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Hospital outcomes in Jehovah's Witness patients with acute gastrointestinal bleeding: A matched cohort study

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Abstract

Background: Acute gastrointestinal bleeding (GIB) may require urgent resuscitation, endoscopy, and red blood cell (RBC) transfusion. Management is particularly challenging in Jehovah's Witness (JW) patients who decline RBC transfusion. **Aim:** To compare short-term hospital outcomes between JW patients with acute GIB and individually matched transfusion-eligible comparators. **Methods:** We conducted a single-center retrospective matched cohort study of adults admitted from 2010 to 2026. Twenty-two JW patients who declined RBC transfusion and underwent inpatient endoscopy were manually matched 1:1 with comparators admitted within 7 calendar days, managed by the same attending gastroenterologist, and meeting the applicable high-risk threshold of Glasgow–Blatchford Score > 6 for suspected upper GIB or Oakland Score >8 for suspected lower GIB. Paired *t*-tests or Wilcoxon signed-rank tests were used as appropriate. **Results:** Mean initial hemoglobin was 8.45 g/dL in JW patients and 9.06 g/dL in comparators (paired difference, −0.61 g/dL; 95% CI, −2.81 to 1.58; $p = 0.567$). Mean hemoglobin at endoscopy was 8.35 and 9.24 g/dL, respectively (paired difference, −0.89 g/dL; 95% CI, −2.54 to 0.75; $p = 0.273$). Admission-to-procedure time did not differ significantly ($p = 0.472$). Median hospital length of stay was 5.5 versus 3.5 days and was longer among JW patients ($p = 0.020$). **Conclusion:** No statistically significant differences were detected in hemoglobin outcomes or procedure timing, but JW patients had longer hospital stays. Findings are exploratory and limited by the small sample, residual imbalance, and unavailable patient-level severity scores. **Relevance for Patients:** Patients with acute GIB who decline RBC transfusion may benefit from individualized monitoring, blood-conservation strategies, and careful discharge planning.

Keywords: Jehovah's Witness; Gastrointestinal bleeding; Bloodless medicine; Endoscopy; Red blood cell transfusion; Acute anemia; Matched cohort study

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1. Introduction

Acute gastrointestinal bleeding (GIB) remains one of the most common and clinically significant reasons for hospitalization in gastroenterology.[1] It encompasses a broad spectrum of disease severity, ranging from self-limited bleeding to massive hemorrhage resulting in hemodynamic instability, shock, multiorgan dysfunction, or death. GIB is traditionally categorized as upper gastrointestinal bleeding due to peptic ulcer disease, gastritis, esophagitis, or Mallory–Weiss tears, whereas lower gastrointestinal bleeding may result from diverticular bleeding, angioectasias, ischemic colitis, inflammatory bowel disease, hemorrhoids, or colorectal malignancy.[2] Although advances in endoscopy, pharmacotherapy, resuscitation, and risk stratification have improved clinical care, acute GIB continues to carry substantial morbidity, mortality, and health care utilization.[3,4]

The management of acute GIB requires rapid assessment of bleeding severity, hemodynamic status, comorbid disease burden, medication exposure, and likelihood of ongoing hemorrhage. Current guideline-based care emphasizes early recognition of high-risk features, appropriate resuscitation, correction of coagulopathy when indicated, risk stratification, and timely endoscopic evaluation or intervention.[5,6] For upper GIB, the American College of Gastroenterology (ACG) recommends endoscopy within 24 hours after presentation for most hospitalized patients, along with hemodynamic stabilization and appropriate pre-endoscopic therapy when indicated.[7] For lower GIB, updated guidance similarly emphasizes risk stratification, selective inpatient colonoscopy, and individualized timing of intervention based on severity and clinical stability.[8] The current ACG upper and lower GIB guidelines support restrictive transfusion approaches in many clinically stable patients and emphasize endoscopic and supportive management as central components of care.[9]

Red blood cell (RBC) transfusion has historically been viewed as a cornerstone of supportive management for patients with acute GIB and significant anemia.[10] Transfusion may improve oxygen-carrying capacity, support hemodynamic stabilization, and serve as a bridge to definitive hemostasis. However, the optimal transfusion threshold in acute GIB has been the subject of significant investigation. Modern evidence has challenged liberal transfusion strategies and increasingly supports restrictive transfusion practices in many patients.[11] In a meta-analysis of randomized trials of patients with acute upper GIB, it was found that a restrictive transfusion strategy improved outcomes compared with a liberal transfusion strategy, including improved survival and reduced further bleeding in selected patients.[12] These findings contributed to a broader shift away from reflexive liberal transfusion toward more individualized transfusion thresholds, particularly in hemodynamically stable patients without active cardiovascular ischemia.[13]

The movement toward restrictive transfusion has important implications for patients who cannot or choose not to accept blood products. Although RBC transfusions remain lifesaving in selected cases of massive hemorrhage, current evidence suggests that transfusion itself is not always the primary determinant of favorable outcomes in acute GIB.[14] Instead, patient outcomes are influenced by several interacting factors, including early recognition, adequate intravascular resuscitation, reversal or management of anticoagulation [15], rapid localization of bleeding, definitive endoscopic or radiologic hemostasis, prevention of recurrent bleeding, and optimization of cardiopulmonary reserve.[16] This evolving understanding creates an important context for examining outcomes among Jehovah's Witness patients, for whom standard RBC transfusion is typically declined.

