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Functional and Adverse-Event Outcomes Two to Three Years After Child and Adolescent Psychiatric Inpatient Care in Japan: Associations with Adverse Childhood Experiences

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Abstract

Adverse childhood experiences (ACEs) are prevalent among psychiatrically hospitalized youth, but their long-term associations are poorly characterized outside Western settings. This retrospective cohort study extended a one-year outcome study from a Japanese child and adolescent psychiatric inpatient unit to two-to-three years post-discharge (N = 106; medical-protection admissions, 2021–2024), with ACE exposure assessed at discharge by multidisciplinary consensus. Higher ACE burden was independently associated with longer length of stay and greater odds of seclusion and physical restraint, reproducing the index study. The longitudinal CGAS effect was nonsignificant, and the ACE–CGAS correlation attenuated from admission to 24 months. A composite adverse outcome increased with ACE burden (14.8% at ACE = 0 versus 51.1% at ACE ≥ 4; adjusted OR = 1.37, 95% CI 1.15–1.64), but 24-month retention also differed by ACE group (89% versus 60%), so this functional attenuation must be interpreted alongside differential attrition.

Keywords: Adverse childhood experiences; Long-term outcomes; Differential attrition; Composite adverse outcome; Child and adolescent psychiatry

Introduction

Adverse childhood experiences (ACEs), originally operationalized in the Kaiser–CDC framework as ten categories of household dysfunction, abuse, and neglect occurring before age eighteen (Felitti et al., 1998), are highly prevalent among children and adolescents who reach the threshold for psychiatric inpatient care (Isohookana et al., 2013; Benarous et al., 2017). In general-population samples, cumulative ACE burden is consistently associated with increased risk of mental ill-health, problematic substance use, and interpersonal and self-directed violence

in adulthood (Hughes et al., 2017). However, the literature on how ACE burden shapes the long-term post-discharge trajectory of inpatient-treated children and adolescents remains thin, and almost all of it has been generated outside East Asia. Japanese data are particularly sparse: an early prospective evaluation of child and adolescent psychiatric inpatient outcomes in Japan demonstrated significant improvement in CGAS from admission to discharge but neither examined adverse childhood experiences nor followed patients beyond discharge (Setoya et al., 2011). More broadly, child and adolescent psychiatry in Japan has faced structural challenges in service capacity and research infrastructure that contribute to this evidence gap (Tateno et al., 2017).

An index study from this group (Iwadare et al., 2026) examined associations between cumulative ACE exposure and inpatient and twelve-month post-discharge outcomes in a Japanese child and adolescent psychiatric ward (N = 76). Higher ACE burden was independently associated with longer length of stay, higher odds of seclusion, and higher odds of physical restraint during admission, but was not significantly associated with longitudinal Children's Global Assessment Scale (CGAS) trajectories or with twelve-month post-discharge outcomes (treatment discontinuation, re-hospitalization). The authors framed this null short-term finding cautiously, concluding that early post-discharge stability provides no assurance of durable recovery over a longer horizon and explicitly identifying extension to longer follow-up as a priority (Iwadare et al., 2026). The present study addresses that gap by extending follow-up of the same clinical cohort to two-to-three years post-discharge and by introducing outcome measures that capture severe events not visible in CGAS.

Inpatient psychiatric care is among the most widely used acute interventions in adolescent mental health, and systematic-review evidence indicates that admission is associated with

clinically meaningful short-term improvement across multiple domains (Hayes et al., 2018). Whether such treatment can attenuate the long-term influence of ACEs on functioning is empirically open. One body of evidence suggests that intensive treatment can produce treatment response in high-ACE patients comparable to, or even exceeding, that of low-ACE patients: in a randomized trial of psychotherapy for adolescent nonsuicidal self-injury, patients with a history of ACEs showed a significantly greater reduction in self-injury frequency than those without (Edinger et al., 2020). Independently of ACE exposure, the level of functioning achieved by the end of treatment carries its own long-term prognostic weight, and that weight is selective: an end-of-treatment CGAS score of 60 or below has been shown to predict subsequent criminal conviction, bipolar disorder, and borderline personality disorder, but not depression, suicide attempt, or substance misuse (Lundh et al., 2016). At the population level, childhood adversity recorded in hospital records before age eighteen shows a dose-response association with later death by young person suicide, with adjusted odds ratios increasing markedly across cumulative mental-health admission counts (Dougall et al., 2024). Re-hospitalization is itself a common longer-term endpoint in child and adolescent inpatient cohorts (Edgcomb et al., 2020): a population-based study reported a 27.8% ten-year readmission rate, with more than half of readmissions occurring within ninety days of discharge (Miller et al., 2020); higher cumulative ACE burden has in turn been associated with recurrent psychiatric admission among young people (Fellinger et al., 2022). Even where group-level functioning improves, recovery is frequently incomplete: a three-year follow-up of child psychiatric inpatients found significant overall functional gains yet roughly half of patients still scoring within the clinical range, with disruptive behavior disorder and initial illness severity predicting poorer outcome (Sourander & Piha, 1998). Long-term follow-up reinforces this concern: in a small sixteen-year follow-up of a

child inpatient cohort, a substantial proportion of traceable patients had experienced severe adverse outcomes—death, imprisonment, adult psychiatric disorder, or unemployment—by adulthood, leading the authors to call for greater post-discharge support (Healy & Fitzgerald, 2000). These literatures converge on the inference that single-indicator outcome measures, such as a continuous functioning score, may underestimate the long-term ACE-related risk that manifests as discrete, severe, and care-disrupting events.

Building on these observations, the present study addresses two questions in the same inpatient cohort. First, does the association between cumulative ACE burden and global functioning attenuate over the course of two-to-three years of post-discharge follow-up? Second, does ACE burden predict a composite of severe and follow-up-disrupting outcomes (suicide, in-hospital victimization, involuntary commitment, transfer to adult psychiatric care, modified electroconvulsive therapy, overdose, re-hospitalization, and discontinuation/loss to follow-up)? Because differential attrition is anticipated in this clinical population, we also conducted sensitivity analyses to characterize how strongly the inferences depend on the trajectories of patients lost to follow-up.

