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Health Literacy, Self-Efficacy, and Healthcare Utilisation in Older Adults with Multimorbidity in Albania

Velide Pulomemoj [1,*], Anisa Subashi [2], Arshad Mehmood [3], Lorena Serjanaj [3] and Fatjona Kamberi [4]

[1] Department of Biomedicine and Prevention, University of Rome Tor Vergata, 00133 Rome, Italy
[2] Faculty of Social Sciences, University of Tirana, 1010 Tirana, Albania; anisasubashi@gmail.com
[3] Department of Health and Social Care, CECOS College, London E1 4NQ, UK; arshad@cecos.ac.uk (A.M.); lorena.tutor@cecos.ac.uk (L.S.)
[4] Scientific Research Center for Public Health, Faculty of Health, University of Vlore "Ismail Qemali", 9401 Vlora, Albania; fatjona.kamberi@univlora.edu.al
* Correspondence: dea.pulomemoj@gmail.com; Tel.: +355-69-8460155

Abstract

Background: We examined whether health literacy and chronic-disease self-efficacy were independently associated with healthcare use among older adults with multimorbidity. Methods: This secondary cross-sectional analysis included 464 community-dwelling adults aged ≥65 years with ≥2 chronic conditions receiving primary care in Vlora Municipality, Albania. Six-month general practitioner (GP), emergency department (ED), admission, and hospital-night counts were analysed using negative-binomial, logistic, and zero-truncated count models. Models adjusted for age, gender, education, body mass index (BMI), self-rated health, chronic-disease count, health centre, and residence. Results: Health literacy was not associated with GP-visit frequency [incidence rate ratio (IRR) = 1.002, 95% confidence interval (CI) 0.982–1.023; $p = 0.820$], whereas higher self-efficacy was associated with fewer GP visits (IRR 0.909, 95% CI 0.857–0.964; $p = 0.002$). Higher health literacy was associated with greater odds of ED use (OR 1.112, 95% CI 1.055–1.172), admission (OR 1.097, 95% CI 1.034–1.164), and hospital use (OR 1.092, 95% CI 1.031–1.157), while self-efficacy was associated with lower odds (ORs 0.731, 0.636, and 0.647; all $p < 0.001$). Among users, health literacy predicted more admissions (IRR 1.085, 95% CI 1.014–1.160; $p = 0.018$), but neither exposure predicted ED frequency or hospital-night duration. Conclusions: Associations of health literacy and self-efficacy with acute and hospital utilisation were concentrated primarily in whether any use was reported, rather than in subsequent intensity. Because utilisation referred to the six months preceding measurement of the two capacities, temporal direction and appropriateness of care could not be established. Prospective, record-linked studies are needed to clarify these relationships.

Keywords: health literacy; chronic-disease; self-efficacy; multimorbidity; older adults; healthcare utilisation; emergency department; hospitalisation; primary healthcare; Albania

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1. Introduction

1.1. Multimorbidity and Patterns of Healthcare Use in Later Life

Earlier work in this Albanian primary-care cohort showed that health literacy and chronic-disease self-efficacy were positively related, but that analysis did not address healthcare use [1]. The present study moves from the relationship between the two capabilities to a different question: how each is associated with contact with primary, emergency, and hospital services. Multimorbidity changes the practical meaning of healthcare use. Older

adults must often reconcile several treatment plans, monitor overlapping symptoms, manage polypharmacy, and decide which professional to contact when advice conflicts. These demands grow as function declines or treatment burden rises [2,3]. At population level, multimorbidity is associated with substantially higher odds of hospitalisation and a modest increase in readmission, although its relationship with length of stay is less consistent [4]. Service use is therefore produced by more than the number of diagnoses. Clinical severity matters, but so do access, continuity, family support, transport, referral practice, and the organisation of local services. Reviews of multimorbidity care emphasise comprehensive assessment, shared decisions, individualised plans, and coordination across settings because disease-by-disease systems can leave patients carrying the work of integration themselves [5,6].

1.2. Health Literacy, Navigation, and Help-Seeking

Health literacy concerns the knowledge, motivation, and competencies used to access, understand, appraise, and apply health information [7]. In multimorbidity, this includes more than reading instructions. Patients must compare recommendations, recognise warning signs, communicate across professional groups, and judge when a problem can be managed at home and when it requires routine, urgent, or hospital care. The 16-item short version of the European Health Literacy Survey Questionnaire (HLS-EU-Q16) captures perceived difficulty with these tasks across healthcare, disease prevention, and health promotion [8,9]. Limited health literacy has repeatedly been linked with poorer health outcomes, less effective communication, and greater use of emergency or hospital services [10–13]. Yet the literature is not uniform. Studies use different instruments, populations, and definitions of utilisation, and the same contact can represent delayed crisis care in one setting but timely, appropriate help-seeking in another [11,12]. Preventable ED use is only one part of the picture [14]. For that reason, the expected direction of association is not straightforward. Better health literacy may reduce avoidable use by improving adherence, symptom monitoring, and use of routine care. It may also increase appropriate contact by helping people identify deterioration, describe symptoms clearly, request a referral, or navigate a complex system. A positive association with service use cannot, by itself, be read as evidence of harm, inefficiency, or poor self-management [15].