Jehovah's Witnesses are a Christian religious group known in medical settings for their refusal of transfusion of whole blood and major blood components.[17] This refusal is based on religious interpretation rather than a lack of understanding of transfusion risk or benefit.[17] While individual beliefs and preferences may vary, many JW patients decline transfusion of whole blood, RBCs, white blood cells, platelets, and plasma.[18] Some may accept certain blood fractions, cell salvage, albumin, clotting factors, erythropoiesis-stimulating agents, or other blood conservation strategies depending on personal religious interpretation and informed consent discussions.[19,20] Therefore, clinicians must avoid assumptions and instead conduct individualized discussions regarding which products or interventions are acceptable to each patient.[21]

The care of JW patients with acute bleeding is clinically complex because it requires balancing respect for patient autonomy with the urgency of managing potentially life-threatening hemorrhage. In competent adults, refusal of blood transfusion is generally ethically and legally protected, even when refusal may increase the risk of morbidity or death.[22] Clinicians caring for these patients must ensure informed refusal, assess decision-making capacity, document preferences clearly, and rapidly identify acceptable alternatives. In emergent situations, uncertainty about a patient's preferences may create additional challenges. However, when a competent patient has clearly refused transfusion, clinicians are obligated to respect that decision while continuing to provide all acceptable forms of medical and procedural care.[23]

Bloodless medicine has emerged as a structured

approach to caring for patients who decline transfusion or for whom transfusion avoidance is desired. Bloodless management strategies focus on three broad principles: optimizing erythropoiesis, minimizing blood loss, and improving hemostasis. Interventions may include intravenous or oral iron, erythropoiesis-stimulating agents, folate, vitamin B12, vitamin C, minimization of phlebotomy, pediatric-volume blood tubes, meticulous procedural technique, early hemostatic intervention, reversal of anticoagulants when appropriate, desmopressin in selected patients, prothrombin complex concentrate or recombinant factor products when acceptable, and close monitoring in high-acuity settings.[24,25] Bloodless medicine reviews emphasize aggressive anemia treatment, reduction of iatrogenic blood loss, and early control of bleeding as core strategies when transfusion is not an option.[26]

In the setting of acute GIB, bloodless management requires particularly close collaboration among a multidisciplinary team. The urgency of endoscopic intervention may be heightened because definitive source identification can prevent further blood loss and reduce dependence on transfusion-based resuscitation. At the same time, procedural sedation and anesthesia may be perceived as higher risk in patients with profound anemia, particularly if there is concern for ongoing bleeding, cardiopulmonary disease, or hemodynamic instability.[27] These concerns may lead clinicians to delay endoscopy in an attempt to medically optimize the patient. However, excessive procedural delay may also prolong bleeding risk and hospitalization. Thus, the timing of endoscopic evaluation in JW patients requires careful individualized risk-benefit assessment.[28]

Despite the clinical importance of this issue, outcome data for JW patients with acute GIB remains limited. Much of the existing literature consists of case reports, small case series, narrative reviews, or studies of surgical and critical care populations rather than comparative cohorts focused specifically on acute GIB. Prior reports demonstrate that even profound anemia can sometimes improve with intensive bloodless management, but these findings may not generalize across institutions or bleeding etiologies.[29] Furthermore, few studies directly compare JW patients who decline transfusion with transfusion-eligible patients admitted with similar clinical conditions. As a result, uncertainty remains regarding whether transfusion refusal is associated with delayed endoscopic evaluation, prolonged hospitalization, or other adverse short-term hospital outcomes.

We therefore conducted a single-center retrospective matched cohort study of JW patients admitted with acute GIB between 2010 and 2026. Each JW patient included in the comparative analysis was individually matched in a 1:1 ratio with a transfusion-eligible comparator patient based on admission within 7 calendar days after the corresponding JW admission, management by the same attending gastroenterologist, and threshold-based high-risk GIB classification. We hypothesized that JW patients would experience longer hospital length of stay, delayed endoscopic evaluation, and lower hemoglobin levels at the time of endoscopy because RBC transfusion was not available as a treatment option. The primary objective was to compare the length of hospital stay between the two groups. Secondary objectives included comparison of initial hemoglobin, hemoglobin at endoscopy, admission-to-procedure time, and other short-term hospital outcomes.

2. Materials and methods

2.1. Study design and setting

We conducted a single-center retrospective comparative cohort study at a tertiary academic medical center in the Southeastern United States. The study evaluated adult patients admitted with acute GIB between 2010 and 2026. The primary cohort consisted of patients who identified as Jehovah's Witness (JW) and declined RBC transfusion during the index hospitalization. Each JW patient included in the comparative analysis was individually matched in a 1:1 ratio with one transfusion-eligible comparator patient (Table S1).

Matching was performed manually through electronic medical record review. Comparator patients were required to have been admitted within 7 calendar days after the admission of the corresponding JW patient, to have been managed by the same attending gastroenterologist, and to have been classified as having high-risk GIB based on the suspected bleeding location at presentation. High-risk status was defined as a Glasgow–Blatchford Score (GBS) greater than 6 for suspected upper GIB or an Oakland Score greater than 8 for suspected lower GIB.[30] Matching was based on meeting the applicable high-risk threshold rather than on identical numerical scores; therefore, no numerical score caliper was used.

This study was approved by the Institutional Review Board at Augusta University under IRB Net ID 2089342-3. Because of the retrospective design, data were collected through electronic medical record review in accordance with the approved protocol. Patient-level data were de-identified for analysis.

2.2. Patient identification

Eligible JW patients were identified through electronic medical record query and chart review. Patients were

initially screened using the International Classification of Diseases diagnosis code for gastrointestinal hemorrhage (K92.2), and related clinical documentation. Additional confirmation was performed through review of the medical record for documentation of JW religious identity and refusal of RBC transfusion. Patients were considered part of the JW cohort if they were documented as Jehovah's Witnesses and had evidence in the chart that RBC transfusion was declined during the hospitalization.