Methods

Study design and setting

This was a single-center retrospective cohort study extending a previously published one-year outcome study (Iwadare et al., 2026) from the child and adolescent psychiatric inpatient ward at Komagino Hospital, Tokyo, Japan. The present analysis used the medical record review database curated for the original study, updated as of May 6, 2026, to include longer post-discharge follow-up. The study was conducted under the same Komagino Hospital Ethics Committee

approval (approval number 2021-0102) as the index study, which authorized retrospective review of clinical records for patients discharged on or after April 1, 2021. Individual written informed consent was not obtained. The waiver of individual informed consent was granted on the grounds that the study (i) used only existing clinical record information, (ii) involved no invasive procedures, no interventions, and no additional burden on patients or guardians, and (iii) met the applicable provisions of the Japanese national ethical guidelines for medical research. Public notices describing the study, the categories of data to be reviewed, and contact information for inquiries or refusal of participation were posted on July 27, 2021, in the child and adolescent psychiatry inpatient ward, the child and adolescent psychiatry outpatient clinic, the general psychiatry outpatient clinic, and on the hospital website. Patients and their legal guardians retained the right to decline participation at any time. No patients or guardians declined participation through the opt-out procedure. The analysis plan was documented post-hoc and is provided as Supplementary Material.

Cohort definition

From all 170 inpatient discharge records reviewed, we sequentially applied the following inclusion criteria: (1) discharge on or after April 1, 2021 (within the ethics approval period), (2) admission under the medical-protection legal framework (the same admission type as the original study), and (3) at least 730 days (2 years) of post-discharge time elapsed by the data cutoff of May 6, 2026 (i.e., discharge on or before April 1, 2024). These criteria yielded a primary analytic cohort of 106 cases. The cohort flow is shown in Figure 1.

Two cases were missing data on sex; these cases were retained for descriptive and unadjusted analyses (N = 106) but excluded from analyses that adjusted for sex as a covariate (N = 104). The two-tier denominator is reported throughout the paper, and the relevant N is identified for

each analytic model.

Differences in cohort definition between the present continuation study and the index one-year outcome study (which used N = 76) are summarized as follows: the index study admitted both first and subsequent admission episodes as independent observations and applied a one-year minimum follow-up; the present study uses each patient's first qualifying admission, requires a two-year minimum follow-up, and includes patients discharged through April 2024. Direct numerical comparison of effect sizes between the two studies should therefore be interpreted with caution.

Measures

Adverse childhood experiences (ACEs). ACE scores were ascertained at discharge by multidisciplinary team consensus, using the same 10-item ACE framework as the index study (parental separation/divorce, household substance abuse, household mental illness, household incarceration, household domestic violence, emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect). For analyses, ACEs were used both as a continuous score (range 0–10) and as a three-level categorical variable (0, 1–3, ≥ 4), chosen to align with the index study and the threshold convention common in the ACE literature.

Children's Global Assessment Scale (CGAS). CGAS (Shaffer et al., 1983) scores were recorded at six time points: hospital admission, hospital discharge, and 6, 12, 24, and 36 months post-discharge. Scores recorded as 0 or as '?' in the source database were treated as missing in line with the data dictionary established for the index study. CGAS scores at 24 months were the primary follow-up time point for the present continuation study; 36-month data were used as a secondary descriptive endpoint where available.

Inpatient clinical outcomes. Length of stay (days, log-transformed for analysis), any seclusion during admission, and any physical restraint during admission were extracted from the inpatient record. These reproduce the primary outcomes of the index study and are presented here for the larger cohort.

Composite adverse outcome. A composite adverse outcome was defined as the occurrence of at least one of the following events during the post-discharge follow-up period: (i) a serious clinical event, (ii) any psychiatric re-hospitalization, or (iii) discontinuation or loss to follow-up. Serious events were defined as suicide, in-hospital sexual victimization, involuntary commitment, transfer to an adult psychiatric ward, modified electroconvulsive therapy, or overdose. Discontinuation/lost to follow-up was defined by the post-discharge clinical note documenting self-discontinuation, loss of contact, or transfer to another facility, with two specified exclusions: (a) conversion to voluntary admission, which we treated as a continuation of treatment rather than as discontinuation, and (b) clinically planned termination of follow-up in the context of good outcome (e.g., follow-up ended due to good progress, school referral, or residential placement). One additional case was excluded from the discontinuation flag because the keyword “transfer” in its note referred to a pre-admission history rather than a post-discharge event. Composite outcome adjudication was finalized in consultation with the treating clinician, and the adjudication rules are provided in Supplementary Table S1.

Covariates. All adjusted analyses controlled for sex, neurodevelopmental disorder status, and age at admission. Neurodevelopmental disorder was defined as any ICD-10 F84 code (pervasive developmental disorders, including childhood autism F84.0, Asperger syndrome F84.5, and pervasive developmental disorder unspecified F84.9) or any F90 code (hyperkinetic disorders, ADHD), recorded as a primary or secondary diagnosis at admission or discharge. This

adjustment set follows the index study. We use the ICD-10 diagnostic labels as recorded in the source clinical records; the F84.5 category is subsumed under autism spectrum disorder without intellectual disability in DSM-5 and ICD-11. The institutional medical record uses a three-digit numeric coding system that maps deterministically to ICD-10; the corresponding mapping is provided as Supplementary Table S2.

Statistical analyses

Two outcomes were designated as primary: (1) the longitudinal trajectory of CGAS scores from admission through 36 months, modeled with a linear mixed-effects model (LMM) with a random intercept by participant, fixed effects for ACE score, time point (categorical), sex, neurodevelopmental disorder, and age at admission, fitted by restricted maximum likelihood; and (2) the composite adverse outcome, modeled with logistic regression with the same adjustment set. Both primary models used the N = 104 cohort that included sex as a covariate.

Secondary analyses included: (a) reproduction of the index study's inpatient clinical outcomes (length of stay, seclusion, physical restraint) in the present cohort, using linear regression for log-transformed length of stay and logistic regression for any-occurrence binary outcomes; (b) time-point–specific Pearson correlations and adjusted linear regressions between ACE score and CGAS, used as the primary evidence for the catch-up hypothesis; and (c) a one-year-to-two-year CGAS change analysis among participants with both time points, used to characterize the rebound observed in the index cohort.

