1.6% LIS	2% LIS	<0.001	Yes
Race & Ethnicity	83.6% White	78.9% White	<0.001	Yes
Race & Ethnicity	14.6% All Other Races	19.9% All Other Races	<0.001	Yes

C.2 Exhibit 2. Risk Scores

Tables C.3, C.4, and C.5 provide details on the data and analyses of Hierarchical Condition Category (HCC) risk scores included in Exhibit 2, Risk Scores.

Table C.3. HCC Risk Score Distribution for AHCAH and Comparison Group Patients

Group	Minimum Score	25th Percentile	Median	Average	75th Percentile	Maximum Score
AHCAH	0.13	0.90	1.59	2.04	2.74	14.07
Comparison	0.13	0.98	1.72	2.26	3.06	18.06

Table C.4. Comparison of Average HCC Risk Scores for Top 25 MS-DRGs, AHCAH versus Comparison Group

DRG Code	AHCAH Average HCC Risk Score	Comparison Group Average HCC Risk Score	P-Value for Difference in HCC Risk Score	Statistically Significant? (p-value <0.05)	AHCAH Risk Score Higher?
177	1.8537	1.7323	0.0001	Yes	Yes
178	2.1660	1.8900	0.0001	Yes	Yes
189	1.9411	2.1212	0.0334	Yes	No
190	2.0892	2.1565	0.4860	No	No
191	2.2537	2.2302	0.2402	No	Yes
193	1.8814	1.9924	0.0257	Yes	No
194	1.7235	1.9497	0.0002	Yes	No
195	1.0978	1.2617	0.0544	No	No
202	1.6298	1.7590	0.1456	No	No
280	2.2837	1.8405	0.0006	Yes	Yes
291	2.3836	2.2195	0.0000	Yes	Yes
292	2.4001	2.2021	0.0643	No	Yes
392	1.5483	1.5736	0.9122	No	No
602	2.5313	2.1488	0.0210	Yes	Yes
603	1.6249	1.7991	0.0004	Yes	No
638	2.4243	2.0381	0.0351	Yes	Yes
641	1.9478	1.7234	0.1378	No	Yes
682	2.4529	2.0686	0.0081	Yes	Yes
683	2.0330	1.9827	0.4758	No	Yes
689	2.3299	2.0235	0.0010	Yes	Yes
690	1.8955	1.8421	0.1203	No	Yes
698	2.8898	2.7716	0.1060	No	Yes
699	2.7513	2.4451	0.0596	No	Yes
871	1.9953	2.0771	0.1791	No	No
872	1.6661	1.7485	0.3191	No	No

Table C.5. HCC Risk Scores by Gender for AHCAH and Comparison Group Patients

Group by Gender	Average HCC Risk Score Across DRGs	Minimum HCC Risk Score Across DRGs	Minimum HCC Risk Score Across DRGs
AHCAH Male	1.82	0.17	10.56
Comparison Male	2.03	0.13	14.65
AHCAH Female	1.72	0.27	8.57
Comparison Female	1.95	0.21	15.46

C.3 Exhibit 3. Clinical Conditions

The tables in this section provide additional details on the data and analyses presented by Exhibit 3, Clinical Conditions. Tables C.6 and C.7 provide details on the data and analyses related to Major Diagnostic Categories (MDCs) and Medicare Severity Diagnosis Related Groups (MS-DRGs), respectively.

Table C.6. Top 10 MDCs by Number of Claims and Total Reimbursements Paid for AHCAH Patients

MDC Code	MDC Code Description	Number of Claims	Total Paid	Percent of Total Episodes
04	Diseases & disorders of the respiratory system	6,102	$65,325,348.02	36%
05	Diseases & disorders of the circulatory system	2,713	$30,934,554.53	16%
18	Infectious & parasitic diseases, systemic or unspecified sites	2,601	$37,589,616.29	16%
11	Diseases & disorders of the kidney & urinary tract	2,040	$18,921,714.90	12%
09	Diseases & disorders of the skin, subcutaneous tissue & breast	1,063	$7,928,890.62	6%
06	Diseases & disorders of the digestive system	766	$7,039,110.71	5%
10	Endocrine, nutritional & metabolic diseases & disorders	473	$4,476,815.05	3%
07	Diseases & disorders of the hepatobiliary system & pancreas	206	$2,498,292.69	1%
08	Diseases & disorders of the musculoskeletal system & conn tissue	193	$3,142,519.55	1%
01	Diseases & disorders of the nervous system	131	$1,760,032.53	1%