The comparator cohort was identified from adult patients admitted with acute GIB during the same study period who did not have documented refusal of RBC transfusion and were eligible to receive RBC transfusion at the discretion of the treating clinical team. Comparator patients were manually reviewed and matched to each JW patient according to the criteria described below (also see Figure 1).

2.3. Inclusion and exclusion criteria

Patients were eligible for inclusion in the JW cohort if they met the following criteria:

- Age 18 years or older
- Admission for suspected or confirmed acute GIB between 2010 and 2026
- Documented identification as a Jehovah's Witness

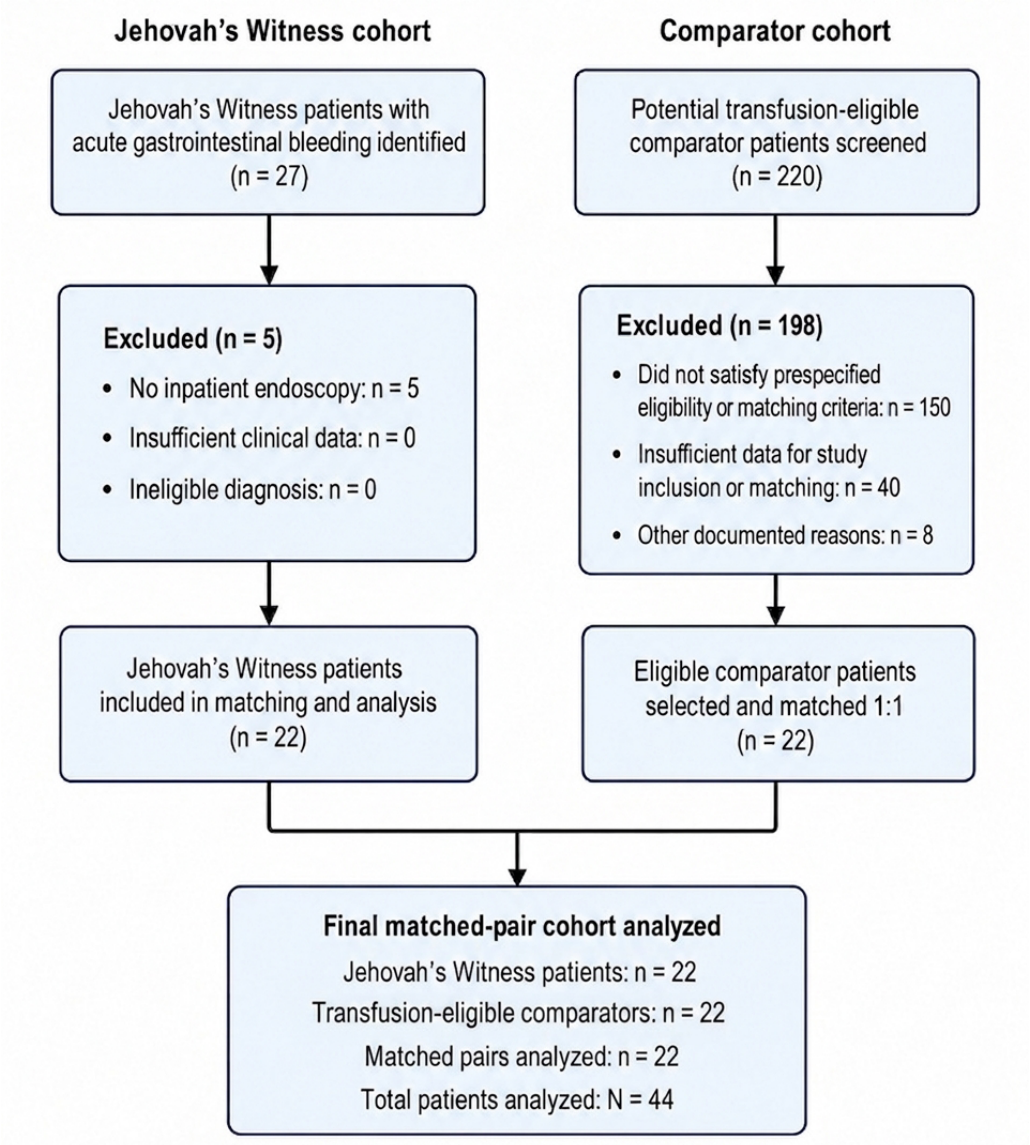


Figure 1. Patient-selection and matching flow diagram

- Documented refusal of RBC transfusion during the index hospitalization
- Underwent endoscopic evaluation during the hospitalization
- Had the clinical and outcome data required for the study available

Comparator patients were eligible if they: (i) were 18 years or older; (ii) were admitted with suspected or confirmed acute GIB during the same study period; (iii) did not have documented refusal of RBC transfusion; (iv) were eligible to receive RBC transfusion if clinically indicated; (v) met the applicable high-risk GIB threshold; (vi) underwent endoscopic evaluation during the hospitalization; and (vii) had the clinical and outcome data required for the study available.

Patients in either cohort were excluded if they were younger than 18 years, lacked evidence of acute GIB, had anemia unrelated to acute gastrointestinal loss, had insufficient documentation to confirm eligibility or study outcomes, or had any documented cardiac, pulmonary, renal, or hepatic comorbidity. These comorbidity exclusions were applied equally to JW patients and potential comparators. The broad exclusions reduced the number of patients eligible for inclusion. Five JW patients with suspected or confirmed acute GIB did not undergo endoscopic evaluation and were therefore excluded from the primary matched analysis.

2.4. Comparator selection and matching procedure

Each eligible JW patient was manually matched in a 1:1 ratio with one specific comparator patient through electronic medical record review.

Potential comparators were required to: (i) have been admitted within 7 calendar days after the admission date of the corresponding JW patient; (ii) have been managed by the same attending gastroenterologist; (iii) meet the applicable high-risk GIB threshold; and (iv) satisfy the comorbidity and data-availability criteria.