Sensitivity analyses for the catch-up finding included: (i) last-observation-carried-forward (LOCF) imputation of missing 24-month CGAS scores; (ii) a pessimistic imputation in which dropouts at 24 months were assigned a CGAS score 15 points lower than their discharge CGAS;

and (iii) a tipping-point analysis in which the assumed offset for dropouts was varied from 0 to −30 points to identify the threshold at which the conclusion changed. Differential attrition was tested by chi-square comparison of follow-up retention across ACE groups.

All analyses were two-sided with $\alpha = 0.05$. The two primary outcomes were not adjusted for multiplicity beyond their designation as primary; secondary and exploratory analyses are reported as such, and the study's inferential reach should be interpreted accordingly. Analyses were performed in Python 3.12 (pandas, statsmodels, scipy) and independently replicated in R 4.3 (lme4, lmerTest, base glm/lm); all primary and secondary results agreed to within rounding precision (full replication report provided as Supplementary Material).

Use of large language models

The authors used a large language model (Anthropic's Claude) to assist with drafting and language editing of the manuscript and with statistical-analysis scripting. The large language model is not an author. All content was reviewed and verified by the authors, who take full responsibility for the integrity and accuracy of the work.

Results

Cohort and baseline characteristics

Of 170 discharge records reviewed, 106 cases met the criteria for the primary analytic cohort (Figure 1). Mean age at admission was 12.9 ± 1.6 years; 56 cases (52.8%) were male; mean ACE score was 3.2 ± 2.8 (range 0–10). Distribution by ACE group was: ACE = 0 (n = 27, 25.5%), ACE = 1–3 (n = 34, 32.1%), and ACE ≥ 4 (n = 45, 42.5%). Neurodevelopmental disorders were present in 68 cases (64.2%). Among diagnostic categories, mood disorders (ICD-10 F30–F39) were recorded in 53 cases (50.0%), pervasive developmental disorders (F84) in 47 cases

(44.3%), childhood/adolescent-onset behavioural and emotional disorders (F90–F98) in 39 cases (36.8%), and neurotic, stress-related, and somatoform disorders (F40–F48) in 33 cases (31.1%); cases frequently met criteria for more than one chapter. Within the F84 series, the F84.5 subcode accounted for 42 of 47 F84 cases (89.4%), with childhood autism (F84.0) in 5 cases and pervasive developmental disorder unspecified (F84.9) in 1 case. Median length of stay was 286 days (interquartile range 188–383). Baseline characteristics are summarized in Table 1. ACE group differed by length of stay (Kruskal–Wallis $p = 0.008$), CGAS at discharge (analysis of variance $p = 0.014$), seclusion ($p = 0.035$), and physical restraint ($p = 0.007$); the ACE ≥ 4 group had longer admissions, lower discharge CGAS, and higher rates of restrictive interventions, consistent with the index study.

Inpatient clinical outcomes (replication of the index study)

Adjusted associations between ACE score and inpatient clinical outcomes are presented in Table 2. ACE score was associated with longer length of stay (β per 1-point increase = +0.067 on the log scale, 95% CI +0.020 to +0.114, $p = 0.005$), higher odds of any seclusion (OR = 1.27, 95% CI 1.08–1.49, $p = 0.003$), and higher odds of physical restraint (OR = 1.33, 95% CI 1.06–1.68, $p = 0.015$). These results reproduce the index one-year outcome study in direction and significance.

CGAS trajectory and the catch-up pattern

Mean CGAS scores by ACE group at each time point are shown in Figure 3. CGAS rose sharply from admission (mean 23.5 ± 8.5) to discharge (mean 58.7 ± 7.5), declined at 6 and 12 months, partially rebounded at 24 months, and converged at 36 months. In the linear mixed-effects model adjusted for sex, neurodevelopmental disorder, and age, the ACE main effect on CGAS across

all time points was not statistically significant (β = −0.359, 95% CI −0.922 to +0.204, p = 0.21). However, the time-point–specific correlation between ACE score and CGAS attenuated markedly across follow-up (Figure 4). At admission, the correlation was negative and statistically significant (r = −0.199, p = 0.042, n = 105); at discharge, r = −0.183 (p = 0.061); at 6 months, r = −0.022 (p = 0.83); at 12 months, r = −0.021 (p = 0.84); at 24 months, r = +0.049 (p = 0.68); and at 36 months, r = +0.003 (p = 0.99). The pattern is consistent with a catch-up interpretation, in which any baseline ACE-related differences in functioning narrow or disappear over the course of post-discharge follow-up.

An exploratory one-year-to-two-year CGAS change analysis (n = 72 with both time points) showed group differences (analysis of variance F = 3.73, p = 0.029): the ACE = 0 group gained on average +4.5 points, the ACE = 1–3 group changed by −1.0 point, and the ACE ≥ 4 group gained +5.5 points. We interpret this pattern as suggesting heterogeneous recovery trajectories within the middle-ACE band, but caution against over-interpreting it as a primary finding.

Composite adverse outcome and the bifurcation pattern

The composite adverse outcome and its components are presented in Table 3. The composite event rate increased monotonically with ACE exposure: 4 of 27 (14.8%) in the ACE = 0 group, 10 of 34 (29.4%) in the ACE = 1–3 group, and 23 of 45 (51.1%) in the ACE ≥ 4 group (three-group chi-square $\chi^2 = 10.45$, p = 0.005). In adjusted logistic regression, each one-point increase in ACE score was associated with an OR of 1.37 for the composite outcome (95% CI 1.15–1.64, p < 0.001). Five serious events were observed: one case of post-discharge suicide following involuntary commitment (ACE = 7), one case of in-hospital sexual victimization with subsequent adult-ward transfer and inter-hospital transfer (ACE = 10), one case of post-discharge admission to an adult psychiatric ward (ACE = 4), one case of overdose-induced delirium leading to re-

hospitalization (ACE = 3), and one case of in-hospital modified electroconvulsive therapy (ACE = 1). The two life-threatening or near-life-threatening events (suicide; sexual victimization) both occurred in cases with ACE ≥ 7.

Differential attrition and sensitivity analyses

Follow-up retention at 24 months differed by ACE group: 89% in ACE = 0, 68% in ACE = 1–3, and 60% in ACE ≥ 4 (chi-square p = 0.033). Cases lost to 24-month follow-up (n = 32) had lower mean admission CGAS (20.1 vs 24.9, t-test p = 0.002) and higher mean ACE scores (4.25 vs 2.78, p = 0.016) than cases retained in follow-up (n = 74). Differential attrition was therefore non-random and operated against detection of any residual ACE–CGAS association at later time points.