Table C.7. Top 10 MS-DRGs by Number of Claims and Total Medicare Payments for AHCAH Patients

MS-DRG Code	MS-DRG Code Description	Count	Total Medicare Payments	Percent of Total Episodes
291	Heart failure and shock with MCC	1916	$19,543,865	12%
177	Respiratory infections and inflammations with MCC	1842	$28,671,541	11%
871	Septicemia or severe sepsis without MV >96 hours with MCC	1552	$24,876,838	9%
193	Simple pneumonia and pleurisy with MCC	1008	$9,959,386	6%
603	Cellulitis without MCC	841	$5,546,535	5%
690	Kidney and urinary tract infections without MCC	742	$4,484,217	5%
872	Septicemia or severe sepsis without MV >96 hours without MCC	663	$5,497,683	4%
190	Chronic obstructive pulmonary disease with MCC	644	$5,256,559	4%
194	Simple pneumonia and pleurisy with CC	548	$3,241,455	3%
178	Respiratory infections and inflammations with CC	433	$4,011,557	3%

C.4 Exhibit 4. Quality of Care Summary

Tables C.8, C.9, and C.10 provide details on the data and analyses related to Exhibit 4, Quality of Care Summary, including comparisons between AHCAH and the comparison group on 30-day mortality rates, 30-day all cause readmission rate, and catheter-associated urinary tract infection rates for the top 10 Medicare Severity Diagnosis Related Groups (MS-DRGs).

Table C.8. 30-Day Mortality Rate, per 1,000, for AHCAH and Comparison Group

DRG Code	DRG Code Description	AHCAH Rate	Comparison Rate	AHCAH Rate Lower?
177	Respiratory infections and inflammations with MCC	43.2	192.8	Yes
178	Respiratory infections and inflammations with CC	16.5	67.4	Yes
190	Chronic obstructive pulmonary disease with MCC	24.4	73.4	Yes
193	Simple pneumonia and pleurisy with MCC	21.1	127.9	Yes
194	Simple pneumonia and pleurisy with CC	11.0	46.5	Yes
291	Heart failure and shock with MCC	52.7	137.7	Yes
603	Cellulitis without MCC	7.5	18.8	Yes
690	Kidney and urinary tract infections without MCC	7.1	35.3	Yes
871	Septicemia or severe sepsis without MV >96 hours with MCC	35.1	312.6	Yes
872	Septicemia or severe sepsis without MV >96 hours without MCC	15.4	49.2	Yes

Table C.9. 30-Day All-Cause Readmission Rate, per 1,000, for AHCAH and Comparison Group

DRG Code	DRG Code Description	AHCAH Rate	Comparison Rate	AHCAH Rate Lower?
177	Respiratory infections and inflammations with MCC	155.8	132.7	No
178	Respiratory infections and inflammations with CC	161.7	156.1	No
190	Chronic obstructive pulmonary disease with MCC	161.5	182.6	Yes
193	Simple pneumonia and pleurisy with MCC	138.9	157.0	Yes
194	Simple pneumonia and pleurisy with CC	111.3	154.5	Yes
291	Heart failure and shock with MCC	178.5	181.6	Yes
603	Cellulitis without MCC	123.7	146.4	Yes
690	Kidney and urinary tract infections without MCC	173.9	163.7	No
871	Septicemia or severe sepsis without MV >96 hours with MCC	144.3	121.3	No
872	Septicemia or severe sepsis without MV >96 hours without MCC	122.2	148.0	Yes

Table C.10. Catheter-Associated Urinary Tract Infection Rate, per 1,000, for AHCAH and Comparison Group

DRG Code	DRG Code Description	AHCAH Rate	Comparison Rate	AHCAH Rate Lower?
177	Respiratory infections and inflammations with MCC	5.4	9.3	Yes
178	Respiratory infections and inflammations with CC	4.6	3.7	No
190	Chronic obstructive pulmonary disease with MCC	0.0	3.5	Yes
193	Simple pneumonia and pleurisy with MCC	4.0	2.7	No
194	Simple pneumonia and pleurisy with CC	0.0	1.1	Yes
291	Heart failure and shock with MCC	14.1	11.5	No
603	Cellulitis without MCC	0.0	0.9	Yes
690	Kidney and urinary tract infections without MCC	1.3	0.6	No
871	Septicemia or severe sepsis without MV >96 hours with MCC	3.2	5.3	Yes
872	Septicemia or severe sepsis without MV >96 hours without MCC	1.5	1.2	No