For patients presenting with suspected upper GIB, high-risk status was defined by the original matching team as a GBS greater than 6. For patients presenting with suspected lower GIB, high-risk status was defined as an Oakland Score greater than 8. The original matching team confirmed that these scores were calculated using admission clinical and laboratory values obtained before transfusion, endoscopy, bloodless therapy, or other definitive treatment. Patient-level GBS and Oakland Score values were not available in the final analytic dataset and therefore could not be independently summarized or used to assess numerical severity balance within matched pairs.

Matching was based on whether both patients met the applicable high-risk threshold rather than on identical or closely similar numerical scores. No maximum allowable difference, or caliper, was specified for the numerical GBS or Oakland Scores.

The applicable score was selected according to the suspected bleeding location and clinical presentation at admission. Matching was not performed according to the definitive bleeding source subsequently identified during endoscopy. Therefore, individual matched pairs were not necessarily concordant according to the final upper- or lower-GIB diagnosis.

Potential comparators were reviewed chronologically according to admission date. When more than one potentially eligible comparator was admitted during the 7-day matching window, the earliest chronologically admitted patient who met all eligibility and matching criteria and had complete data for the prespecified study variables was selected. No random selection procedure was used. Comparator selection was completed without consideration of study outcomes, including hospital length of stay, hemoglobin at endoscopy, and admission-to-procedure time.

All JW patients included in the primary comparative analysis were successfully matched with one comparator patient, resulting in 22 matched pairs and 44 total participants. A complete stepwise description of the comparator-selection protocol is provided in the Supplementary File (see *Supplementary methods*).

2.5. Data collection

Data were abstracted from the electronic medical record according to the approved IRB protocol. Collected demographic variables included age, sex, and race. Clinical variables available for analysis included presenting symptoms, initial admission hemoglobin, hemoglobin at the time of endoscopy, use of anticoagulant or antiplatelet medications at presentation, and intensive care unit admission. Patient-level GBS and Oakland Score values used during the original matching process were not available in the final analytic dataset. Presenting symptoms included rectal bleeding, melena, hematochezia, hematemesis, symptomatic anemia, or other documented manifestations of GIB.

Procedural variables included type of endoscopic procedure, admission-to-procedure time, endoscopic findings, presence of active bleeding, therapeutic interventions performed, use of interventional radiology, and anesthesia method when documented. Endoscopic interventions included modalities such as hemostatic clipping, argon plasma coagulation, band ligation,

polypectomy, injection therapy, or other standard endoscopic therapies as clinically indicated.

2.6. Exposure and comparator definitions

The primary exposure was documented refusal of RBC transfusion during the index hospitalization among patients identified as JW. The available dataset did not identify the exact time at which refusal was documented or whether transfusion preferences were reassessed throughout the hospitalization. Patients in the JW cohort were therefore classified as transfusion-declining patients. Comparator patients were classified as transfusion-eligible rather than transfusion-accepting because they did not have documented refusal of RBC transfusion and could receive transfusion if clinically indicated. Comparator classification did not require actual receipt of an RBC transfusion.

Preferences regarding other blood products, blood fractions, and blood-conservation therapies were documented when available. Bloodless therapies included iron supplementation, erythropoiesis-stimulating agents, vitamin B12, folate, vitamin C, desmopressin, and coagulation factor products accepted by the individual patient.

2.7. Outcomes

The primary outcome was hospital length of stay, measured in days from admission to discharge. Length of stay was selected because it reflects overall hospital course, need for monitoring, procedural timing, clinical stability, and discharge readiness (Figure 2).

Secondary comparative outcomes included initial hemoglobin, hemoglobin at the time of endoscopy, admission-to-procedure time, endoscopic findings, need for endoscopic hemostatic intervention, and final disposition. Intensive care unit (ICU) admission and use of bloodless therapies were summarized descriptively within the JW cohort because corresponding comparator ICU data were unavailable. Admission-to-procedure time was defined as the time from hospital admission to first documented endoscopic procedure during the hospitalization. Hemoglobin at time of endoscopy was defined as the hemoglobin value most closely preceding the endoscopic procedure.

Exploratory analyses evaluated associations between hemoglobin values, admission-to-procedure time, and hospital length of stay within the JW cohort.

2.8. Statistical analysis

Descriptive statistics were used to summarize demographic, clinical, and procedural characteristics. Continuous variables were reported as means with standard deviations (SDs) or medians with interquartile ranges (IQRs), as appropriate based on their distributions. Categorical variables were reported as frequencies and percentages.