Three sensitivity analyses were applied to the 24-month time point. Last-observation-carried-forward imputation yielded an ACE–CGAS correlation of r = −0.03 (p = 0.75, N = 106), consistent with the catch-up finding. Pessimistic imputation that assigned dropouts a CGAS score 15 points below their discharge CGAS yielded r = −0.15 (p = 0.12, N = 106) — the catch-up pattern weakened but did not reverse. Tipping-point analysis (varying the dropout offset from 0 to −30 points) showed that the correlation became statistically significant only when the assumed offset reached approximately −25 points or more (offset −25: r = −0.20, p = 0.04; offset −30: r = −0.21, p = 0.03). The catch-up interpretation is therefore conditional on the assumption that dropouts did not experience large CGAS declines relative to their discharge level.

Within-group functional outcomes among the high-ACE group

Within the ACE ≥ 4 group, the 24-month CGAS distribution among participants who were retained in follow-up did not differ substantially from that of lower-ACE groups (Figure 3).

However, follow-up retention itself was lowest in the ACE ≥ 4 group (60% at 24 months versus 89% in the ACE = 0 group), and the composite adverse outcome — which by definition includes loss to follow-up — was concentrated in this same group. Because loss to follow-up precludes 24-month CGAS measurement, the apparent within-group similarity in functional scores among retained participants and the dose-dependent composite outcome are not independent observations: they describe complementary partitions of the same cohort. We discuss the implications of this structure in the Discussion.

Discussion

The present study reports three findings in the same Japanese child and adolescent psychiatric inpatient cohort followed for two-to-three years post-discharge. First, the index study's associations between ACE burden and inpatient clinical complexity (longer length of stay, higher odds of seclusion and physical restraint) reproduce in the larger cohort with the same direction and statistical significance. Second, the time-point–specific association between ACE burden and CGAS, weakly negative at admission, attenuates over follow-up among participants retained in the cohort and is essentially zero by 24 months. Third, a composite adverse outcome combining serious events, re-hospitalization, and loss to follow-up was associated with ACE burden in a graded fashion, although the elevated event rate in the high-ACE group was driven primarily by re-hospitalization and loss to follow-up rather than by serious events alone. We interpret these three findings cautiously, with particular attention to the role of differential attrition.

The reproduction of the index study's inpatient findings is the most secure observation in the present analysis. The expanded cohort yielded effect estimates that were directionally consistent with the index study and statistically significant at conventional thresholds, providing additional evidence that cumulative ACE burden contributes to inpatient clinical complexity in this

population, independent of sex, neurodevelopmental disorder status, and age at admission. The elevated rates of seclusion and physical restraint observed in the higher-ACE group are consistent with broader evidence that restraint and seclusion remain relatively common interventions in acute adolescent psychiatric units (Furre et al., 2016; Czernin et al., 2024). The diagnostic profile of our cohort — pervasive developmental disorders (ICD-10 F84) in 44.3%, predominantly the F84.5 subcode (89% of F84 cases), alongside high rates of mood and stress-related disorders — situates these findings in a population of cognitively unimpaired youth in whom trauma and neurodevelopmental presentation frequently co-occur. Generalization to settings with different diagnostic profiles should be made with caution.

The attenuation of the time-point–specific ACE–CGAS correlation across follow-up is consistent with two non-exclusive interpretations: an intervention-related interpretation, in which inpatient and post-discharge care progressively narrows ACE-related differences in functioning among those who remain in care; and an attrition-related interpretation, in which patients with the most adverse trajectories are progressively lost from follow-up, leaving a selected subset whose functioning is not strongly distinguished by ACE burden. The data presented here cannot adjudicate between these interpretations. The differential-attrition pattern (89% retention at 24 months in the ACE = 0 group versus 60% in the ACE ≥ 4 group, $p = 0.033$), the more impaired admission CGAS of dropouts (mean 20.1 versus 24.9 in retained cases), and the higher mean ACE score of dropouts (4.25 versus 2.78) are all compatible with the attrition-related interpretation. Tipping-point analysis quantifies the strength of this concern: the time-point ACE–CGAS correlation at 24 months reverses to a statistically significant negative association only when assumed dropout CGAS is approximately 25 points below discharge CGAS or worse. Whether this threshold is plausible for the dropouts in this cohort cannot be answered from the

data we observed; we therefore consider the functional attenuation to be a finding conditional on assumptions about the unobserved that we cannot verify, and we recommend interpreting it together with the composite-outcome and retention findings rather than in isolation.

The graded association between ACE burden and the composite adverse outcome (adjusted OR = 1.37 per 1-point ACE increase) captures a dimension of the cohort's experience that the CGAS trajectory does not. However, the components of the composite are heterogeneous in clinical severity, and the elevated event rate in the high-ACE group was driven primarily by re-hospitalization and loss to follow-up rather than by serious events. Five serious events were observed in the entire cohort: one suicide, one in-hospital sexual victimization, one transfer to an adult psychiatric ward, one overdose-induced delirium, and one in-hospital modified electroconvulsive therapy course. Both the suicide and the sexual victimization occurred in cases with ACE ≥ 7, but the small number of serious events does not support inferential claims about the ACE–serious-event association. Our composite-outcome finding is therefore best read as evidence that ACE burden is associated with a higher rate of clinically meaningful events and care-disrupting events combined, with the directional concordance to population-level evidence on childhood adversity and later self-harm presentations and suicide death (Dougall et al., 2024) provided as supportive but not as primary evidence.

Our results bear a partial relationship to existing longitudinal evidence on end-of-treatment global functioning in adolescent psychiatric care. In a predominantly outpatient Swedish cohort, Lundh et al. (2016) reported that an end-of-treatment CGAS score of 60 or below predicted later criminal conviction, bipolar disorder, and borderline personality disorder, but not depression, suicide attempt, or substance misuse, over multi-year follow-up. The composite outcomes of the present study are different in composition, the follow-up duration is shorter, and the population

(Japanese inpatient sample) and the analytic approach differ; we therefore frame the relationship between the two studies as one of complementary observation rather than direct replication or contradiction. The broader picture from the literature — that long-term outcomes of adolescent psychiatric inpatient care are heterogeneous and only partially captured by any single continuous functioning indicator — is consistent with our finding that the cohort's experience is not uniformly described by CGAS trajectory alone.