C.5 Exhibit 5. Mortality and HCC Comparison

Table C.11 provides details on the data and analyses related to Exhibit 5, Mortality and HCC Comparison, including comparisons between AHCAH and the comparison group patients on mortality and HCC risk scores for the top 25 Medicare Severity Diagnosis Related Groups (MS-DRGs), and whether those differences are statistically significant at the 0.05 level.

Table C.11. Mortality and HCC Risk Score Comparisons Between AHCAH and Comparison Group for Top 25 DRGs

DRG Code	AHCAH Average Risk Score	Comparison Average Risk Score	Risk Score Higher	P-value, Difference in Average Risk	P-value < 0.05?	AHCAH Mortality Rate	Comparison Mortality Rate	Mortality Rate Higher	P-value, Difference in Mortality	P-value <0.05?
177	1.8537	1.7323	AHCAH	0.0001	Yes	0.0432	0.1928	Comparison	<0.0001	Yes
178	2.166	1.89	AHCAH	0.0001	Yes	0.0165	0.0674	Comparison	<0.0001	Yes
189	1.9411	2.1212	Comparison	0.0334	Yes	0.0296	0.1825	Comparison	<0.0001	Yes
190	2.0892	2.1565	Comparison	0.486	No	0.0244	0.0734	Comparison	<0.0001	Yes
191	2.2537	2.2302	AHCAH	0.2402	No	0.0091	0.0313	Comparison	0.0675	No
193	1.8814	1.9924	Comparison	0.0257	Yes	0.0211	0.1279	Comparison	<0.0001	Yes
194	1.7235	1.9497	Comparison	0.0002	Yes	0.011	0.0465	Comparison	<0.0001	Yes
195	1.0978	1.2617	Comparison	0.0544	No	<0.0001	0.0195	Comparison	0.2637	No
202	1.6298	1.759	Comparison	0.1456	No	0.0084	0.0198	Comparison	0.3282	No
280	2.2837	1.8405	AHCAH	0.0006	Yes	0.0647	0.1496	Comparison	0.0038	Yes
291	2.3836	2.2195	AHCAH	0	Yes	0.0527	0.1377	Comparison	<0.0001	Yes
292	2.4001	2.2021	AHCAH	0.0643	No	0.0303	0.0684	Comparison	0.1124	No
392	1.5483	1.5736	Comparison	0.9122	No	<0.0001	0.0233	Comparison	0.0036	Yes
602	2.5313	2.1488	AHCAH	0.021	Yes	0.0462	0.097	Comparison	0.0497	Yes

DRG Code	AHCAH Average Risk Score	Comparison Average Risk Score	Risk Score Higher	P-value, Difference in Average Risk	P-value < 0.05?	AHCAH Mortality Rate	Comparison Mortality Rate	Mortality Rate Higher	P-value, Difference in Mortality	P-value <0.05?
603	1.6249	1.7991	Comparison	0.0004	Yes	0.0075	0.0188	Comparison	0.0147	Yes
638	2.4243	2.0381	AHCAH	0.0351	Yes	0.0089	0.0279	Comparison	0.3775	No
641	1.9478	1.7234	AHCAH	0.1378	No	0.0192	0.0658	Comparison	0.0691	No
682	2.4529	2.0686	AHCAH	0.0081	Yes	0.0987	0.2218	Comparison	0.0001	Yes
683	2.033	1.9827	AHCAH	0.4758	No	0.0167	0.0724	Comparison	0.0002	Yes
689	2.3299	2.0235	AHCAH	0.001	Yes	0.0482	0.1063	Comparison	0.0032	Yes
690	1.8955	1.8421	AHCAH	0.1203	No	0.0071	0.0353	Comparison	<0.0001	Yes
698	2.8898	2.7716	AHCAH	0.106	No	0.0467	0.1349	Comparison	<0.0001	Yes
699	2.7513	2.4451	AHCAH	0.0596	No	<0.0001	0.0342	Comparison	0.0032	Yes
871	1.9953	2.0771	Comparison	0.1791	No	0.0351	0.3126	Comparison	<0.0001	Yes
872	1.6661	1.7485	Comparison	0.3191	No	0.0154	0.0492	Comparison	<0.0001	Yes

C.6 Exhibit 6. Readmissions and HCC Comparison

Table C.12 provide details on the data and analyses related to Exhibit 6, Readmissions and HCC Comparison, including comparisons between AHCAH and the comparison group patients on hospital readmissions and HCC risk scores for the top 25 Medicare Severity Diagnosis Related Groups (MS-DRGs) , and whether those differences are statistically significant at the 0.05 level.