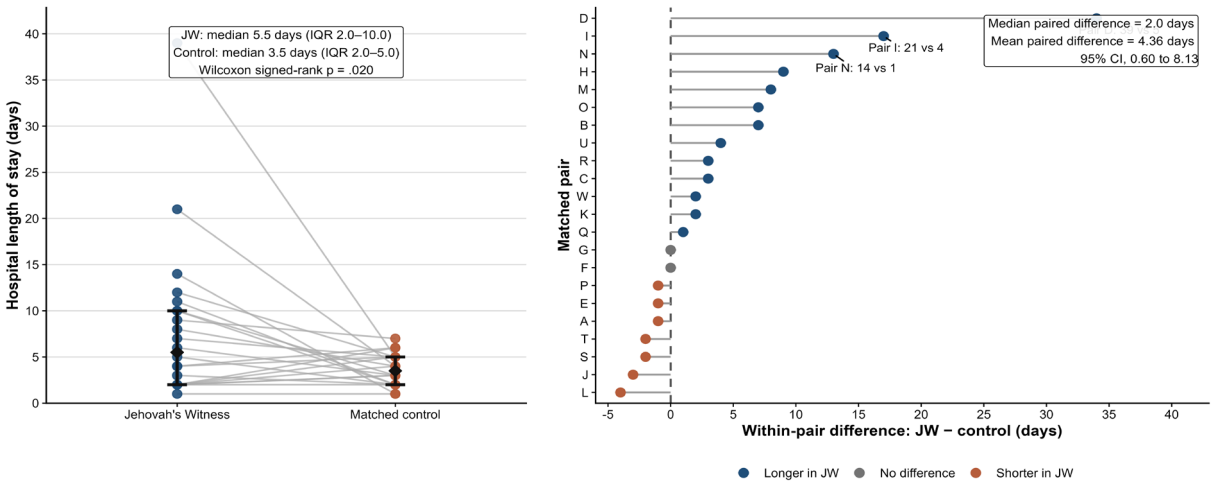


Figure 2. Hospital length of stay among matched pairs. (A) Individual values connected within matched pairs, with diamonds representing medians and error bars representing interquartile ranges (IQRs). (B) Within-pair difference calculated as the Jehovah's Witness (JW) value minus the corresponding transfusion-eligible comparator value.

Because each JW patient was individually matched with one comparator patient, between-group analyses accounted for the matched-pair structure. For continuous outcomes, the distribution of within-pair differences was evaluated. Paired *t*-tests were used when the within-pair differences were approximately normally distributed, whereas Wilcoxon signed-rank tests were used when the paired differences were non-normally distributed.

Initial hemoglobin and hemoglobin at endoscopy were compared using paired *t*-tests. Admission-to-procedure time and hospital length of stay were compared using Wilcoxon signed-rank tests because their within-pair differences were non-normally distributed. Sparse paired binary outcomes, including interventional radiology procedure use, were evaluated exploratorily using exact McNemar tests.

For principal continuous outcomes, paired effect estimates and 95% confidence intervals were reported. Mean paired differences with 95% confidence intervals were reported for hemoglobin outcomes. Median within-pair differences and corresponding interval estimates were reported for skewed outcomes when estimable.

Baseline characteristics were presented using raw values and standardized mean differences rather than relying primarily on significance tests to assess balance. ICU admission was summarized descriptively within the JW cohort and was not included in the matched-pair comparative analyses because comparator ICU-utilization data were unavailable. Given the sample size of 22 matched pairs, the principal analyses were descriptive and based on paired effect estimation. No extensively adjusted multivariate model was used because the available sample was insufficient to support stable adjustment for multiple predictors.

Exploratory associations within the JW cohort were evaluated using Spearman rank correlation when variables were non-normally distributed. These analyses were considered hypothesis-generating and were not interpreted as causal.

Complete data were available for all 44 patients for the demographic variables and principal outcomes included in the matched-pair analyses. The descriptive procedural and treatment variables reported in the Supplementary File were also complete. No statistical imputation was performed.

All statistical tests were two-sided, and $p < 0.05$ was considered statistically significant. Analyses were conducted using R, version 4.5.2.

3. Results

3.1. Study population

Between 2010 and 2026, a total of 27 JW patients were identified as having presented to a Southeastern tertiary academic medical center with acute GIB. Of these, 22 patients underwent endoscopic evaluation and were included in the primary analysis. JW patients were each successfully matched in a 1:1 ratio with one transfusion-eligible comparator patient, resulting in 22 matched pairs and 44 total participants.

Jehovah's Witness (JW) patients were older on average than matched comparators, with a mean age of 69.2 versus 62.5 years and an absolute standardized mean difference of 0.46, indicating residual imbalance. Baseline demographic and clinical characteristics are presented in Table 1, together with standardized mean differences to describe residual balance between the cohorts. Standardized mean differences demonstrated residual imbalance in age, race, initial hemoglobin, and anticoagulant or antiplatelet use, despite identical sex distributions. Baseline bleeding location, hemodynamic variables, and calendar-period distributions were not available in the final analytic dataset and therefore could not be added to Table 1.

Table 1. Baseline and matching characteristics

Characteristic	JW patients (*n*= 22)	Transfusion-eligible comparators (*n* = 22)	SMD
Age (years)	69.2 ± 14.2	62.5 ± 15.2	0.46
Sex: female, *n* (%)	10 (45.5%)	10 (45.5%)	0.00
Race: Black, *n* (%)	16 (72.7%)	12 (54.5%)	0.38
Race: Hispanic, *n* (%)	1 (4.5%)	0 (0.0%)	0.31
Race: White, *n* (%)	5 (22.7%)	10 (45.5%)	0.49
Initial hemoglobin (g/dL)	8.45 ± 3.02	9.06 ± 2.77	0.21
Anticoagulant or antiplatelet use, *n* (%)	4 (18.2%)	7 (31.8%)	0.32

Notes: Values are presented as mean ± SD or *n* (%). Standardized mean differences are reported as absolute values; larger values indicate greater residual imbalance. Patient-level GBS and Oakland Score values were unavailable in the final analytic dataset and could not be summarized. Abbreviations: JW: Jehovah's Witness; SD: Standard deviation; SMD: Standardized mean difference.

Presenting symptoms among patients in both cohorts included rectal bleeding, melena, hematochezia, and symptomatic anemia. These presenting features were consistent with the broad clinical spectrum of acute gastrointestinal bleeding. Patients in both groups underwent inpatient evaluation and management based on clinical severity, hemodynamic status, hemoglobin levels, medication exposure, and suspected bleeding source.

3.2. Hemoglobin at presentation and at time of endoscopy

Mean initial hemoglobin among JW patients was 8.45 ± 3.02 g/dL, with values ranging from 3.8 g/dL to 16 g/dL. In comparison, the mean initial hemoglobin among transfusion-eligible comparator patients was 9.06 ± 2.77 g/dL (Table 1). The mean paired difference was −0.61 g/dL, with a 95% confidence interval of −2.81 to 1.58 g/dL. This difference was not statistically significant in the paired analysis (p = 0.567). Eight JW patients presented with an initial hemoglobin below 7 g/dL (Figure S1).