1.3. Self-Efficacy: Understanding Is Not the Same as Acting

Chronic-disease self-efficacy refers to confidence in carrying out the actions required to manage illness. It includes confidence in symptom control, activity, emotional coping, obtaining support, and communication with clinicians [16,17]. Health literacy and self-efficacy are related, but they are not interchangeable. Evidence from chronic-disease populations indicates that health literacy and self-efficacy are associated with quality of life [18]. Evidence on the broader construct of patient activation, which combines knowledge, skills, and confidence, suggests an inverse association with hospitalisation and ED use in chronic-disease populations [19]. At the same time, older adults receiving acute or inpatient care tend to report lower general self-efficacy than those receiving care in less intensive settings [20]. Both pathways are plausible: low confidence may make early self-management harder, while serious illness, functional loss, and recent hospital care may erode confidence. Treatment burden sharpens this distinction. Even a well-informed patient may struggle when appointments, medicines, monitoring, travel, and lifestyle recommendations compete for limited time and energy [21]. Understanding a care plan does not necessarily ensure it can be followed when pain, fatigue, financial constraints, competing treatment demands, or inadequate support interfere with daily management [21]. These considerations suggest a hypothesis that self-efficacy might be associated with decisions

about seeking care; however, cross-sectional associations cannot establish when confidence changes relative to urgent-care use.

1.4. What Healthcare Utilisation Does and Does Not Represent

Healthcare utilisation is often treated as a single outcome, but contacts with different services do not carry the same meaning. A planned GP visit may support prevention or medication review. An ED visit may represent necessary escalation, delayed access to primary care, uncertainty about symptoms, or a preference shaped by previous experience. Hospital admission may be appropriate and unavoidable. Counts alone cannot distinguish these possibilities [22].

Recent intervention evidence illustrates the problem. A 2025 systematic review of multimorbidity interventions found limited and inconsistent effects on utilisation overall. Self-management support was associated with fewer hospitalisations but slightly more ED visits, while care coordination combined with self-management support was linked to fewer hospitalisations and ED visits but more outpatient and GP contacts [23]. These patterns are better understood as possible redistribution of care across settings than as a simple reduction in use. The content of support also matters. Reviews of disadvantaged older adults favour accessible, culturally responsive, multicomponent approaches rather than information alone [24]. Qualitative evidence shows why: older people with multimorbidity describe reduced physical capacity, anxiety, financial pressure, disrupted daily routines, weak coordination, and reliance on family and professionals [25]. Such constraints can shape both confidence and the ability to obtain timely care. Evidence from emergency care is similarly cautious. Systematic reviews have found that many ED-based interventions do not consistently reduce revisits or admissions. The more promising approaches combine early geriatric assessment, care coordination, referral, and follow-up, while acknowledging that some recurrent use reflects frailty and disease trajectory rather than a remediable failure of patient behaviour [26,27]. Utilisation should therefore be interpreted alongside outcomes that matter to older adults. Independence, physical function, quality of life, mental wellbeing, and the experience of coordinated care may be more important than reducing every contact [28]. Nurse-led and multidisciplinary models can strengthen self-management, adherence, function, and continuity, with some evidence of lower readmission or healthcare burden, but effects depend on context and implementation [29].

1.5. Albanian Primary Care and the Research Programme

The Albanian setting may influence how health literacy and confidence translate into realised care. National research has linked primary-care use with geographical proximity, financial circumstances, perceived quality, professional attitudes, chronic illness, and diagnostic resources [30]. Primary-care staff in Vlora have described gaps in infrastructure, protocols, referral pathways, and coordination for people with multimorbidity [31]. Similar constraints are reported across resource-limited settings, where distance, workforce shortages, fragmented services, and weak person-centred care can shift demand towards emergency or hospital services [32]. This is the third manuscript from the same participant cohort. The first paper reported the association between health literacy and chronic-disease self-efficacy [1]. A separate measurement paper examines the structure and group comparability of the HLS-EU-Q16. The current analysis addresses a distinct outcome question: whether health literacy and self-efficacy are independently associated with the occurrence and intensity of healthcare use.

1.6. Study Aim and Hypotheses

The aim was to estimate the independent associations of health literacy and chronic-disease self-efficacy with six-month GP, ED, and hospital utilisation among adults aged 65 years or older with multimorbidity receiving primary care in Vlora Municipality. The analysis separated the occurrence of ED and hospital use from frequency or duration among users because the factors that lead to service entry may differ from those that shape care after entry. Higher self-efficacy was expected to be associated with lower utilisation, particularly a lower probability of urgent or hospital care. No directional hypothesis was imposed for health literacy because both reduced avoidable use and improved access to appropriate care were plausible. Interaction analyses were exploratory (Table 1).

Table 1. Study objectives, research questions, and analytical approach.

