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Original Research

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Early care limitation after ICH in a population-based study: what drives clinicians' decisions?

Álvaro Lambea-Gil[1,2,3], Pol Camps-Renom[1,2], Joan Martí-Fàbregas[1,2], Marina Guasch-Jiménez[1,2], Garbiñe Ezcurra-Díaz[1,2], Joan Miquel Fernández-Vidal[1,2], Luis Prats-Sanchez[1,2], Alejandro Martínez-Domeño[1,2], Natalia Pérez de la Ossa[1,2,3], Anna Ramos-Pachón[1,2,3,*], on behalf of HIC-CAT investigators

[1]Stroke Unit, Neurology Department, Hospital de la Santa Creu I Sant Pau, Barcelona, Spain
[2]Institut de Recerca (IR) Sant Pau, Barcelona, Spain
[3]Department of Medicine, Universitat Autònoma de Barcelona, Barcelona, Spain
*Corresponding author: Anna Ramos-Pachón, Stroke Unit, Neurology Department, Hospital de la Santa Creu I Sant Pau, Carrer Sant Quintí, 89, Barcelona CP 08025, Spain (aramosp@santpau.cat)
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Abstract

Introduction: **Early care limitation (ECL) after ICH is increasingly recognised, but population-based data on time-dependent determinants remain scarce. We aimed to identify influencing factors of ECL within 72 h from admission and explore differences by sex, haematoma location and stroke-centre type.**

Patients and methods: **Prospective population-based study of consecutively recruited adults with spontaneous ICH and pre-stroke mRS 0–3, admitted within the first 24 h to any hospital of the Catalan Stroke Network (HIC-CAT registry, 2020-2022). Early care limitation was recorded at 24 h (ECL-24 h) and 72 h (ECL-72 h). Candidate predictors were selected using all-subsets modelling for each time window. Model performance was assessed overall and in predefined subgroups.**

Results: **Among 1821 patients, ECL-24 h was applied in 355 (19.5%) and an additional 102 had ECL by 72 h, yielding an overall ECL rate of 25.1%. Strongest predictors of ECL-24 h were age, prior anticoagulant use, baseline NIHSS, ICH volume and intraventricular haemorrhage (AUC 0.88). Predictors of ECL-72 h were age, prior anticoagulant use, pre-stroke mRS, baseline NIHSS and early neurological deterioration within 72 h (AUC 0.90). Across subgroups, AUCs ranged from 0.85 to 0.90, with lower performance in infratentorial ICH for ECL-72 h and in telestroke centres. Among ECL-24 h patients, 39 (11%) achieved 3-month favourable functional outcome, whereas no patients with ECL-72 h achieved this outcome.**

Conclusion: **Early care limitation after ICH is frequent and its determinants differ by timing. In our study, very early decisions rely mainly on the static severity at admission, whereas later decisions incorporate neurological deterioration and appear to better align with prognosis. These findings support deferring ECL decisions until clinical evolution can be observed.**

Keywords decision-making early care limitation, ICH, life support care, patient care management, prognosis, self-fulfilling prophecies, stroke, stroke care networks, withdrawal of treatment

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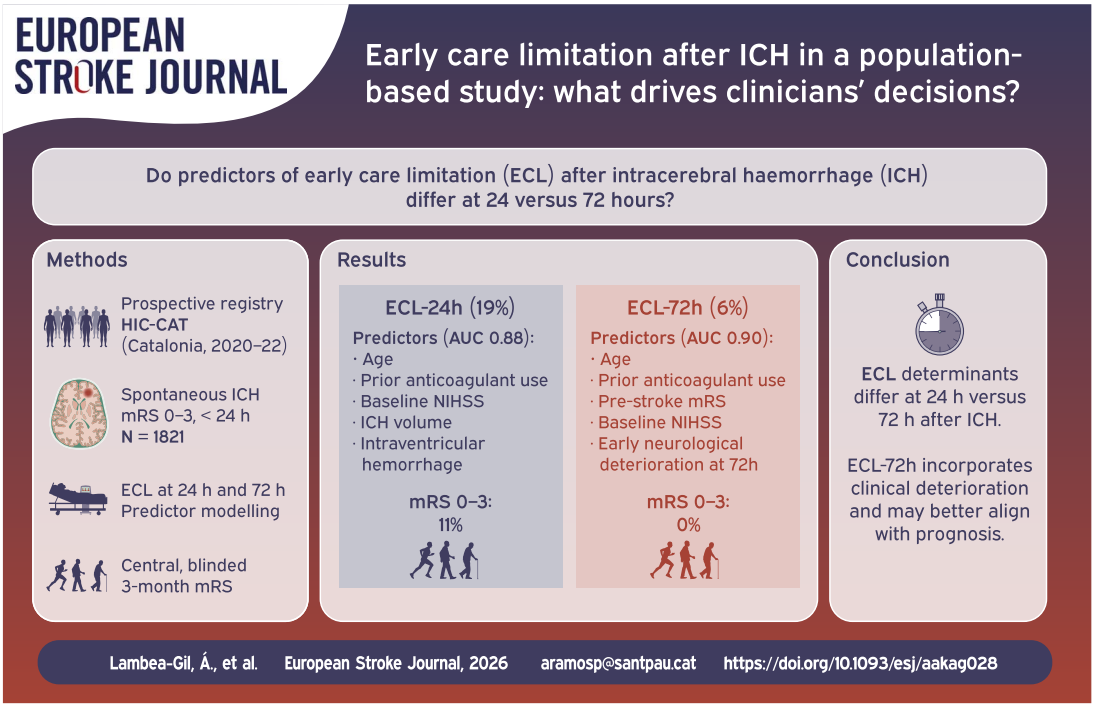
Graphical Abstract