Mean hemoglobin at the time of endoscopy was 8.35 ± 2.84 g/dL among JW patients and 9.24 ± 1.78 g/dL among comparators. The mean paired difference was −0.89 g/dL (95% CI, −2.54 to 0.75 g/dL), which was not statistically significant (p = 0.273).

These analyses did not detect statistically significant between-group differences in either initial hemoglobin or hemoglobin at endoscopy. However, the confidence intervals included potentially clinically meaningful differences in both directions and should not be interpreted as establishing equivalence.

3.3. Timing of endoscopic intervention

Among JW patients who underwent endoscopy, 12 of 22 (54.5%) underwent endoscopic evaluation within 24 hours of admission, and 15 of 22 (68.2%) underwent endoscopy within 48 hours. Median admission-to-procedure time was 1.0 day (IQR, 1.0–3.0 days) among JW patients and 2.0 days (IQR, 1.0–3.0 days) among matched comparators. The median within-pair difference was 0 days. Admission-to-procedure time did not differ significantly between groups in the Wilcoxon signed-rank analysis (p = 0.472).

These findings indicate that the study did not detect a statistically significant difference in procedural timing between the two groups. They do not establish that the timing was equivalent, or that transfusion refusal had no influence on individual clinical decisions.

Within the JW cohort, admission-to-procedure time was not significantly associated with hospital length of stay (Spearman ρ = 0.12; 95% CI, −0.31 to 0.54; p = 0.581). Hemoglobin at endoscopy demonstrated a moderate inverse association with length of stay (ρ = −0.49; 95% CI, −0.75 to −0.11; p = 0.021), indicating that lower hemoglobin values at the time of endoscopy were associated with longer hospitalizations. Initial hemoglobin also demonstrated a moderate inverse association with length of stay (ρ = −0.44; 95% CI, −0.72 to −0.06; p = 0.041). Given the small sample, wide confidence intervals, multiple exploratory comparisons, and absence of adjustment for confounding, these associations should be considered hypothesis-generating and should not be interpreted as causal.

3.4. Endoscopic findings and interventions

Endoscopic abnormalities were identified in 14 of 22 JW patients (63.6%), and active bleeding was documented in 4 of 22 (18.2%). Endoscopic findings included LA grade A esophagitis, anastomotic ulcers, gastric ulcers, duodenal ulcers, and duodenal angiectasias. These findings reflect the heterogeneous etiologies of acute GIB in the study population.

Therapeutic endoscopic interventions were performed as clinically indicated. Interventions included standard hemostatic and therapeutic modalities, such as polypectomy, band ligation, hemostatic clipping, and argon plasma coagulation. These modalities were used to achieve source control, reduce ongoing blood loss, and prevent recurrent bleeding. Because the study was retrospective and did not include a standardized treatment protocol, the results cannot determine whether a particular endoscopic intervention caused the observed hospital outcomes. Interventional radiology procedures were performed in 3 of 22 JW patients (13.6%) and 1 of 22 matched comparators (4.5%). Because the number of events was small, this finding was considered descriptive. In an exploratory exact McNemar analysis, the difference was not statistically significant (p = 0.625).

Five JW patients identified during the study period did not undergo endoscopic evaluation and were not included in the primary comparative analysis. Specific reasons for the absence of endoscopy were not available in the final analytic dataset.

3.5. Bloodless medical management

Bloodless medical therapies were documented in 12 of 22 JW patients (54.5%). Documented therapies included iron supplementation, erythropoietin, vitamin B12, folate, vitamin C, desmopressin, and recombinant factor VIIa. These interventions were used as alternatives or adjuncts to transfusion-based resuscitation, with the goal of supporting erythropoiesis, improving hemostasis, and minimizing further anemia.

The use of bloodless therapies highlights the importance of individualized management in JW patients. While RBC transfusion was declined, other interventions were available and used depending on clinical indication and patient acceptance. These therapies were administered as components of individualized management that also included monitoring, hemodynamic support, minimization of additional blood loss, and endoscopic evaluation when clinically indicated.

3.6. Intensive care utilization and hospital length of stay

ICU admission occurred in 16 of 22 JW patients (72.7%). Corresponding ICU-utilization data were unavailable for the matched comparator cohort; therefore, no paired between-group analysis was performed. The dataset also did not permit determination of the specific clinical reasons for ICU admission.

3.7. Hospital length of stay

Median hospital length of stay was 5.5 days (IQR, 2.0–10.0 days) among JW patients and 3.5 days (IQR, 2.0–5.0 days) among matched comparators. The median within-pair difference was 2.0 days. Hospital length of stay was significantly longer among JW patients in the Wilcoxon signed-rank analysis (p = 0.020). The mean within-pair difference was 4.36 days, with a 95% confidence interval of 0.60 to 8.13 days, although the mean estimate was influenced by several prolonged JW hospitalizations (Table S2).

The within-pair differences were notably large for several pairs, including hospital stays of 39 versus 5 days, 21 versus 4 days, and 14 versus 1 day. Therefore, the length-of-stay findings should be interpreted cautiously given the small sample, skewed distribution, and influence of several prolonged hospitalizations (Figure S2).

3.8. Comparative outcomes

In matched-pair analyses, no statistically significant differences were detected in initial hemoglobin, hemoglobin at endoscopy, or admission-to-procedure time. Hospital length of stay, however, was significantly longer among JW patients than among their matched comparators (Table 2).

The initial hypothesis that JW patients would have worse short-term outcomes was therefore only partially supported. JW patients did not have statistically significant differences in the measured hemoglobin outcomes or procedural timing, but they experienced longer hospitalizations in the paired analysis.