One way to summarize the joint pattern of (a) functional attenuation among retained participants and (b) ACE-graded composite-outcome rates would be to characterize the cohort's experience as a partial functional convergence among those retained in care alongside ACE-graded risk for care-disrupting events. This framing aligns with the index study's caution that early clinical stability is an unreliable indicator of a patient's eventual long-term course (Iwadare et al., 2026), and it places attrition prevention among the practical concerns of post-discharge support. Two practical implications follow. First, because loss to follow-up was concentrated in the higher-ACE group and itself constituted much of the composite adverse outcome, structured post-discharge continuity of care—rather than functional status at discharge alone—may be where ACE-related risk is most actionable; prospective inpatient studies have linked treatment to measurable health gain while underscoring the cost and organization of after-care as central to durable benefit (Green et al., 2007). Second, the elevated rates of seclusion and restraint in the higher-ACE group point to trauma-informed care as a relevant inpatient framework, since contemporary models of child and adolescent inpatient practice increasingly embed trauma-informed principles into routine care (Calhoun et al., 2022), and structured strategies for reducing seclusion and restraint are an established component of such models (Perers et al., 2022). However, given the dependence of the functional-attenuation finding on assumptions

about unobserved trajectories, we offer this framing as a discussion point rather than as a confirmed feature of the cohort, and we do not generalize it beyond the present sample. Larger, multi-center, prospective studies with active follow-up and pre-specified attrition handling would be needed to evaluate whether this pattern is a stable feature of the population.

Limitations

The findings should be interpreted in light of the following limitations. First, and most consequentially, the analysis is subject to differential attrition: 24-month follow-up retention was 89% in the ACE = 0 group versus 60% in the ACE ≥ 4 group ($p = 0.033$), and dropouts had lower admission CGAS and higher ACE scores than retained cases. The functional-attenuation finding therefore depends on assumptions about the trajectories of patients lost to follow-up; tipping-point analysis quantifies but does not resolve this dependence. Second, the components of the composite adverse outcome are heterogeneous in clinical severity and are not weighted in the primary analysis; the elevated event rate in the high-ACE group was driven primarily by re-hospitalization and loss to follow-up. We did not undertake a component-by-component inferential analysis because the per-component event counts were too small to support reliable individual estimates, and we caution against interpreting the composite OR as evidence about any single component. Third, this is a single-center retrospective study with a modest sample size ($N = 106$) and a specific diagnostic profile (high rates of cognitively unimpaired autism-spectrum and mood/stress-related presentations), and external validity beyond similar settings should not be assumed. Fourth, ACE exposure was assessed at discharge by multidisciplinary team consensus rather than by direct patient report, following the methodology of the index study; the consensus assessment was not validated against patient self-report. Fifth, the analysis plan was documented post-hoc rather than prospectively registered; while we have made the plan

publicly available as Supplementary Material, the pre-specification protections normally afforded by prospective registration are not available here, and inferential claims should be read with corresponding caution. Sixth, cohort definitions in the present study and the index study differ in episode handling, period covered, and one case-level adjudication; we have therefore avoided direct numerical comparison of effect sizes across the two studies. Seventh, ACE was treated as a linear continuous variable, an assumption that may not hold uniformly across the full 0–10 range, as the index study has also noted.

Conclusion

Among children and adolescents discharged from a Japanese psychiatric inpatient unit and followed for two-to-three years, higher cumulative ACE burden was associated with greater inpatient clinical complexity, reproducing the index study's findings in a larger cohort. The longitudinal main effect of ACE on CGAS was not significant, and the time-point–specific ACE–CGAS correlation attenuated over follow-up among participants retained in care. A composite of serious events, re-hospitalization, and loss to follow-up was associated with ACE burden in a graded fashion, but the association was driven primarily by the latter two components rather than by serious events alone. The functional-attenuation finding was sensitive to assumptions about patients lost to follow-up, indicating that differential attrition is a substantive limitation of inferences about long-term functional recovery in this population. Larger prospective studies with active follow-up and pre-specified attrition handling are needed to clarify the relative contributions of treatment-related convergence and selective attrition to apparent long-term functional outcomes.

Declarations

Ethical Approval This study was approved by the Komagino Hospital Ethics Committee (approval number 2021-0102). All procedures were conducted in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments.

Informed Consent Individual written informed consent was not obtained. The study was conducted under an opt-out procedure approved by the Komagino Hospital Ethics Committee (approval number 2021-0102), in accordance with the applicable Japanese national ethical guidelines for medical research. See the Methods section for full details of the opt-out procedure and the rationale for waiver of individual informed consent.

Consent for Publication Not applicable.

Competing Interests The authors declare no competing interests.

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Data Availability Available from the corresponding author on reasonable request.

Author Contributions Y.I. conceptualized and designed the study, curated the data, performed the statistical analysis, and wrote the original draft. N.Y., T.H., E.O., and M.M. contributed to data acquisition and to the multidisciplinary consensus assessment of clinical measures. M.K. supervised the work. All authors critically reviewed the manuscript and approved the final version.

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Tables and Figures

Tables and figures are provided as separate files. Captions and intended placement are listed below.

Table 1. Baseline characteristics of the analytic cohort, by ACE score group (N = 106).

Table 2. Adjusted associations between ACE score and inpatient clinical outcomes (N = 104).

Table 3. Composite adverse outcome and its components, by ACE score group (N = 106).

Supplementary Table S1. Adjudication rules for the composite adverse outcome.

Supplementary Table S2. Institutional diagnosis code to ICD-10 mapping with cohort distribution.

Figure 1. Cohort flow diagram (STROBE-style).