Introduction

Intracerebral haemorrhage (ICH) remains the most devastating form of stroke, with short-term mortality rates approaching 40%.[1] While the initial severity of ICH clearly influences outcomes, self-fulfilling prophecies of poor recovery may also play a substantial role.[2] Such expectations can shape clinical decisions and frequently lead to early care limitation (ECL), including the withholding or withdrawal of life-sustaining therapies and other active interventions. Early care limitation has been reported in 20%–50% of patients with ICH,[3-5] most often within the first 24 h of presentation and is associated with a 2- to 3-fold increase in in-hospital mortality compared to those without ECL, independently of patient and ICH characteristics. Avoidance of such orders has been associated with a 30% absolute reduction in expected mortality, without an increase in severe disability among survivors.[6]

These ECL decisions are often guided by prognostic scores based on clinical and radiological assessments obtained at admission,[7,8] but such tools have important limitations. When applied prematurely or in isolation, they may foster overly pessimistic prognostication. Recognising this, major European and American guidelines recommend deferring prognostic assessments for at least 48–72 h after hospitalisation.[9-11] This recommendation gains further support from recent advances in acute management, such as the INTERACT3 and ENRICH trials, which have shown that active treatment can improve both survival and functional outcome in ICH.[12,13] Taken together with recent calls to reframe ICH as a time-critical, treatable emergency ("Code ICH"), these advances support moving away from therapeutic nihilism towards protocolised, target-driven acute care.[14-16] Indeed, longitudinal data indicate that around 40% of initially severe ICH survivors may achieve functional independence at 1 year,[17] emphasising that prognostic decisions should consider factors beyond baseline severity alone.

Several patient- and ICH-related characteristics have been associated with ECL, including age, pre-stroke functional dependence, comorbidity, clinical severity, haematoma volume and intraventricular extension.[18,19] Differences have also been reported according to ethnicity or sex, although inconsistently.[2,20,21] Organisational aspects of stroke care systems and centre experience may also influence these decisions; however, prospective, longitudinal, population-based data exploring these determinants remain scarce. Importantly, determinants of ECL may differ according to timing; we hypothesise that very early decisions (≤24 h) rely predominantly on information available at presentation and may be more sensitive to physician- and system-level practice variation, whereas later decisions (24–72 h) increasingly reflect patient-related factors and clinical course.

The aim of this study was to identify factors associated with ECL in patients with acute ICH within the first 72 h of hospitalisation. To this end, we conducted a population-based study across an entire stroke care network to: (1) identify predictors of ECL within 24 and 72 h of admission; (2) describe 3-month functional outcomes among patients receiving ECL and (3) assess whether these predictors vary by sex, ICH location and stroke-centre type.

Patients and methods

Study design and population

We conducted an observational, multicentre study using a prospective population-based registry of patients consecutively diagnosed with acute spontaneous ICH over a 2-year period (HIC-CAT study, March 2020 to March 2022) across the entire Stroke

Care Network of Catalonia, Spain (approximately 7.7 million inhabitants during the study period).

The HIC-CAT study (ClinicalTrials.gov identifier: NCT03956485) included all patients aged ≥ 18 years diagnosed with spontaneous ICH in any public hospital with stroke care capacity in Catalonia. Patients were excluded if they had a baseline mRS score > 3, if more than 24 h had elapsed from symptom onset to diagnosis, or if no follow-up data were available after discharge.[22]

Based on stroke resources, participating hospitals—all audited by the Catalan Agency for Health Quality and Assessment (AQUAS)—were classified as comprehensive stroke centres (CSCs, *n* = 9), primary stroke centres (PSCs, *n* = 5) or telestroke centres (TSCs, *n* = 14). Comprehensive stroke centres met structural, staffing and diagnostic criteria for 24/7 specialised ICH care, including neurosurgery and angiography. Primary stroke centres had on-site neurology but lacked some of these capacities, while TSCs relied on remote neurology support. Further details on the Catalan Stroke System and hospital organisation are provided in the main HIC-CAT report.[22]

During the study period, each centre followed its usual care pathway for patients with ICH. Although no standardised protocol for ICH management was in place, centres adhered to available European Stroke Organisation[23] and American Heart Association/American Stroke Association[24] guidelines. All centres had access to neurosurgical consultation, either on-site or remote.