Given the small sample size, retrospective design, threshold-based severity matching, and potential residual imbalance between the groups, the findings should be interpreted as exploratory. They do not demonstrate equivalence, noninferiority, or causal effects of transfusion refusal, bloodless treatment, ICU monitoring, or endoscopic intervention.

Additionally, an extensively adjusted multivariate model was not performed because it would be vulnerable to overfitting and unstable estimates. Primary analyses therefore emphasized matched-pair comparisons, effect estimates, and 95% confidence intervals. Baseline balance was assessed using standardized mean differences.

Table 2. Paired clinical outcomes

Outcome	JW patients	Transfusion-eligible comparators	Paired effect	95% CI	Test	p-value
Initial hemoglobin	8.45 ± 3.02 g/dL	9.06 ± 2.77 g/dL	Mean difference −0.61 g/dL	−2.81 to 1.58	Paired t-test	0.567
Hemoglobin at endoscopy	8.35 ± 2.84 g/dL	9.24 ± 1.78 g/dL	Mean difference −0.89 g/dL	−2.54 to 0.75	Paired t-test	0.273
Admission-to-procedure time	1.0 (1.0–3.0) days	2.0 (1.0–3.0) days	Median paired difference 0 days	—	Wilcoxon signed rank	0.472
Length of hospital stay	5.5 (2.0–10.0) days	3.5 (2.0–5.0) days	Median paired difference +2 days	—	Wilcoxon signed rank	0.020
Length of hospital stay (mean difference)	—	—	Mean paired difference +4.36 days	0.60 to 8.13	Paired mean estimate	—

Note: Continuous paired differences were calculated as the JW value minus the corresponding transfusion-eligible comparator value.
Abbreviations: CI: Confidence interval; JW: Jehovah's Witness.

4. Discussion

Acute gastrointestinal bleeding (GIB) is a common cause of hospitalization and remains associated with substantial morbidity and mortality, particularly among older adults and patients with significant comorbidities.[31] Initial management includes hemodynamic assessment, intravenous access, crystalloid resuscitation when indicated, and consideration of RBC transfusion.[5] Current guidelines generally support a restrictive transfusion strategy, with a hemoglobin threshold near 7 g/dL for many hemodynamically stable patients, because unnecessary transfusion may increase the risk of volume overload, transfusion reactions, and other complications.[32]

The management of Jehovah's Witness (JW) patients with acute GIB presents additional challenges because RBC transfusion is generally declined, including in cases of severe anemia or ongoing hemorrhage.[33] Acceptance of other blood-derived products or blood-conservation techniques varies among individual patients, emphasizing the importance of early, individualized discussions regarding acceptable therapies.[34] When transfusion is unavailable, clinicians must rely on close hemodynamic monitoring, minimization of additional blood loss, correction of coagulopathy when acceptable, support of erythropoiesis, and timely control of the bleeding source.[35]

In this single-center retrospective matched cohort study, 22 JW patients hospitalized with acute GIB were individually matched with 22 transfusion-eligible comparator patients. No statistically significant differences were detected in initial hemoglobin, hemoglobin at endoscopy, or admission-to-procedure time. Hospital length of stay, however, was significantly longer among JW patients. These findings partially supported the original hypothesis. JW patients had longer observed hospital stays, whereas the study did not detect statistically significant between-group differences in admission-to-procedure time or the measured hemoglobin outcomes.

The absence of a statistically significant difference in admission-to-procedure time is clinically relevant because severe anemia and the inability to provide rescue transfusion may influence decisions regarding sedation or endoscopy. In this selected cohort, admission-to-procedure time was not statistically different between JW patients and transfusion-eligible comparators. This result does not establish equivalent procedural timing, demonstrate that transfusion refusal had no influence on clinical decision-making, or establish that endoscopy is uniformly safe at very low hemoglobin levels. Endoscopic and anesthetic decisions should remain individualized according to hemodynamic stability, ongoing blood loss, cardiopulmonary reserve, and anticipated procedural benefit.[35,36]

Jehovah's Witness (JW) patients had numerically lower mean hemoglobin levels at presentation and at endoscopy, although neither paired comparison reached statistical significance. The confidence intervals were relatively wide and included potentially meaningful differences, reflecting the limited precision of the small sample. Therefore, these findings should not be interpreted as evidence that the groups had equivalent hemoglobin levels or that access to transfusion had no clinical effect. Comparator patients were eligible to receive RBC transfusion, whereas JW patients declined RBC transfusion, and differences in treatment exposure may have influenced hemoglobin trajectories.

In this exploratory analysis, lower initial hemoglobin and lower hemoglobin at endoscopy were associated with longer hospitalization, whereas admission-to-procedure time was not significantly associated with length of hospital stay. Because the analysis included only 22 patients, was unadjusted, and involved multiple exploratory comparisons, the relative importance of anemia severity and procedural timing cannot be determined.

Length of hospital stay was significantly longer among JW patients, with a median of 5.5 days compared with 3.5 days among matched comparators. JW status and transfusion refusal were associated with longer observed hospitalization, but the study cannot determine whether this difference resulted from transfusion refusal, residual differences in bleeding severity, monitoring practices, discharge decision-making, or other unmeasured factors. Potential explanations include intensive monitoring, administration of therapies with delayed hematologic effects, repeated laboratory assessment, concern for recurrent bleeding, and greater caution in discharge planning; however, these factors were not formally evaluated. Prior literature has similarly emphasized that patients who decline transfusion may require increased monitoring and multidisciplinary management even when definitive hemostasis is achieved.