Objective	Research Question (RQ)	Primary Analysis	Purpose
Describe utilisation	RQ1. How common and how variable were GP, ED, admission, and hospital-night counts?	Descriptive statistics	Establish the distribution, skewness, and proportion of zero use.
Assess GP frequency	RQ2. Are health literacy and self-efficacy independently associated with the number of GP visits?	Negative-binomial regression	Model an overdispersed count outcome with relatively few zeros.
Assess occurrence	RQ3. Are the two exposures associated with whether any ED or hospital use occurred?	Logistic regression	Estimate the odds of crossing the threshold into each service.
Assess intensity	RQ4. Among users, are the exposures associated with frequency or duration?	Zero-truncated Poisson or negative-binomial regression	Model positive counts when zero is impossible by design.
Test robustness	RQ5. Do the findings persist under alternative count specifications and after excluding discordant hospital records?	Sensitivity analyses	Evaluate dependence on model form and data consistency.
Clarify coefficient changes	RQ6. Does adding self-efficacy change the estimated health-literacy association?	Sequential models	Describe statistical suppression or negative confounding; not mediation.
Explore effect modification	RQ7. Does the health-literacy association differ across levels of self-efficacy?	Centred interaction models	Generate hypotheses about whether information and confidence operate jointly.

Scientific contribution. Previous work established a positive association between health literacy and self-efficacy in this cohort [1]. This study contributes a different, service-specific question: whether these two distinct capacities are independently associated with the occurrence of emergency or hospital use and, among users, with subsequent frequency or duration. Separating these components helps distinguish associations with any contact from those with intensity, a clinically important distinction because multimorbidity interventions can change utilisation differently across care settings [23]. The results are interpreted as conditional cross-sectional associations, not mechanisms of help-seeking or indicators of care quality.

2. Materials and Methods

2.1. Study Design, Reporting Framework, and Cohort Overlap

This article reports a secondary analysis of a cross-sectional study of community-dwelling older adults with multimorbidity receiving primary healthcare in Vlora Municipality, Albania. No additional participants were recruited, and no new variables were collected for this paper. The cohort, health-literacy measure, self-efficacy measure, and selected descriptive characteristics were reported in the first publication [1]. The present hypotheses, healthcare-utilisation outcomes, two-part count models, sensitivity analyses, sequential models, and interaction analyses are distinct. Reporting was organised with reference to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations for cross-sectional studies [33]. Health literacy and self-efficacy were measured at the study assessment, while utilisation referred to the preceding six months. This design does not establish temporal ordering. All regression results are therefore interpreted as adjusted associations, not as causal effects, mediation effects, or predictions of future utilisation.

2.2. Study Setting

The study was conducted in five public primary healthcare centres in Vlora Municipality, southern Albania. The centres served urban and surrounding administrative areas, including Novoselë and Orikum. Centre indicators were included in every adjusted model because differences in staffing, access, referral practices, diagnostic resources, and service organisation could influence utilisation independently of patient characteristics [30,31]. Participants were recruited from February to July 2025. The analytical residence variable included urban, peri-urban, and rural categories.

2.3. Participants and Eligibility

Eligible participants were aged 65 years or older, lived in the community, had at least two physician-diagnosed chronic conditions, were registered with and receiving care from a participating centre, and provided written informed consent. People with documented cognitive impairment that prevented informed consent or reliable questionnaire completion, including diagnosed dementia, were excluded, as were those who declined participation.

2.4. Sampling and Recruitment

Primary healthcare centres were selected using the procedure described in the parent study [1]. Sampling was stratified by place of residence. Within each participating centre, eligible individuals were selected from family-physician registers using a randomised list and approached sequentially until the required allocation was reached. If a selected person was ineligible or declined, the next eligible person was invited. Recruitment continued until 464 participants had been enrolled.

2.5. Sample-Size Basis

The parent study estimated a minimum sample of 384 using a single-proportion formula with 95% confidence, an expected proportion of 0.50, and a margin of error of 0.05 [1]. The target was increased by approximately 20% to accommodate ineligibility and non-response, producing a recruitment goal of 464. This was a survey sample-size calculation, not an outcome-specific power analysis for the current regressions. All eligible observations were retained, and uncertainty is presented through 95% confidence intervals.

2.6. Data Collection and Questionnaire Administration

The questionnaire covered sociodemographic and clinical characteristics, health literacy, chronic-disease self-efficacy, and healthcare utilisation. The questionnaires were administered by the main researcher and the doctoral student, while healthcare utilisation counts were self-reported by study participants. Recorded characteristics included age, gender, education, self-rated health, number of chronic diseases, primary healthcare centre, and residence. Weight and height were used to calculate body mass index (BMI). The database contained responses to all 16 health-literacy items and all 33 self-efficacy items.

2.7. Healthcare-Utilisation Outcomes

Four non-negative count outcomes over the preceding six months were assessed: GP visits, ED visits, hospital admissions, and hospital nights. For ED visits, admissions, and hospital nights, two-part outcomes distinguished any use (zero vs. $\geq$1) from positive frequency or duration among users. GP visits, with few zeros, were analysed as a single full-sample count.