The reporting of this study adheres to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.[25]

Study variables

The following variables were collected: demographics; past medical history and prior treatments; logistics and time metrics; clinical and radiological findings on admission; advanced care directives; ECL at 24 and 72 h; care bundle achievement at 24 and 72 h; neurosurgical consultation and intervention; in-hospital complications, including early neurological deterioration during the first 72 h (early neurological deterioration [END]-72 h) and 3-month functional outcome and mortality. ICH volume was quantified at baseline using the ABC/2 formula or by planimetry on CT, according to local neuroradiology practice. Early neurological deterioration-72 h was defined as an increase of ≥ 4 points in the NIHSS or a decrease of > 1 point in the Glasgow Coma Scale.

Early care limitation was defined as a documented decision to withhold or withdraw the escalation of life-sustaining treatments and/or disease-directed acute interventions intended to alter the course of ICH. This included, for example, decisions not to pursue ICU-level escalation (intubation, mechanical ventilation or other organ support) or to forgo neurosurgical interventions. Early care limitation was recorded as a dichotomous variable according to whether any such decision was made within the first 24 h (ECL-24 h) or within the first 72 h (ECL-72 h) after admission; the registry does not capture the specific type of limitation, precluding stratified analyses by subtype. For these analyses, ECL-72 h was pre-specified as decisions made between 24 and 72 h among patients alive at 24 h and without prior ECL-24 h. The exact timing of the decision and any later modifications were not captured beyond these 2 predefined time windows.

Primary and secondary objectives

The primary objective was to identify predictors of ECL-24 h and ECL-72 h. Secondary objectives were to describe mortality and 3-month functional outcomes in patients receiving ECL, and to assess whether factors associated with ECL-24 h and ECL-72 h differed across predefined subgroups: sex, ICH location and stroke-centre type.

Statistical analysis

Categorical variables were reported as counts (*n*) and percentages (%). Continuous variables were reported as means and SD if normally distributed, or as medians and IQRs otherwise (assessed by the Shapiro–Wilk test). Group comparisons were performed using the Student's *t*-test or Mann–Whitney *U* test for continuous variables, and χ^2 or Fisher's exact test for categorical variables, as appropriate. For comparisons involving more than 2 groups, the Kruskal–Wallis test was used.

Missing data on ECL (6.9% for ECL-24 h and 8.2% for ECL-72 h) were imputed as "no ECL" for the primary analyses, based on the clinical assumption that ECL is an active decision that should be documented. A sensitivity analysis excluding cases with missing ECL status was performed to ensure consistency. Baseline characteristics of patients with and without missing ECL data were compared to assess potential bias.

Univariate analyses were first performed to assess associations with ECL-24 h and ECL-72 h, with *P* values corrected for multiple testing using a pragmatic Bonferroni adjustment (×10, adjusted *P* values truncated at .999). Variables with a corrected $P < .1$ and without clinical redundancy were retained as candidates for multivariable modelling. Variance inflation factors (VIFs) were then calculated, showing no evidence of collinearity (all VIF < 10). Multivariable logistic regression was used to identify predictors of ECL, reporting adjusted odds ratios (aORs) with 95% CIs. Multivariable models used complete-case analysis for covariates.

For the primary objective, all possible subset models were performed to explore combinations of predictors. Models were evaluated based on discrimination (area under the curve; AUC), which we interpreted as poor (<0.70), moderate (0.70–0.80), high (0.80–0.90) and very high (≥0.90), calibration (Hosmer–Lemeshow test) and parsimony (Akaike and Bayesian information criteria: AIC and BIC, respectively), retaining only models with ΔAIC ≤ 10 and ΔBIC ≤ 6 compared to the best-fitting model. An identical approach was applied to ECL-72 h.

For secondary analyses in predefined subgroups (sex, ICH location and centre type), we applied the final models derived from the primary analysis. Model discrimination was assessed using the AUC within each subgroup, and differences were tested using the DeLong test. Receiver operating characteristic curves were plotted for visualisation.

Statistical significance was set at $P < .05$ (2-sided). Analyses were performed using Stata v.19 (StataCorp, College Station, TX, USA), and figures were generated using R v.4.5.1 (RStudio, Boston, MA, USA).

Results

A total of 1821 patients were included (Figure 1). The mean age was 70.3 ± 14.1 years, and 37.8% (*n* = 687) were women.