Table C.12. Hospital Readmissions and HCC Risk Score Comparisons Between AHCAH and Comparison Group for Top 25 MS-DRGs

DRG Code	AHCAH Readmissions Rate	Comparison Readmissions Rate	P-value, Difference in Readmission Rates	p-value < 0.05?	AHCAH HCC Risk Score	Comparison HCC Risk Score	P-value, Difference in Risk Scores	p-value < 0.05?
177	0.155809	0.132732	0.004413	Yes	1.8537	1.732305	0.0001	Yes
178	0.161663	0.156077	0.8045	No	2.166	1.889974	0.0001	Yes
189	0.152174	0.164328	0.5528	No	1.9411	2.12124	0.0334	Yes
190	0.161491	0.182562	0.194	No	2.0892	2.156534	0.486	No
191	0.136929	0.203721	0.01435	Yes	2.2537	2.230209	0.2402	No
193	0.138889	0.157014	0.1304	No	1.8814	1.99244	0.0257	Yes
194	0.111314	0.154451	0.007083	Yes	1.7235	1.949655	0.0002	Yes
195	0.057692	0.128895	0.04593	Yes	1.0978	1.261747	0.0544	No
202	0.168724	0.172593	0.9452	No	1.6298	1.759012	0.1456	No
280	0.205674	0.203927	1.0	No	2.2837	1.840481	0.0006	Yes
291	0.178497	0.181634	0.7478	No	2.3836	2.219484	<0.0001	Yes
292	0.176471	0.208516	0.4198	No	2.4001	2.202109	0.0643	No
392	0.176678	0.189344	0.6419	No	1.5483	1.573602	0.9122	No
602	0.175573	0.168491	0.9237	No	2.5313	2.148791	0.021	Yes
603	0.123662	0.146428	0.07528	No	1.6249	1.799068	0.0004	Yes
638	0.141593	0.182569	0.3176	No	2.4243	2.038062	0.0351	Yes
641	0.190476	0.182186	0.9261	No	1.9478	1.723361	0.1378	No
682	0.188312	0.16589	0.5245	No	2.4529	2.068599	0.0081	Yes
683	0.211618	0.18547	0.3396	No	2.033	1.982688	0.4758	No
689	0.172996	0.15149	0.4087	No	2.3299	2.023502	0.001	Yes

DRG Code	AHCAH Readmissions Rate	Comparison Readmissions Rate	P-value, Difference in Readmission Rates	p-value < 0.05?	AHCAH HCC Risk Score	Comparison HCC Risk Score	P-value, Difference in Risk Scores	p-value < 0.05?
690	0.173854	0.163708	0.4936	No	1.8955	1.842052	0.1203	No
698	0.179577	0.176463	0.9538	No	2.8898	2.771644	0.106	No
699	0.218905	0.212834	0.9036	No	2.7513	2.445131	0.0596	No
871	0.14433	0.12131	0.006508	Yes	1.9953	2.077065	0.1791	No
872	0.122172	0.147991	0.07222	No	1.6661	1.748468	0.3191	No

C.7 Exhibit 7. Hospital Acquired Conditions Comparison

Table C.13 provide details on the data and analyses related to Exhibit 7, Hospital Acquired Conditions Comparison, including comparisons between AHCAH and the comparison group patients on the six most prevalent hospital acquired conditions (HACs), and whether those differences are statistically significant at the 0.05 level.