2.8. Health Literacy

Health literacy was assessed using the 16-item HLS-EU-Q16, based on the European Health Literacy Survey (HLS-EU) framework [7–9]. Items cover access, understanding, appraisal, and application of health information. Responses were coded 1 for fairly/very easy and 0 for fairly/very difficult, yielding a complete 0–16 score, with higher values indicating greater perceived health literacy. The continuous score was used in all regressions; inadequate (0–8), problematic (9–12), and adequate (13–16) levels were used descriptively [9]. The measure reflects perceived health literacy rather than direct reading or numeracy performance.

2.9. Chronic-Disease Self-Efficacy

Chronic-disease self-efficacy was assessed using a 33-item Chronic Disease Self-Efficacy Scale (CDSES-33), derived from Stanford chronic-disease self-management measures [16]. Items were rated from 1 (not at all confident) to 10 (totally confident) across nine domains. Domain scores were calculated as item means, and the overall score as the unweighted mean of the nine domains, ensuring equal domain contribution. Scores ranged from 1–10, with higher values indicating greater confidence. The continuous overall score was used in all models.

2.10. Albanian-Language Translation and Adaptation of Data Collection Instruments

Both instruments used for data collection, HLS-EU-Q16 and CDSES-33, are validated, and their English versions are open-source and available for use without permission. The 16-item HLS-EU-Q16 and CDSES-33 were independently translated and culturally adapted into Albanian by bilingual specialists. The clarity and appropriateness of the translated versions were then evaluated through pilot testing with native Albanian speakers. Before finalisation, the instruments were revised and proofread in response to participant feedback.

This process supported the linguistic appropriateness of the Albanian versions, although their formal cross-cultural validity has not been fully established.

2.11. Covariates and Coding

Covariates were prespecified based on their potential associations with healthcare need, access, health literacy, self-management, and service organisation. The same adjustment set was used in all models: age, gender, education, BMI, self-rated health, chronic-disease count, health centre, and residence. No automated covariate selection was applied. Self-rated health was grouped as excellent/very good, good, and fair/poor; chronic-disease count as two versus three conditions; health centre as a five-level fixed effect; and residence as urban, peri-urban, or rural. Reference categories were male, primary education, excellent/very good health, two conditions, Centre 1, and urban residence. Fixed centre effects were used because only five centres were available.

2.12. Data Management and Quality Assurance

Data preparation was independently reproduced in Stata Statistical Software, Version 18 (StataCorp LLC, College Station, TX, USA) and R software, version 4.3.3. including checks of identifiers, duplicates, variable types, ranges, outcome validity, BMI, HLS-EU-Q16, self-efficacy scores, and missingness. Reconstructed values matched the stored variables. All 464 participants had complete data for primary analyses; therefore, no imputation was performed. A prespecified consistency flag identified 12 participants (2.6%) reporting admissions without hospital nights or vice versa. They were retained in the primary analysis because the discrepancy could not be resolved retrospectively. Admission and hospital-night models were repeated after their exclusion.

2.13. Reliability of the Exposure Measures

Internal consistency was assessed using Cronbach's alpha [34]. Alpha was 0.924 for HLS-EU-Q16 and 0.974 for overall self-efficacy, with domain values of 0.840–0.958. These coefficients support internal consistency of the exposure scores in this sample but do not establish Albanian-language cultural validity, structural validity, or subgroup measurement equivalence.

2.14. Statistical Analysis and Rationale

The analytical strategy linked the outcome component to the corresponding research question: RQ2 considered GP-visit counts in all participants, RQ3 assessed any acute or hospital use, and RQ4 examined positive frequency or duration conditional on use. Model selection additionally considered the distributions of the observed outcomes. GP use was common, whereas ED and hospital outcomes had many zeros. Poisson, negative-binomial, hurdle, and zero-inflated models address dispersion and zero values differently [35–37]. A prespecified sequence of distribution checks, model selection, convergence and support assessment, common covariate adjustment, and sensitivity, interaction, sequential, and cross-software analyses was followed to minimise data- and *p*-value–driven model selection.

2.14.1. Descriptive Analysis and Preliminary Data Checks

Continuous characteristics were summarised using means and standard deviations, and categorical variables using frequencies and percentages. Healthcare counts were additionally described by medians, interquartile ranges, ranges, and zero/positive-use proportions to account for skewness. Data checks confirmed identifier uniqueness, valid outcome ranges and codes, and reconstruction of BMI, HLS-EU-Q16, self-efficacy domains, and

overall self-efficacy. All 464 participants had complete data for primary models; therefore, no imputation was required. These checks ensured data integrity and model eligibility.

2.14.2. Assessment of Overdispersion and Poisson Adequacy

Poisson regression assumes equidispersion, whereas negative-binomial regression allows variance to exceed the mean through an estimated dispersion parameter [36,37]. All outcomes showed significant overdispersion: chibar^2 = 142.81 for GP visits, 157.64 for ED visits, 76.74 for admissions, and 1221.19 for hospital nights (all $p < 0.001$). Negative-binomial regression was therefore used for full-sample counts, reducing the risk of underestimated standard errors and overstated precision.