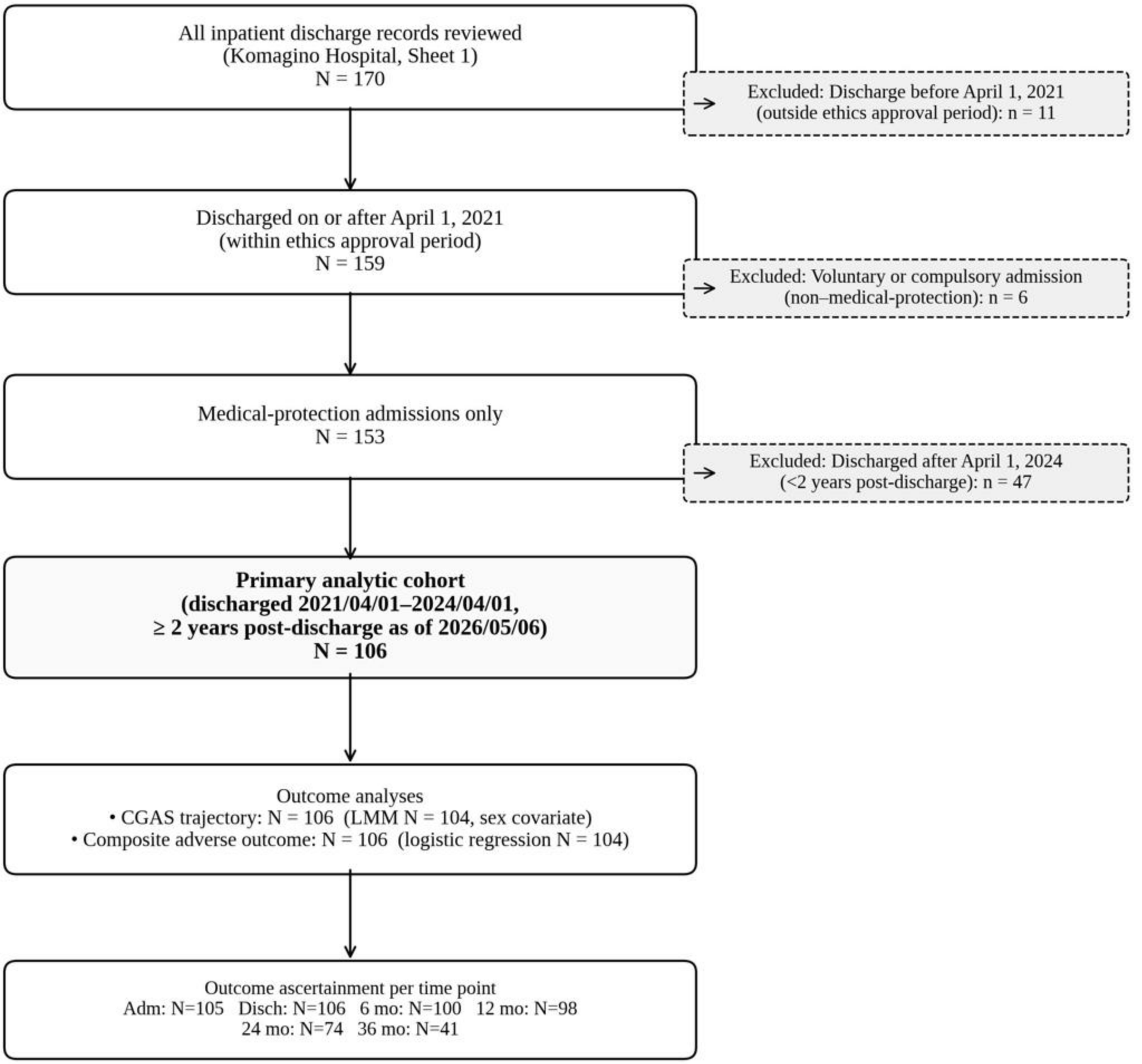
Figure 2. Forest plot of ACE effects across primary outcomes (N = 104; adjusted models).

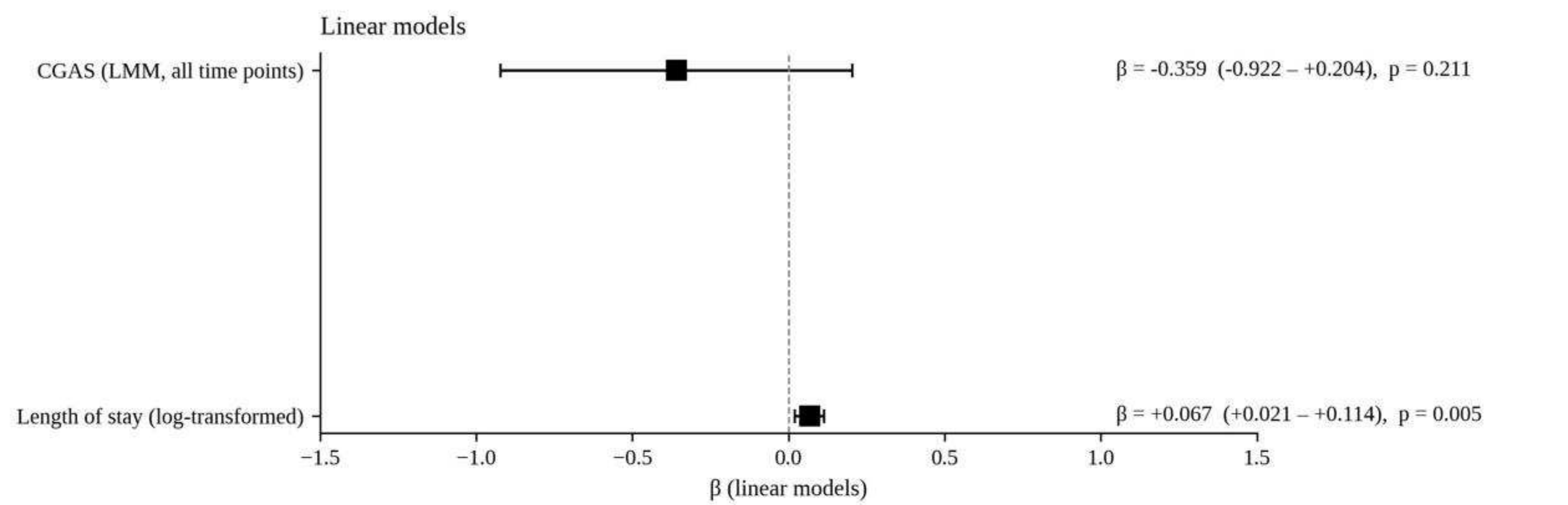
Figure 3. Longitudinal CGAS trajectory by ACE group (N = 106).

Figure 4. Time-point–specific ACE–CGAS associations.