Table C.13. Hospital Acquired Conditions Comparison, AHCAH versus Comparison Group

HAC Code	HAC Code Definition	AHCAH Count	Comparison Count	AHCAH Rate	Comparison Rate	AHCAH Higher	p-value	p-value <0.05?
HAC06	Catheter-associated Urinary Tract Infection (UTI)	98	5815	0.00742	0.00904	No	0.0506	No
HAC04	Stage III And IV Pressure Ulcers	3	309	0.00021	0.00048	No	0.2276	No
HAC09	Manifestations Of Poor Glycemic Control	2	307	0.00015	0.00048	No	0.1017	No
HAC07	Vascular Catheter-associated Infection	2	161	0.00011	0.00025	No	0.7767	No
HAC05	Falls And Trauma	1	255	0.00008	0.00039	No	0.0978	No

HAC Code	HAC Code Definition	AHCAH Count	Comparison Count	AHCAH Rate	Comparison Rate	AHCAH Higher	p-value	p-value <0.05?
HAC14	Iatrogenic Pneumothorax W/ Venous Catheterization	0	137	0.0	0.00021	No	0.1212	No

Note: The denominators used to calculate the respective rates for each of the hospital acquired conditions are 13,217 for the AHCAH group and 643,625 for the Comparison Group.

C.8 Exhibit 8. Utilization Summary

Tables C.14, C.15, and C.16 provide details on the data and analyses related to Exhibit 8, Utilization Summary, including comparisons between AHCAH and the comparison group on percent of total episodes of care, average length of stay, and average 30-day post discharge Medicare spending for the top 10 Medicare Severity Diagnosis Related Groups (MS-DRGs).

Table C.14. Percent of Total Episodes of Care for AHCAH and Comparison Group for the Top 10 Medicare Severity Diagnosis Related Groups (MS-DRGs)

DRG Code	DRG Code Description	AHCAH Percent	Comparison Percent	AHCAH Percent Lower?
177	Respiratory infections and inflammations with MCC	11.0%	2.4%	No
178	Respiratory infections and inflammations with CC	2.6%	0.4%	No
190	Chronic obstructive pulmonary disease with MCC	3.8%	0.4%	No
193	Simple pneumonia and pleurisy with MCC	6.0%	0.9%	No
194	Simple pneumonia and pleurisy with CC	3.3%	0.4%	No
291	Heart failure and shock with MCC	11.4%	2.2%	No
603	Cellulitis without MCC	5.0%	0.5%	No
690	Kidney and urinary tract infections without MCC	4.4%	0.7%	No
871	Septicemia or severe sepsis without MV >96 hours with MCC	9.3%	4.3%	No
872	Septicemia or severe sepsis without MV >96 hours without MCC	4.0%	0.8%	No

Table C.15. Average Length of Stay (LOS) in Days for AHCAH and Comparison Group for the Top 10 Medicare Severity Diagnosis Related Groups (MS-DRGs)

DRG Code	DRG Code Description	AHCAH Average LOS	Comparison Average LOS	AHCAH LOS Lower?
177	Respiratory infections and inflammations with MCC	8.3	8.4	Yes
178	Respiratory infections and inflammations with CC	6.1	5.9	No
190	Chronic obstructive pulmonary disease with MCC	7.2	5.8	No
193	Simple pneumonia and pleurisy with MCC	7.4	6.6	No
194	Simple pneumonia and pleurisy with CC	5.9	4.9	No
291	Heart failure and shock with MCC	9.0	6.9	No
603	Cellulitis without MCC	7.1	5.3	No
690	Kidney and urinary tract infections without MCC	4.4	5.0	Yes
871	Septicemia or severe sepsis without MV >96 hours with MCC	9.3	8.3	No
872	Septicemia or severe sepsis without MV >96 hours without MCC	4.0	5.7	Yes

Table C.16. Average Post 30-Day Medicare Spending for AHCAH and Comparison Group for the Top 10 Medicare Severity Diagnosis Related Groups (MS-DRGs)

DRG Code	DRG Code Description	AHCAH Medicare Spending	Comparison Medicare Spending	AHCAH Medicare Spending Lower?
177	Respiratory infections and inflammations with MCC	$6,084	$7,104	Yes
178	Respiratory infections and inflammations with CC	$5,590	$6,976	Yes
190	Chronic obstructive pulmonary disease with MCC	$5,939	$5,326	No
193	Simple pneumonia and pleurisy with MCC	$4,892	$7,119	Yes
194	Simple pneumonia and pleurisy with CC	$3,801	$4,888	Yes
291	Heart failure and shock with MCC	$7,328	$7,706	Yes
603	Cellulitis without MCC	$4,802	$5,711	Yes
690	Kidney and urinary tract infections without MCC	$4,838	$6,615	Yes
871	Septicemia or severe sepsis without MV >96 hours with MCC	$6,333	$8,354	Yes
872	Septicemia or severe sepsis without MV >96 hours without MCC	$3,819	$5,952	Yes

C.9 Exhibit 9. 30-Day Post-Discharge Medicare Spending

Table C.17 provides details on the data and analyses related to Exhibit 9, 30-day Post-Discharge Medicare Spending Summary, including statistical comparisons between AHCAH and the comparison group on the average 30-day post-discharge Medicare spending for the top 25 Medicare Severity Diagnosis Related Groups (MS-DRGs).