2.14.3. Negative-Binomial Model for GP Visits

GP visits were analysed using a full-sample negative-binomial model because 86.6% of participants reported at least one visit and RQ2 focused on overall consultation frequency. A two-part model would have shifted the estimand to separate use and frequency processes. The log-link model yielded incidence-rate ratios (IRR = $\exp(\beta)$), representing multiplicative changes in expected GP-visit rates per one-point increase in health literacy or self-efficacy, adjusted for covariates. Model checks confirmed convergence, finite estimates, $n = 464$, robust covariance estimation, and reproduction of estimates in R [35–37].

2.14.4. Two-Part Strategy for ED and Hospital Outcomes

ED visits had 42.2% zero values, whereas admissions and hospital nights each had 69.4%. A two-part (hurdle-type) approach was chosen to address two distinct research questions: whether any service use occurred, and the frequency or duration among participants with at least one episode [35–37]. Logistic regression modelled any use, while zero-truncated count regression modelled the positive counts. The two estimates refer to different conditional quantities and were interpreted separately. The two-part specification was selected for its correspondence with the study questions, not because a latent "always-zero" group had been demonstrated; zero-inflated models address a different mixture assumption and were not the prespecified estimand of interest [35,36].

2.14.5. Choice of Positive-Count Distribution

Positive counts were modelled separately because truncation changes the outcome support and likelihood. ED visits ($n = 268$) and hospital nights ($n = 142$) remained overdispersed and were analysed using zero-truncated negative-binomial models. Admissions ($n = 142$) showed negligible dispersion, so a more parsimonious zero-truncated Poisson model was used. All models met checks for positive outcomes, expected sample size, convergence, finite estimates and confidence intervals, robust covariance estimation, and reproducibility in R software, version 4.3.3. Findings from the smaller admission and hospital-night samples were interpreted cautiously given the relatively large covariate set.

2.14.6. Covariate Strategy, Centre Adjustment, and Effect Measures

Health literacy and self-efficacy were entered simultaneously because they were positively related but potentially had distinct associations with healthcare use. Joint modelling provided coefficients conditional on the other construct and reduced potential omitted-variable distortion. Covariates were prespecified based on demographic characteristics, information resources, health need, geographical access, and service organisation, and the same set was retained across all primary models without stepwise selection [35,37]. Centre was included as a five-level fixed effect to account for average differences among the participating centres. Huber–White heteroskedasticity-robust standard errors were

used [38,39], but they were not adjusted for within-centre correlation. Centre fixed effects and cluster-robust inference address different issues; with only five centres, conventional cluster-robust variance estimation can have unreliable conventional standard errors. Inference should therefore be interpreted with this constraint in mind. Logistic and count effects are reported as ORs and IRRs, respectively, with 95% CIs, representing conditional associations per one-point exposure increase.

2.14.7. Sensitivity and Record-Consistency Checks

Sensitivity analysis was used to test model dependence rather than to search for a preferred result. First, ED visits, admissions, and hospital nights were re-analysed as single full-sample negative-binomial counts. These models intentionally collapsed occurrence and intensity and therefore tested whether the main directional conclusions survived a different estimand. Second, admission and hospital-night models were repeated after excluding the 12 participants with discordant admission and night reports. Third, outcome definitions, exposure coding, reference categories, and covariates were held constant across specifications. Robustness was judged from the consistency of direction, magnitude, confidence intervals, and substantive interpretation, not solely from whether p values remained below 0.05.

2.14.8. Sequential Models and Assessment of Statistical Suppression

Sequential logistic models assessed any ED use and hospital admission. Model 1 included health literacy, Model 2 added self-efficacy, and Model 3 added all covariates. This was not a mediation analysis, as temporal and causal requirements were unmet. Instead, the analysis assessed whether adjusting for the positively correlated self-efficacy measure altered the health-literacy association, consistent with statistical suppression or negative confounding [40]. These comparisons describe coefficient changes across nested specifications; because the exposure measures were obtained at the survey and earlier care use was recalled, they cannot identify causal suppression mechanisms or mediation.

2.14.9. Exploratory Interaction Analysis and Multiplicity Control

Health literacy and self-efficacy were mean-centred before interaction testing. Interactions were assessed for GP visits, ED use, admissions, and hospital nights, using a Bonferroni threshold of 0.0125 for the four exploratory tests [41]. For GP visits, adjusted predictions and conditional health-literacy slopes were examined at self-efficacy levels of −1 SD, mean, and +1 SD. Interaction findings were interpreted based on consistency across product-term tests, conditional slopes, multiplicity adjustment, and software replication.

2.14.10. Convergence, Reproducibility, and Scope of the Reported Checks

Primary analyses were conducted in Stata Statistical Software, Version 18 (StataCorp LLC, College Station, TX, USA) [42] and independently replicated in R software, version 4.3.3 [43], including full-count, two-part, sensitivity, sequential, and interaction analyses. Reproducibility was assessed by comparing sample sizes, estimates, confidence intervals, and conclusions. Results were consistent across programs, with minor differences in robust CIs and p-values that did not affect main-effect conclusions. Only available diagnostics are reported; unavailable residual, influence, collinearity, link, and calibration diagnostics were not assessed.