ICU admission occurred in 16 of 22 JW patients (72.7%) during the index hospitalization. Because comparator ICU-utilization data were unavailable, this finding is descriptive and cannot be interpreted as evidence of greater ICU use among JW patients. The dataset did not permit determination of the specific reasons for ICU admission, and ICU placement should not be attributed solely to transfusion refusal.

Bloodless therapies were received by 12 of 22 (54.5%) JW patients, including iron supplementation, erythropoietin, vitamin B12, folate, vitamin C, desmopressin, and coagulation factor products. Bloodless management strategies are intended to minimize ongoing blood loss,

support erythropoiesis, optimize hemostasis, and facilitate definitive source control.[37] However, these findings are descriptive and do not establish that transfusion refusal caused greater ICU utilization or that any individual bloodless therapy improved hemoglobin recovery or reduced length of hospital stay. Treatment and monitoring decisions were individualized according to clinician judgment, patient preference, and clinical circumstances.

The principles used in bloodless medicine may also have relevance beyond the JW population. Restrictive transfusion strategies, reduction of unnecessary phlebotomy, correction of reversible contributors to anemia, and timely control of bleeding are increasingly incorporated into patient blood-management programs.[38] Nevertheless, the present findings should not be interpreted as demonstrating that transfusion is unnecessary in acute GIB. RBC transfusion remains an important therapy for selected patients with severe anemia, hemodynamic instability, active hemorrhage, or inadequate physiologic compensation.[39]

Taken together, these findings show that JW status was associated with longer length of hospital stay, whereas no statistically significant differences were detected in the measured hemoglobin outcomes or admission-to-procedure time. Because matching was based on threshold-defined high-risk status rather than exact severity scores, patient-level GBS and Oakland Score values were unavailable, and residual baseline imbalance remained, the observed differences cannot be attributed solely to transfusion refusal. These results should therefore be considered exploratory and hypothesis-generating.

A strength of this study is its direct comparison of JW patients with individually matched transfusion-eligible patients. Much of the existing literature concerning acute GIB among patients who decline transfusion consists of case reports, case series, and single-cohort descriptions.[40] In the current study, comparator patients were matched according to admission within 7 calendar days after the corresponding JW admission, management by the same attending gastroenterologist, and threshold-based high-risk classification using the GBS or Oakland Score. The study also evaluated clinically relevant measures, including hemoglobin, timing of endoscopy, ICU use, bloodless therapies, and length of hospital stay.

Several limitations should be considered. First, the retrospective design introduces the possibility of incomplete documentation, misclassification, selection bias, and unmeasured confounding. Five identified JW patients who did not undergo endoscopy were excluded from the primary analysis, meaning the results apply only to selected patients who received endoscopic evaluation. In addition, patients with documented cardiac, pulmonary, renal, or hepatic comorbidities were excluded from both cohorts. Although these exclusions were intended to reduce confounding, they contributed to the small sample and limit generalizability to the broader GIB population.

Furthermore, matching was based on whether patients exceeded high-risk GBS or Oakland Score thresholds rather than on identical or closely similar numerical scores. The original matching team confirmed that the scores were calculated from pretreatment admission clinical and laboratory values. However, patient-level numerical scores were unavailable, so the complete score distributions could not be reported, numerical severity balance within matched pairs could not be assessed, and individual score calculations could not be independently verified. Final upper- versus lower-GIB location was also not necessarily concordant within matched pairs. Residual differences in bleeding severity and source may therefore remain. Baseline standardized mean differences also indicated residual imbalance in age, race, initial hemoglobin, and anticoagulant or antiplatelet use.

The study included only 22 matched pairs. This limited statistical power and produced imprecise confidence intervals. An extensively adjusted multivariate model was therefore not performed because it would have been vulnerable to overfitting and unstable estimates. Also, the study was conducted at one tertiary academic center, which may limit generalizability to hospitals with different endoscopic, critical-care, or bloodless-medicine resources. The study period also spanned multiple years during which transfusion practices, GIB guidelines, endoscopic techniques, and blood-conservation strategies evolved.

Finally, the study was not adequately powered to assess uncommon but clinically important outcomes such as mortality, recurrent bleeding, 30-day readmission, emergency surgery, or procedure-related complications. Mortality in acute GIB may be substantially higher among patients with advanced age, severe bleeding, hemodynamic instability, or major comorbidities. Larger multicenter studies should include these outcomes, complete pretreatment severity-score distributions, and longer-term measures such as hemoglobin recovery, readmission, and quality of life.

5. Conclusion

In this small, single-center retrospective matched cohort study, JW patients with acute GIB who underwent endoscopic evaluation did not have statistically significant differences in initial hemoglobin, hemoglobin at endoscopy, or admission-to-procedure time compared with individually matched transfusion-eligible patients.

Length of hospital stay, however, was significantly longer among JW patients.

ICU monitoring and individualized bloodless therapies were frequently documented within the JW cohort. These descriptive findings highlight the complexity of caring for selected patients with acute GIB who decline RBC transfusion but do not establish that transfusion refusal caused greater resource utilization. These findings are exploratory and do not establish equivalence, noninferiority, procedural safety at specific hemoglobin thresholds, or a causal benefit from endoscopy or bloodless therapy.

Larger multicenter studies with prospectively defined comparator selection, complete severity-score reporting, and longer-term clinical outcomes are needed to better characterize the effects of transfusion refusal and identify optimal management strategies for patients with acute GIB who decline blood products.

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Conflict of interest

The authors declare that they have no competing interests.

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Ethics approval and consent to participate

This study was approved by the Augusta University Institutional Review Board (IRB Net ID 2089342-3). The Institutional Review Board waived the requirement for informed consent because the study involved retrospective review of existing clinical records.

Consent for publication

Not applicable.

Availability of data

The de-identified data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to institutional and Institutional Review Board requirements.

Further disclosure

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