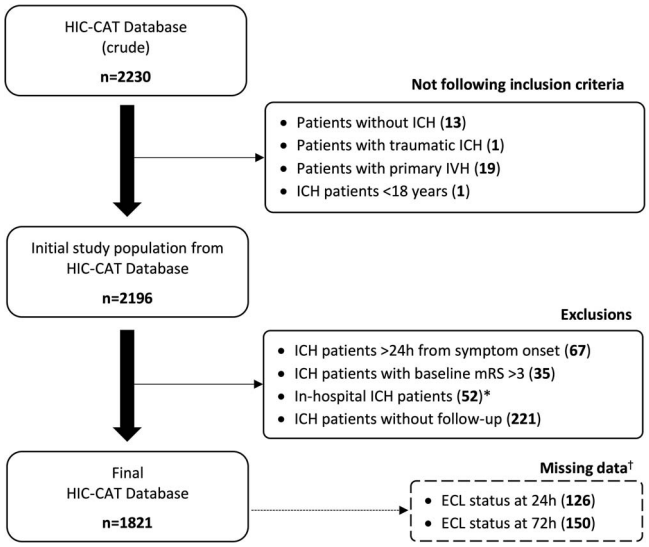


Figure 1 Study flowchart showing the inclusion and exclusion of patients from the HIC-CAT registry.

Median NIHSS score at admission was 13 (IQR 5–21), median haematoma volume was 18 mL (IQR 6–45) and intraventricular haemorrhage was present in 40% (n = 703). ICH location was deep supratentorial in 51.7% (n = 906), lobar supratentorial in 37.4% (n = 655) and infratentorial in 10.9% (n = 190). Initial admission was to a TSC in 16% (n = 292), a PSC in 17.1% (n = 311) and a CSC in 66.9% (n = 1218). Median time from symptom onset to first hospital admission was 145 min (IQR 71–443). Advance care directives were recorded in 20 patients (1.3%).

Early care limitation was applied in 355 patients within the first 24 h (ECL-24 h, 19.5%). Among the 1664 patients alive at 24 h, 102 transitioned from active treatment to ECL by 72 h (ECL-72 h, 6.1%), while 105 patients with ECL-24 h received active treatment at 72 h (ECL reversal). Reversal was more common among patients initially admitted to TSC/PSC (41% vs 24.8%) and among those transferred to a CSC (14.3% vs 2.6%); baseline severity characteristics (age, NIHSS, ICH volume and intraventricular haemorrhage) were otherwise broadly similar.

Key baseline characteristics by ECL timing are summarised in Table 1. Full baseline characteristics with corrected p-values are reported in Tables S1 and S2.

In-hospital mortality among patients with ECL-24 h was 76.8% (n = 272), compared with 23% (n = 310) in patients who remained on active treatment ($P < .001$). Similarly, in patients who transitioned to ECL at 72 h, in-hospital mortality reached 87.3% (n = 89). Cumulative in-hospital mortality is shown in Figure S1.

Three-month mortality was 80.9% (n = 287) in the ECL-24 h group and 29.3% (n = 430) among patients maintained on active treatment. A favourable 3-month functional outcome (mRS 0–3) was achieved in 11% (n = 39) of ECL-24 h patients and 45.4% (n = 665) of those maintained on active treatment. For the ECL-72 h group, 92.2% (n = 94) had died by 3 months, and none of the survivors achieved a favourable functional outcome. Among ECL-24 h patients alive at 24 h (n = 258), those who reversed to active treatment at 72 h had better 3-month outcomes than those with persistent ECL (mRS 0–3: 26.7% vs 6.5%; mortality: 54.3% vs 91.5%).

Determinants for early care limitation within first 24 and 72 h

The final multivariable model identifying the strongest determinants of ECL-24 h is shown in Table 2 and included age, prior anticoagulation use, NIHSS score, ICH volume and intraventricular haemorrhage on admission. Model discrimination was AUC 0.88 (95% CI, 0.86–0.90).

The final multivariable model identifying the strongest determinants of ECL-72 h is shown in Table 3 and included age, prior anticoagulation use, pre-stroke mRS score, NIHSS score on admission and END-72 h. Model discrimination was AUC 0.90 (95% CI, 0.88–0.93).

In a sensitivity analysis excluding patients with missing ECL status at 24 and 72 h, results remained consistent.

Subgroup analysis for early care limitation

Discrimination across predefined subgroups (sex, haematoma location and stroke-centre type) is shown in Figure 2. Baseline characteristics are provided in Tables S3–S8. Key results are summarised below.

By sex, ECL-24 h was applied in 21.8% of women [150/687] and 18.1% of men [205/1133]; ECL-72 h rates were 7.5% in women [39/521] and 7.1% in men [63/885]. Model discrimination (Figure 2A) was comparable between sexes for both time windows.