2.14.11. Statistical Decision Rules and Interpretation Boundaries

All primary tests were two-sided, with $p < 0.05$ and 95% CIs excluding 1.00 indicating prespecified main exposure associations. The Bonferroni threshold applied only to the four exploratory interaction tests; no correction was applied to secondary covariate coefficients.

Effect sizes and CIs were prioritised over significance labels. Given the cross-sectional design and retrospective six-month utilisation data, results represent adjusted associations rather than causal effects, future risks, preventable use, or mediation pathways. Reporting followed STROBE principles [33].

2.15. Ethical Considerations

The parent study was conducted in accordance with the Declaration of Helsinki and applicable European research-ethics standards. Participation was voluntary and written informed consent was obtained. Personal data were handled in accordance with Albanian Law No. 9887 of 10 March 2008, as amended by Law No. 48/2012. The study was reviewed by the Operator of Health Care Services, the Regional Directorate of Vlora, and the Directorate of Public Health and Health Education. Ethical approval was granted on 3 June 2024 (No. 1084/1).

3. Results

3.1. Analytical Sample and Data-Quality Checks

All 464 enrolled participants contributed to every full-sample primary model. There were no duplicate identifiers, no missing values in the model variables, and no out-of-range exposure values. Reconstructed BMI, HLS-EU-Q16, self-efficacy domain, and total self-efficacy values agreed with the stored analytical variables. The positive-count samples comprised 268 ED users, 142 participants reporting at least one admission, and 142 reporting at least one hospital night. The latter groups were not identical: 12 records (2.6%) were discordant between admission and hospital-night reports; retaining them in the primary analysis preserved the original data, while exclusion analyses tested whether they drove the hospital findings.

3.2. Participant Characteristics

The mean age was 69.93 years (SD 4.72; range 65–84), and 252 participants (54.3%) were women. Primary education was the highest completed level for 52.4%, and 89.7% reported two chronic diseases. Urban and rural residents each represented approximately 45% of the sample, while 10.8% were classified as peri-urban. Mean health literacy was 10.69 (SD 4.79): 31.7% had inadequate, 25.4% problematic, and 42.9% adequate health literacy. Mean chronic-disease self-efficacy was 5.56 (SD 1.78) on the 1–10 scale (Table 2).

3.3. RQ1: Distribution of Healthcare Utilisation

GP contact was common: 402 participants (86.6%) reported at least one visit, and the mean was 2.86 visits over six months. ED use was reported by 268 participants (57.8%). Hospital use was less frequent: 142 participants (30.6%) reported at least one admission and the same number reported at least one hospital night. All outcomes were right-skewed, with maxima of 20 GP visits, 30 ED visits, 10 admissions, and 35 hospital nights. The variances derived from the reported standard deviations were approximately 8.29 for GP visits, 4.54 for ED visits, 1.37 for admissions, and 16.73 for hospital nights, each exceeding its corresponding mean. Together with the zero proportions and the formal dispersion tests, this pattern supported negative-binomial full-count models and separate occurrence/intensity models for ED and hospital outcomes (Table 3).

Table 2. Participant characteristics (n = 464).

Characteristic	Category or Statistic	n (%) or Mean ± SD	Range
Age, years	Mean ± SD	69.93 ± 4.72	65–84
Body mass index, kg/m^2	Mean ± SD	26.48 ± 4.58	17.58–57.21
Health-literacy score	Mean ± SD	10.69 ± 4.79	0–16
Health-literacy category	Inadequate (0–8)	147 (31.7)	—
	Problematic (9–12)	118 (25.4)	—
	Adequate (13–16)	199 (42.9)	—
Chronic-disease self-efficacy	Mean ± SD	5.56 ± 1.78	1–10
Gender	Male	212 (45.7)	—
	Female	252 (54.3)	—
Education	Primary	243 (52.4)	—
	Secondary	169 (36.4)	—
	Tertiary	52 (11.2)	—
Self-rated health	Excellent/very good	83 (17.9)	—
	Good	320 (69.0)	—
	Fair/poor	61 (13.1)	—
Number of chronic diseases	Two	416 (89.7)	—
	Three	48 (10.3)	—
Health centre	Centre 1	234 (50.4)	—
	Centre 2	94 (20.3)	—
	Centre 3	64 (13.8)	—
	Centre 4	33 (7.1)	—
	Centre 5	39 (8.4)	—
Residence	Urban	208 (44.8)	—
	Peri-urban	50 (10.8)	—
	Rural	206 (44.4)	—

Note. Percentages may not total 100 because of rounding. Health-literacy categories were used descriptively; continuous scores were used in regression models.

Table 3. Six-month healthcare utilisation (n = 464).

Outcome	Mean ± SD	Median (IQR)	Range	Any Use, n (%)	Zero Use, n (%)
General-practitioner visits	2.86 ± 2.88	2.0 (1.0–3.5)	0–20	402 (86.6)	62 (13.4)
Emergency-department visits	1.32 ± 2.13	1.0 (0–2)	0–30	268 (57.8)	196 (42.2)
Hospital admissions	0.55 ± 1.17	0 (0–1)	0–10	142 (30.6)	322 (69.4)
Hospital nights	1.63 ± 4.09	0 (0–2)	0–35	142 (30.6)	322 (69.4)

Note. SD = Standard deviation. IQR = interquartile range. Any use denotes a count greater than zero.