Figure 5. Composite adverse outcome by ACE group.

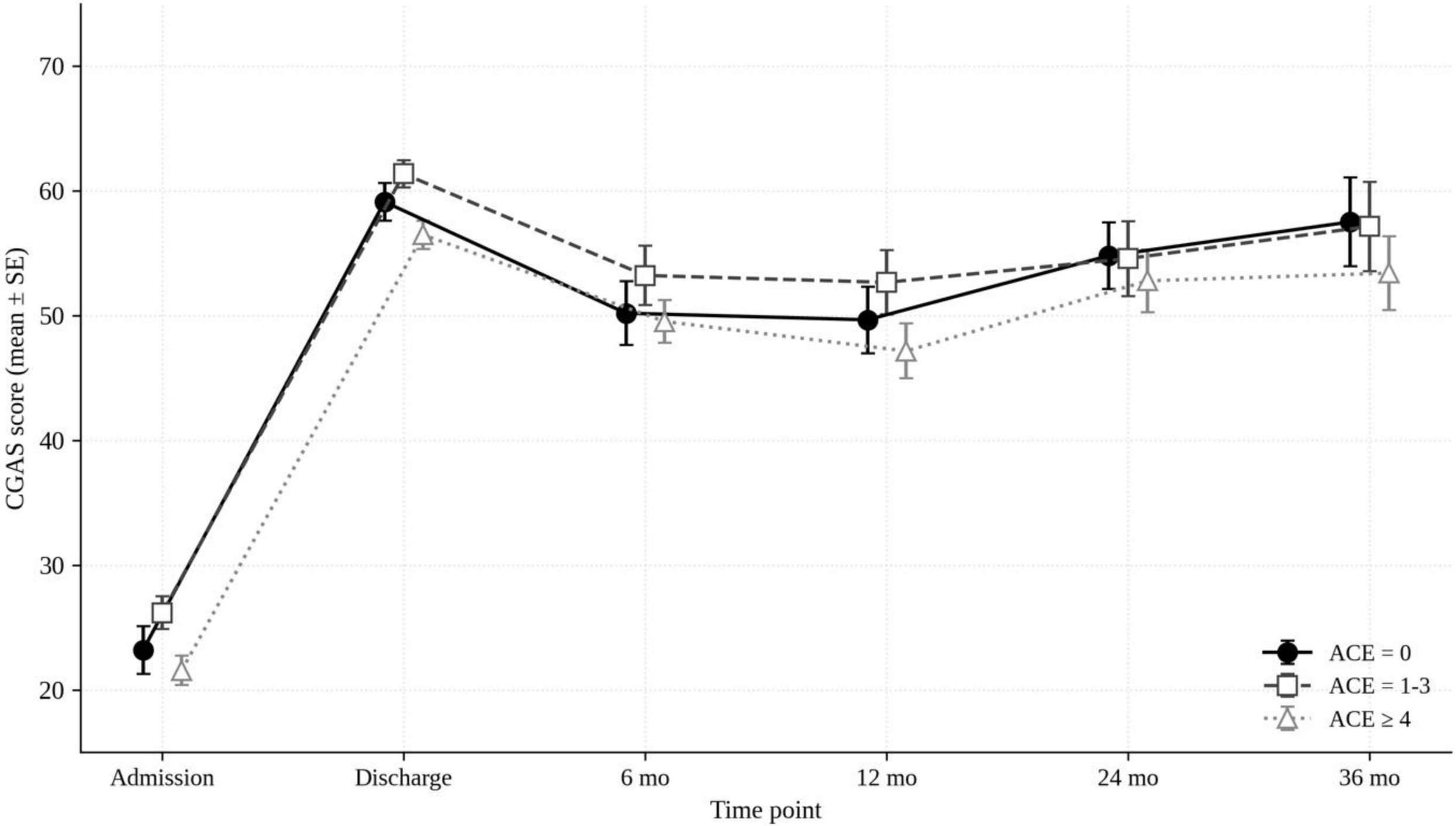
Figure 1. Cohort flow diagram (STROBE-style)





All estimates adjusted for sex, neurodevelopmental disorder status, and age at admission. N = 104 for all models.

Figure 3. Longitudinal CGAS trajectory by ACE group (N = 106)



Per-time-point N varies due to missing follow-up data (see Figure 1, bottom panel).

Figure 4. Time-point–specific ACE–CGAS associations (N = 106 with available data per time point)