By haematoma location, ECL-24 h was applied in 27.9% lobar [183/655], 14.6% deep [132/906] and 20.5% infratentorial [39/190]. Early care limitation-72 h rates were 10.1% in lobar [46/457], 5.8% in deep [43/742] and 8.9% in infratentorial [13/146]. Model discrimination (Figure 2B) did not differ across locations for ECL-24 h, but differed for ECL-72 h ($P < .001$), with the lowest performance in infratentorial ICH (AUC 0.86; 95% CI, 0.82–0.89).

By stroke-centre type, ECL-24 h was lowest in patients initially admitted to a TSC (TSC 13% [38/292], PSC 21.9% [68/311], CSC 20.4% [249/1218]). ECL-72 h showed similar rates across centre types (TSC 6.9% [17/246], PSC 5.9% [14/237], CSC 7.7% [71/923]). Model discrimination (Figure 2C) differed by centre type for both ECL-24 h (P = .005) and ECL-72 h (P = .001), with the lowest performance in TSC (ECL-24 h AUC 0.86; 95% CI, 0.84–0.88; ECL-72 h AUC 0.85; 95% CI, 0.81–0.89). Transfers to a CSC were frequent, particularly from TSC (82.5% [241/292]) and, to a lesser extent, from PSC (19.6% [61/311]). Among patients not transferred to a CSC, ECL was more common (ECL-24 h: TSC 37.3% [19/51], PSC 26.4% [66/250]; ECL-72 h: TSC 18.5% [5/27], PSC 7.3% [13/179]), whereas rates were lower among transferred patients (ECL-24 h 7% [21/302]; ECL-72 h 4.7% [13/278]).

Discussion

In this population-based study across an entire stroke care network, ECL was applied at some point during the first 72 h in about 25% of patients with spontaneous ICH, predominantly within the first 24 h. Determinants differed by timing: early ECL was mainly associated with admission severity markers, whereas ECL between 24 and 72 h was more strongly related to pre-stroke functional status and early neurological deterioration, which emerged as the dominant determinant (aOR 18.4). Among patients receiving ECL within 24 h, 11% achieved a favourable

Table 1 Patients key characteristics according to early care limitation.

Variables	Non-ECL-24 h (*n* = 1466)	ECL-24 h (*n* = 355)	*P* value*	Non-ECL-72 h (*n* = 1304)	ECL-72 h (*n* = 102)	*P* value*
Age, mean (SD)	68.8 (14.3)	76.3 (11)	<**.001**	68 (14.4)	75.8 (11.6)	<**.001**
Sex (*n*, % women)	537 (36.7)	150 (42.3)	.052	482 (37)	39 (38.2)	.807
Pre-stroke mRS, median (IQR)	0 (0–1)	1 (0–2)	<**.001**	0 (0–1)	1 (0–2)	<**.001**
Initial hospital admission, *n* (%)						
Telestroke centre	254 (17.3)	38 (10.7)	**.002**	229 (17.6)	17 (16.7)	.819
Primary stroke centre	243 (16.6)	68 (19.2)	.247	223 (17.1)	14 (13.7)	.380
Comprehensive stroke centre	969 (66.1)	249 (70.1)	.146	852 (65.3)	71 (69.6)	.382
GCS, median (IQR)	15 (13–15)	8 (4–14)	<**.001**	15 (14–15)	14 (9–15)	<**.001**
NIHSS, median (IQR)	10 (4–18)	23 (18–30)	<**.001**	10 (4–18)	17 (8–22)	<**.001**
ICH volume (mL), median (IQR)	13 (5–30)	65 (27–115)	<**.001**	12 (4–29)	22 (8–64)	<**.001**
IVH component, *n* (%)	473 (33.7)	230 (64.8)	<**.001**	407 (32.6)	45 (44.1)	**.018**
Anticoagulants	214 (16.1)	108 (31.7)	<**.001**	142 (12.0)	42 (43.3)	<**.001**
ICH location, *n* (%)						
Deep	774 (55.4)	132 (37.3)	<**.001**	699 (56.2)	43 (42.2)	**.006**
Lobar	472 (33.8)	183 (51.7)	<**.001**	411 (33.1)	46 (45.1)	**.014**
Infratentorial	151 (10.8)	39 (11.0)	.910	133 (10.7)	13 (12.8)	.523
Advance care directives, *n* (%)	8 (0.6)	12 (3.9)	<**.001**	2 (0.2)	3 (3.3)	<**.001**
Neurosurgical consultation, *n* (%)	453 (36.6)	152 (47.4)	<**.001**	375 (33.7)	61 (63.5)	<**.001**
END within first 72 h, *n* (%)	–	–	–	296 (25.5)	84 (86.6)	<**.001**

Abbreviations: ECL, early care limitation; END, early neurological deterioration; GCS: Glasgow Coma Scale; IVH: intraventricular haemorrhage. Bold indicates statistically significant differences ($p < 0.05$). Non-ECL-24 h: Patients with non-early care limitation orders within first 24 h; ECL-24 h: patients with ECL within the first 24 h; Non-ECL-72 h: patients with non ECL neither at 24 h nor at 72 h. ECL-72 h: patients with ECL within the first 72 h, but not within first 24 h. END (not applicable for ECL-24 h, as the timing of neurological deterioration within the first 72 h was not recorded). [a] Unadjusted *P*-values, 2-sided.