3.4. RQ2: Associations with GP-Visit Frequency

In the fully adjusted negative-binomial model, health literacy was not associated with GP-visit frequency (IRR 1.002, 95% CI 0.982–1.023; $p = 0.820$). The confidence interval was compatible with effects ranging from about 1.8% fewer to 2.3% more visits per health-literacy point, providing no evidence of a monotonic association of practical size across the scale. Each one-point increase in self-efficacy was associated with a 9.1% lower expected GP-visit rate (IRR 0.909, 95% CI 0.857–0.964; $p = 0.002$). Under the fitted log-linear model, an illustrative two-point difference in self-efficacy corresponds to an expected rate ratio of approximately 0.83, or 17.4% fewer visits, with all other variables held constant. This remains an adjusted association rather than evidence that increasing confidence would cause consultation rates to fall. Among secondary covariates, secondary and tertiary education, higher BMI, and peri-urban residence were associated with lower GP rates, while fair/poor self-rated health and attendance at Centre 5 were associated with higher rates. The centre indicators were jointly associated with GP visits ($p < 0.0001$), indicating that between-centre differences remained after adjustment for measured patient characteristics. Residence did not reach joint significance ($p = 0.068$). These covariate estimates were not multiplicity-adjusted and should be read as contextual information rather than separate confirmatory findings.

3.5. RQ3: Associations with the Occurrence of Emergency and Hospital Use

Health literacy and self-efficacy showed opposite associations with whether acute or hospital use occurred. Each one-point increase in health literacy was associated with higher odds of any ED use (OR 1.112, 95% CI 1.055–1.172; $p < 0.001$), any hospital admission (OR 1.097, 95% CI 1.034–1.164; $p = 0.002$), and any hospital night (OR 1.092, 95% CI 1.031–1.157; $p = 0.003$). These correspond to 11.2%, 9.7%, and 9.2% higher odds per point. Assuming the fitted linear log-odds relation, an illustrative four-point health-literacy difference corresponds to ORs of approximately 1.53, 1.45, and 1.42, respectively. These are odds ratios rather than absolute probability differences; the change in predicted probability depends on baseline risk and the other covariates. Higher self-efficacy was associated with lower odds of each outcome. The OR was 0.731 for any ED use (95% CI 0.632–0.846), 0.636 for any admission (95% CI 0.538–0.752), and 0.647 for any hospital night (95% CI 0.548–0.764); all $p < 0.001$. These estimates correspond to 26.9%, 36.4%, and 35.3% lower odds per point. For an illustrative two-point difference, the fitted ORs are approximately 0.53, 0.40, and 0.42. The consistency of direction across three related outcomes supports a coherent occurrence pattern, but the estimates may still reflect reverse causation or unmeasured illness severity. Tertiary education was associated with lower odds of any ED use. Women had lower odds of any admission and any hospital nights. Centre 2 was associated with higher odds of ED use, and Centre 5 with higher odds of admission and hospital nights. Centre indicators were jointly significant for any ED use ($p = 0.004$), admission ($p = 0.014$), and hospital nights ($p = 0.040$). Because the centre coefficients may reflect access, referral practice, capacity, or case mix, they should not be interpreted as rankings of centre quality.

3.6. RQ4: Associations with Utilisation Intensity Among Users

Among the 268 ED users, neither health literacy (IRR 1.007, 95% CI 0.960–1.056; $p = 0.785$) nor self-efficacy (IRR 0.922, 95% CI 0.814–1.046; $p = 0.207$) was associated with visit frequency. The health-literacy interval excluded large rate changes per point, while the self-efficacy interval remained compatible with a modest inverse or near-null association. The contrast with the binary component indicates that the principal exposure pattern concerned whether ED use occurred, not the number of visits after entry. Among the 142 admitted participants, health literacy was associated with admission frequency (IRR 1.085,

95% CI 1.014–1.160; $p = 0.018$), equivalent to an 8.5% higher rate per point. Self-efficacy was not associated with admission frequency (IRR 0.997, 95% CI 0.823–1.206; $p = 0.972$). Older age was associated with a slightly lower rate, while women had a higher rate among admitted participants. This component is conditional on having been admitted and therefore concerns a selected subgroup. It cannot be interpreted as the population-wide effect of health literacy on admissions, and the smaller sample and multiple covariates increase uncertainty. Among the 142 participants with positive hospital-night counts, neither health literacy (IRR 0.991, 95% CI 0.951–1.033; $p = 0.665$) nor self-efficacy (IRR 0.913, 95% CI 0.818–1.018; $p = 0.102$) was associated with length of stay. The self-efficacy estimate was directionally inverse but its interval included the null, so the data did not distinguish a modest association from no association. Secondary education and peri-urban residence were associated with fewer nights, while fair/poor self-rated health was associated with more nights; these secondary estimates require cautious interpretation (Table 4).