Table C.17. Average 30-Day Post-Discharge Medicare Spending for AHCAH and Comparison Group for the Top 25 Medicare Severity Diagnosis Related Groups (MS-DRGs)

DRG Code	AHCAH Average Medicare Spending	Comparison Average Medicare Spending	AHCAH minus Comparison Medicare Spending	P-value, Difference in Medicare Spending	P-value < 0.05?	AHCAH Lower?
177	$6,083.65	$7,109.59	-$1,025.94	0.00284	Yes	Yes
178	$5,589.90	$6,978.34	-$1,388.44	0.03287	Yes	Yes
189	$5,244.52	$6,490.75	-$1,246.23	0.12430	No	Yes
190	$5,938.74	$5,326.11	$612.63	0.17700	No	No
191	$4,462.64	$4,227.28	$235.37	0.66570	No	No
193	$4,892.45	$7,105.46	-$2,213.01	<0.0001	Yes	Yes
194	$3,800.82	$4,888.81	-$1,087.99	0.00245	Yes	Yes
195	$1,956.09	$2,990.32	-$1,034.23	0.01375	Yes	Yes
202	$4,349.61	$3,913.90	$435.71	0.55350	No	No

DRG Code	AHCAH Average Medicare Spending	Comparison Average Medicare Spending	AHCAH minus Comparison Medicare Spending	P-value, Difference in Medicare Spending	P-value < 0.05?	AHCAH Lower?
280	$8,566.23	$11,690.02	-$3,123.79	0.00731	Yes	Yes
291	$7,328.22	$7,703.86	-$375.64	0.27970	No	Yes
292	$6,157.50	$5,753.70	$403.80	0.68270	No	No
392	$3,495.30	$4,550.48	-$1,055.18	0.01404	Yes	Yes
602	$9,364.94	$10,151.62	-$786.68	0.52510	No	Yes
603	$4,802.26	$5,711.73	-$909.47	0.03164	Yes	Yes
638	$5,979.45	$6,669.17	-$689.72	0.46670	No	Yes
641	$5,410.60	$6,668.93	-$1,258.33	0.08089	No	Yes
682	$7,000.31	$9,285.35	-$2,285.04	0.00569	Yes	Yes
683	$6,802.58	$6,979.25	-$176.67	0.81790	No	Yes
689	$7,810.51	$9,613.46	-$1,802.96	0.10090	No	Yes
690	$4,838.01	$6,627.58	-$1,789.57	<0.0001	Yes	Yes
698	$6,760.46	$10,087.26	-$3,326.80	<0.0001	Yes	Yes
699	$8,138.65	$7,255.56	$883.09	0.44720	No	No
871	$6,333.28	$8,376.72	-$2,043.44	<0.0001	Yes	Yes
872	$3,819.01	$5,954.18	-$2,135.17	<0.0001	Yes	Yes
Overall	**$5798.04**	**$7438.47**	**-$1640.43**	**<0.0001**	**Yes**	**Yes**

C.10 Exhibit 10. Length of Stay

Tables C.18 and C.19 provide details on the data and analyses related to Exhibit 10, Length of Stay (LOS) Summary, including statistical comparisons between AHCAH and the comparison group on the average length of stay for the top 25 Medicare Severity Diagnosis Related Groups (MS-DRGs).