Table 2 Multivariable logistic regression analysis for variables associated with early care limitation within first 24 h.

Variables	aOR	95% CI	*P* value
Age (per year)	1.05	1.03–1.06	<**.001**
NIHSS score on admission (per point)	1.09	1.07–1.11	<**.001**
ICH volume on admission (per mL)	1.01	1.01–1.02	<**.001**
IVH component on admission	1.63	1.18–2.24	**.003**
Prior anticoagulant treatment	2.28	1.61–3.23	<**.001**

aOR, adjusted odds ratio; IVH, intraventricular haemorrhage. Bold indicates statistically significant differences ($p < 0.05$).

Table 3 Multivariable logistic regression analysis for variables associated with early care limitation within first 72 h.

Variables	aOR	95% CI	*P* value
Age (per year)	1.04	1.02–1.06	<**.001**
Pre-stroke mRS score (per point)	1.28	1.01–1.62	**.045**
NIHSS on admission (per point)	1.06	1.03–1.09	<**.001**
Prior anticoagulant treatment	5.80	3.36–10.13	<**.001**
END within first 72 h	18.36	9.70–34.70	<**.001**

aOR, adjusted odds ratio; END, early neurological deterioration; IVH, intraventricular haemorrhage. Bold indicates statistically significant differences ($p < 0.05$).

3-month functional outcome, illustrating the risk of very early prognostication.

This overall ECL rate is consistent with recent North American population-based cohorts, reporting rates of 20%–25%,[5,26] while European data remain scarce. Despite current guideline recommendations discouraging prognostic decisions within the first 48–72 h,[9-11] ECL remains frequent, underscoring the persistent challenge of premature prognostication in ICH care.