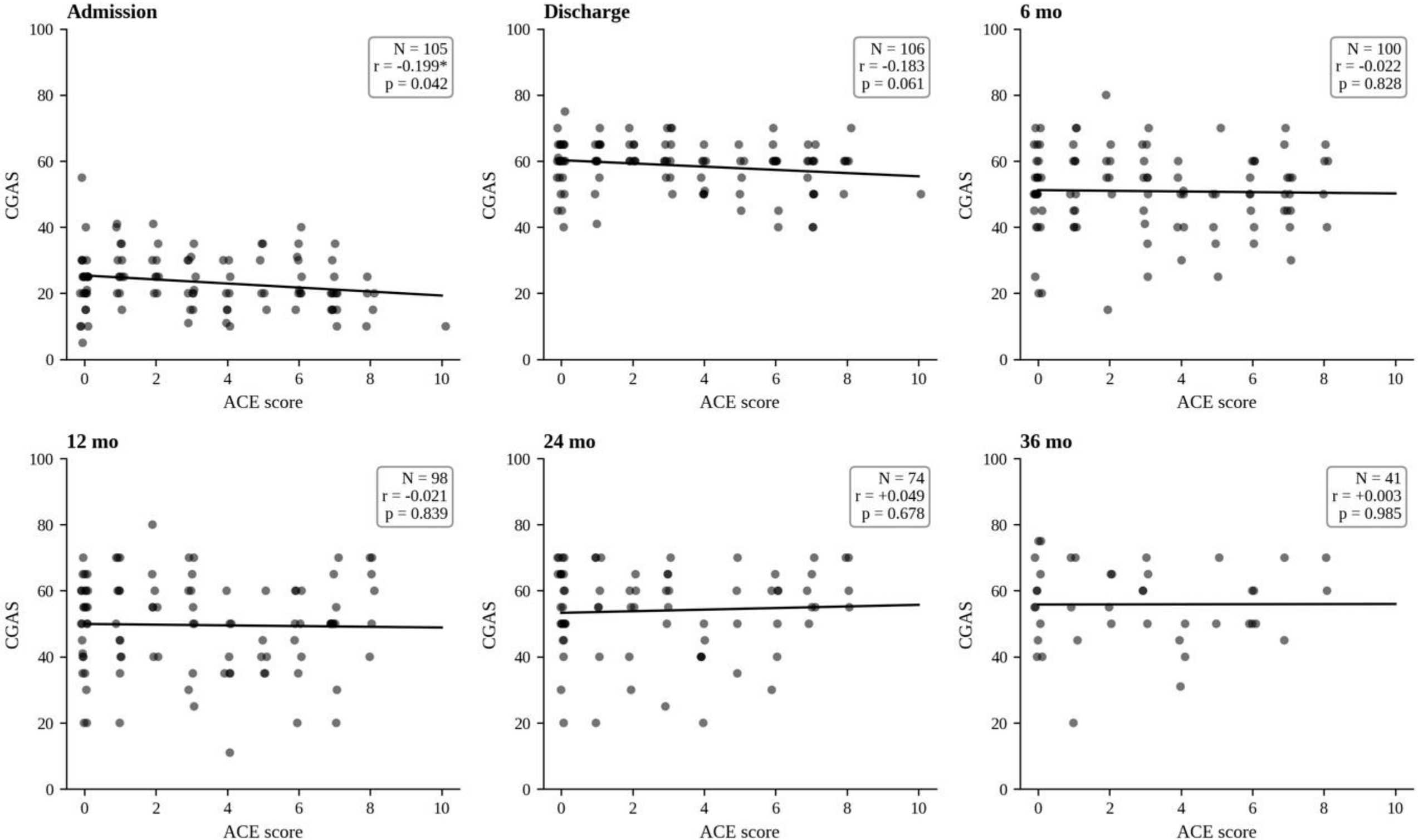
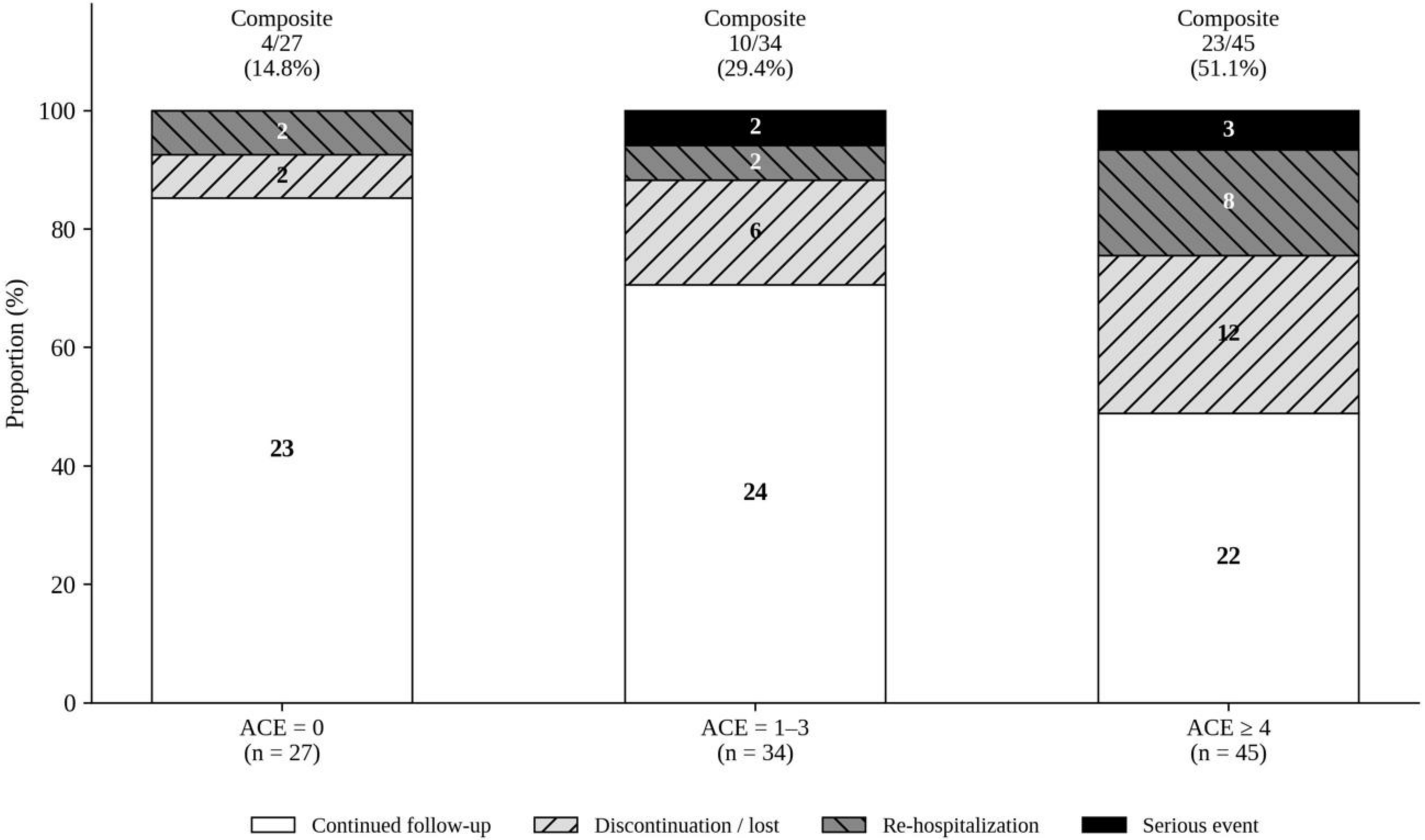


Figure 5. Composite adverse outcome by ACE group (N = 106)



Adjusted OR per 1-point ACE increase: 1.37 (95% CI 1.15–1.64), $p < 0.001$ | Three-group $\chi^2 = 10.45$, $p = 0.005$

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Tables13.xlsx
- SupplementaryTableS2ICD10mapping.xlsx
- SupplementaryTableS1.xlsx
- Rreplication.r
- Rreplicationreportv2.docx
- Rreplicationoutput.txt
- AnalysisPlanposthocEN.docx