Table C.18. Summary of Length of Stay Across Top 25 MS-DRGs

Statistic Type	Statistic
AHCAH Average Length of Stay in Days	7.68
Comparison Group Average Lenth of Stay in Days	6.89
Number of Days AHCAH is higher	0.79
P-value of Difference in Length of Stay	<0.0001
Percent difference in average length of stay between AHCAH and Comparison Group	11.42%

Table C.19. Average Length of Stay (in days) for AHCAH and Comparison Group for the Top 25 Medicare Severity Diagnosis Related Groups (MS-DRGs)

DRG Code	AHCAH Average LOS in Days	Comparison Average LOS in Days	AHCAH minus Comparison LOS	P-value, Difference in LOS	P-value < 0.05?	AHCAH Higher?	% difference (to IP Ave LOS)
177	8.32	8.44	-0.11	0.3893	No	No	-1.35
178	6.12	5.94	0.18	0.2174	No	Yes	3.05
189	6.86	6.21	0.65	<0.0001	Yes	Yes	10.41
190	7.17	5.79	1.38	<0.0001	Yes	Yes	23.84
191	6.16	4.88	1.28	<0.0001	Yes	Yes	26.21
193	7.43	6.65	0.78	<0.0001	Yes	Yes	11.77
194	5.92	4.94	0.98	<0.0001	Yes	Yes	19.73
195	5.31	4.10	1.21	<0.0001	Yes	Yes	29.58
202	6.51	5.07	1.44	<0.0001	Yes	Yes	28.32
280	9.87	7.30	2.57	<0.0001	Yes	Yes	35.21
291	9.04	6.88	2.16	<0.0001	Yes	Yes	31.37
292	8.54	5.52	3.02	<0.0001	Yes	Yes	54.66
392	6.23	4.75	1.48	<0.0001	Yes	Yes	31.09
602	9.96	7.81	2.15	<0.0001	Yes	Yes	27.52
603	7.09	5.29	1.80	<0.0001	Yes	Yes	33.94
638	7.61	5.28	2.33	<0.0001	Yes	Yes	44.25
641	5.96	4.97	0.99	0.0005	Yes	Yes	19.88
682	9.26	7.75	1.51	0.0003	Yes	Yes	19.54
683	7.07	5.39	1.67	<0.0001	Yes	Yes	31.03
689	7.34	6.81	0.52	0.0431	Yes	Yes	7.67
690	6.27	5.01	1.26	<0.0001	Yes	Yes	25.09
698	8.80	8.05	0.75	0.0233	Yes	Yes	9.29
699	7.37	5.66	1.71	<0.0001	Yes	Yes	30.22
871	8.46	8.33	0.13	0.3343	No	Yes	1.57
872	7.11	5.66	1.45	<0.0001	Yes	Yes	25.58
Overall	**7.68**	**6.89**	**0.79**	**<0.0001**	**Yes**	**Yes**	**11.42**

C.11 Exhibit 11. Service Utilization

Table C.20 provides details on the data and analyses related to Exhibit 11, Service Utilization, including statistical comparisons between AHCAH and the Comparison Group on the service utilization rates for 15 grouped service categories.

Table C.20. Service Utilization Rates by Grouped Service Category, AHCAH versus Comparison Group

Grouped Service Category	AHCAH Count	AHCAH Utilization Rate	Comparison Group Count	Comparison Group Utilization Rate	AHCAH minus Comparison Group Rate	P-value, Difference in Rates
Cardiology	9,264	77.8%	551,713	85.7%	-8%	<0.0001
Dialysis	8	0.4%	33,342	5.2%	-5%	<0.0001
ICU	1,840	15.5%	215,082	33.4%	-18%	<0.0001
Imaging	6,764	56.8%	449,628	69.9%	-13%	<0.0001
Laboratory	11,747	98.7%	641,104	99.6%	-1%	<0.0001
Nuclear Medicine	231	1.9%	28,768	4.5%	-3%	<0.0001
Occupational Therapy	2,814	23.6%	226,774	35.2%	-12%	<0.0001
Other	11,845	99.5%	641,382	99.7%	-0.2%	0.002
Pharmacy	11,803	99.1%	641,000	99.6%	-0.5%	<0.0001
Physical Therapy	5,815	48.8%	376,069	58.4%	-10%	<0.0001
Radiology	9,725	81.7%	555,155	86.3%	-5%	<0.0001
Respiratory Services	4,590	38.5%	250,572	38.9%	-0.4%	0.402
Room/Board	7,585	63.7%	487,438	75.7%	-12%	<0.0001
Specialty Services	2,905	24.4%	170,025	26.4%	-2%	<0.0001
Speech	973	8.2%	117,664	18.3%	-10%	<0.0001

Note: The denominators used to calculate the respective utilization rates for each of the grouped service categories are 13,217 for the AHCAH group and 643,625 for the Comparison Group.

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