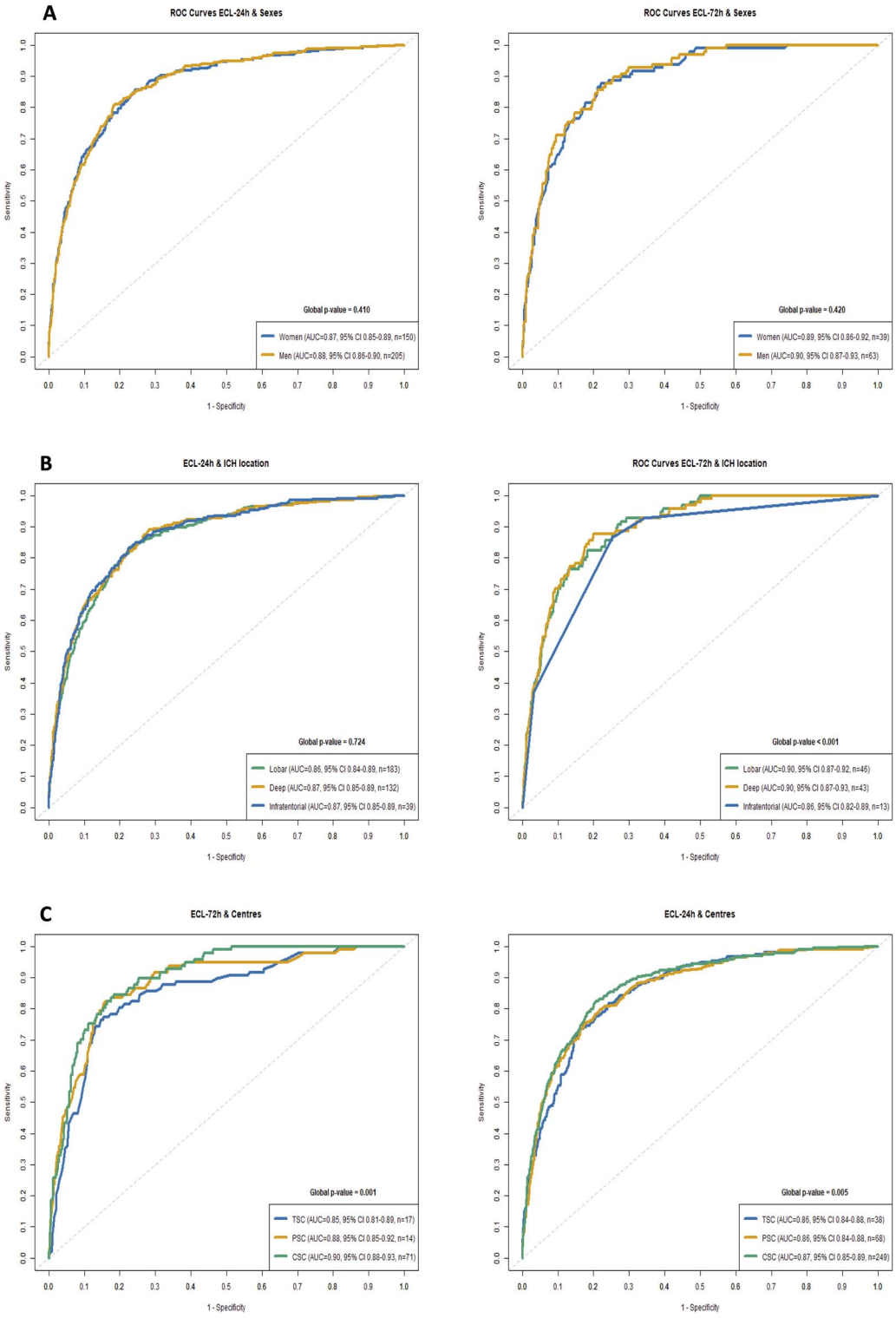


Figure 2 Discriminative performance of prediction models for early care limitation in predefined subgroups. (A) ROC curves stratified by sex. (B) ROC curves stratified by intracerebral hemorrhage location. (C) ROC curves stratified by center type.

These timing-dependent ECL patterns are clinically relevant. Early ECL appears driven largely by baseline clinical and radiological severity, some of which may be partially modifiable through standardised acute-care pathways.[12,13,27,28] This raises concern that limiting treatment based solely on early severity markers may preclude the potential benefits of optimised medical or surgical management. In contrast, later decisions incorporated functional status and neurological deterioration, suggesting greater alignment with the evolving clinical trajectory and prognosis. Together, these findings support a more time-sensitive approach to ECL in which decisions incorporate dynamic clinical evolution rather than static first impressions. Consistent with this, ECL-24 h patients who reversed to active treatment by 72 h had better outcomes than those with persistent ECL, reinforcing

that early ICH-related status may evolve and that decisions should be revisited as the clinical trajectory becomes clearer. In support of such reassessment, when clinically feasible, follow-up neuroimaging capturing early radiological evolution and more closely reflecting final ICH volume may further refine prognostic judgement.[29,30] At the same time, ECL decisions may influence subsequent care by reducing the intensity of neurological monitoring and access to rescue interventions, potentially affecting both the detection of early neurological deterioration and downstream outcomes through self-fulfilling mechanisms.

Subgroup analyses according to sex, haematoma location and stroke-centre type revealed only modest differences. Model performance remained comparable between men and women at both time points. The same pattern was observed for haematoma location, except for a small decrease in model accuracy for infratentorial ICH at ECL-72 h, which may reflect a different clinical phenotype characterised by more impaired consciousness, a factor strongly associated with ECL.[31] However, this subgroup was relatively small and the finding should be interpreted with caution. Across hospital types, discrimination remained good, although performance was lower in TSC. This suggests that system-level factors (such as local care pathways or neurosurgical consultation practices) may influence ECL decisions, particularly in remotely supported hospitals where specialist input may be more episodic (telestroke consultations) compared with continuous on-site neurology specialist coverage in PSC/CSC. In this context, expanding telestroke models from isolated emergency support towards integrated, continuous specialist involvement throughout hospitalisation[32,33] may help align transfers with potentially beneficial interventions and patient goals,[34] while also supporting ECL decision-making as the clinical course evolves.

Recent North American cohorts have highlighted social and economic influences on ECL,[5,26,35] which may not translate directly to universal publicly funded European systems. Beyond these socioeconomic factors, prospective population-based European data describing timing-specific clinical and health-system determinants of ECL are limited. In this context, our network-wide registry provides a novel, real-world view of how determinants differ between very early and later ECL decisions. Linking quality-improvement initiatives to population-based stroke registries capturing all stroke subtypes (not only ischaemic events) could help clarify these organisational drivers and reduce unwarranted ECL.

From an ethical perspective, our findings underline the importance of structured, transparent shared decision-making. Advance care directives (ACDs) were present in only 1.3% of patients, in line with regional and national data,[36] and are often insufficiently specific to meaningfully guide decisions in the acute phase of ICH. While ACDs remain crucial for respecting patient autonomy, their limitations highlight the need to avoid using them as the sole rationale for ECL, particularly when prognosis is still uncertain.

This study has several limitations. First, its observational design precludes causal inference between predictors and ECL decisions, and residual confounding due to unmeasured factors (such as physician attitudes, family preferences or local resource availability) cannot be excluded. Furthermore, we did not capture objective measures of resource constraints, and the study period partially overlapped with the COVID-19 pandemic, particularly the initial pandemic surge (March–May 2020), during which pressures on hospital capacity may have influenced escalation decisions, including ECL. Second, the registry did not capture the precise timing of ECL initiation (beyond the predefined 24- and 72-h windows), nor the clinical setting, clinician role or rationale underlying ECL decisions, limiting insight into nuanced decision-making processes and within-window changes in goals of care. Third, although definitions were pre-established, subtle differences in interpretation and documentation across clinicians and centres may have led to underreporting or misclassification of ECL. In addition, patients were clustered within hospitals; hierarchical modelling could better account for centre-level variation and within-hospital correlation. Fourth, centre-type subgrouping was based on the initial admitting hospital, but most TSC (and some PSC) patients were transferred to CSCs at some point during hospitalisation; therefore, ECL decisions within 24–72 h may have been made by teams at higher-level centres, which could partly influence centre-type comparisons. Fifth, we excluded patients with pre-stroke mRS >3, which limits generalisability to individuals with severe pre-existing disability, in whom ECL patterns and outcomes may differ. Finally, functional outcomes were assessed at 3 months, as prespecified in the registry protocol; longer follow-up might offer a more comprehensive view of later recovery among initially severe cases. Nonetheless, the large sample size, full national coverage, blinded outcome assessment and inclusion of all hospital types strengthen the generalisability of our findings to comparable populations within organised stroke systems of care.

In summary, ECL after ICH is common and is often driven by baseline severity when applied within the first 24 h. This practice carries a risk of premature decisions, as more than 1 in 10 patients limited within this timeframe ultimately achieved a favourable functional outcome. By contrast, decisions made within the first 72 h integrated early neurological deterioration and appear to be more aligned with prognosis. These findings support delaying ECL until clinical evolution can be observed, to avoid potentially self-fulfilling prognostication and ensure that each patient is given a fair opportunity for recovery.

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Author contributions

Álvaro Lambea-Gil (Conceptualisation [equal], Data curation [lead], Formal analysis, Investigation [equal], Methodology [supporting], Software [equal], Visualisation, Writing—original draft [lead], Writing—review & editing [equal]), Pol Camps-Renom (Conceptualisation, Formal analysis, Investigation [supporting], Methodology [lead], Software, Validation, Visualisation [supporting], Writing—review & editing [equal]), Joan Martí-Fàbregas (Conceptualisation [supporting], Data curation [equal], Funding acquisition [lead], Investigation [supporting], Project administration, Resources [lead], Supervision, Writing—review & editing [supporting]), Marina Guasch-Jiménez (Investigation, Visualisation [supporting], Writing—review & editing [equal]), Garbiñe Ezcurra Diaz (Visualisation [supporting], Writing—review & editing [equal]), Joan Miquel Fernández-Vidal (Visualisation

[supporting], Writing—review & editing [equal]), Luis Antonio Prats Sánchez (Investigation, Visualisation [supporting], Writing—review & editing [equal]), Alejandro Martínez-Domeño (Investigation, Resources, Writing—review & editing [supporting]), Natalia Pérez De La Ossa (Investigation, Project administration, Resources, Visualisation [supporting], Writing—review & editing [equal]), Anna Ramos-Pachon (Conceptualisation [equal], Data curation [supporting], Formal analysis, Investigation [equal], Methodology [supporting], Supervision, Validation [lead], Visualisation, Writing—original draft [supporting], Writing—review & editing [equal])

Supplementary material

Supplementary material is available at *European Stroke Journal* online.

Conflicts of interest

The authors declared no potential conflicts of interest with respect to the research, authorship and publication of this article.

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Data availability

Anonymised data not included in this article are available from the corresponding author upon reasonable request.

Ethics approval

The HIC-CAT study was approved by the ethics committee of Hospital de la Santa Creu i Sant Pau as the sponsoring centre (IIBSP-HIC-2019-22) and locally by each participating centre.

Consent to participate

Patients or their legal representatives provided informed consent to participate. In some hospitals, ethics committees required consent only for stroke survivors and for authorisation of the 3-month follow-up assessments via telephone interview.

Informed consent

Informed consent was obtained from patients or their legal representatives. In some participating hospitals, ethics committees required informed consent only for stroke survivors and for authorisation of the 3-month follow-up assessments conducted by telephone interview.

Author agreement

All authors have read and approved the submitted manuscript and agree to its submission to the *European Stroke Journal*.

Authorship

All authors meet the International Committee of Medical Journal Editors (ICMJE) criteria for authorship. All authors have made substantial contributions to the conception and design of the study, or the acquisition, analysis or interpretation of data; have drafted or critically revised the manuscript for important intellectual content; have approved the final version to be published and agree to be accountable for all aspects of the work.

Originality and prior publication

The authors confirm that this manuscript represents original work, has not been published previously, and is not under consideration for publication elsewhere. No part of this manuscript has been published previously except in abstract form.

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