3.7. RQ5: Robustness of the Main Associations

Full-sample negative-binomial sensitivity models supported the main directional pattern. Health literacy was associated with the total number of ED visits (IRR 1.049; $p = 0.002$) and admissions (IRR 1.082; $p = 0.003$), but not hospital nights (IRR 1.040; $p = 0.126$). Self-efficacy remained inversely associated with all three full counts (all $p < 0.001$). Because these models combine non-use and positive intensity, their agreement with the occurrence components indicates that the main signal was sufficiently strong to remain visible even when the two processes were collapsed. After excluding the 12 discordant hospital records, health literacy remained associated with admissions (IRR 1.080; $p = 0.004$) and remained unassociated with hospital nights (IRR 1.041; $p = 0.127$). Self-efficacy remained inversely associated with both outcomes. The close similarity of estimates before and after exclusion indicates that these records were not responsible for the substantive conclusions, although the underlying reason for the discordance still requires documentation (Table 5).

3.8. RQ6: Sequential Models and Statistical Suppression

The health-literacy coefficient became more positive when self-efficacy was introduced. For any ED use, the OR increased from 1.052 in the health-literacy-only model to 1.110 after adding self-efficacy and remained 1.112 after full adjustment. For admission, health literacy was not statistically associated when entered alone (OR 1.033; $p = 0.128$), but increased to 1.112 after self-efficacy was added and remained 1.097 after full adjustment ($p = 0.002$). Most of the coefficient change therefore occurred when self-efficacy entered the model, whereas the remaining covariates produced comparatively little additional change. Because health literacy and self-efficacy were positively correlated in the cohort but had utilisation coefficients in opposite directions, the addition of self-efficacy changed the conditional health-literacy coefficient, making it more positive in the fitted models. The coefficient pattern is descriptively consistent with statistical suppression or negative confounding [40], although differences in logistic odds ratios across nested models also require caution because of their conditional scale. The sequential analysis does not identify a mediator, prove a causal structure, or imply that self-efficacy should be statistically "controlled away" in every substantive analysis; rather, it demonstrates that the estimated health-literacy association depends on whether confidence to manage illness is represented.

Table 4. Adjusted associations of health literacy and chronic-disease self-efficacy with healthcare utilisation.

Outcome and Component	Model	*n*	Health Literacy OR/IRR (95% CI)	*p* Value	Self-Efficacy OR/IRR (95% CI)	*p* Value
GP visits	Negative binomial	464	1.002 (0.982–1.023)	0.820	0.909 (0.857–0.964)	0.002
Any ED use	Logistic	464	1.112 (1.055–1.172)	<0.001	0.731 (0.632–0.846)	<0.001
ED visits among users	Zero-truncated negative binomial	268	1.007 (0.960–1.056)	0.785	0.922 (0.814–1.046)	0.207
Any hospital admission	Logistic	464	1.097 (1.034–1.164)	0.002	0.636 (0.538–0.752)	<0.001
Admissions among admitted participants	Zero-truncated Poisson	142	1.085 (1.014–1.160)	0.018	0.997 (0.823–1.206)	0.972
Any hospital nights	Logistic	464	1.092 (1.031–1.157)	0.003	0.647 (0.548–0.764)	<0.001
Hospital nights among users	Zero-truncated negative binomial	142	0.991 (0.951–1.033)	0.665	0.913 (0.818–1.018)	0.102

Note. ORs = Odds ratios. All models included health literacy, self-efficacy, age, gender, education, BMI, self-rated health, number of chronic diseases, health centre, and residence. Logistic models are reported as ORs; count models as IRRs. Robust standard errors were used. Reference categories were male, primary education, excellent/very good self-rated health, two chronic diseases, Centre 1, and urban residence.

Table 5. Sensitivity analyses.

Sensitivity Analysis	Model	*n*	Health Literacy IRR (95% CI)	*p* Value	Self-Efficacy IRR (95% CI)	*p* Value
ED visits, full sample	Negative binomial	464	1.049 (1.017–1.081)	0.002	0.840 (0.774–0.913)	<0.001
Hospital admissions, full sample	Negative binomial	464	1.082 (1.028–1.139)	0.003	0.744 (0.643–0.860)	<0.001
Hospital nights, full sample	Negative binomial	464	1.040 (0.989–1.094)	0.126	0.666 (0.575–0.772)	<0.001
Admissions, excluding discordance	Negative binomial	452	1.080 (1.025–1.138)	0.004	0.741 (0.640–0.859)	<0.001
Hospital nights, excluding discordance	Negative binomial	452	1.041 (0.989–1.096)	0.127	0.659 (0.566–0.769)	<0.001

Note. Full-sample models include zero and positive counts in one negative binomial model. Discordance analyses excluded 12 participants whose admission and hospital-night reports were inconsistent.

3.9. RQ7: Exploratory Interaction Between Health Literacy and Self-Efficacy

For GP visits, the health-literacy × self-efficacy interaction was IRR 0.988 (95% CI 0.979–0.998; $p = 0.018$ in Stata) [38,39,41]. The coefficient below 1 indicates that the health-literacy slope became less positive as self-efficacy increased. Model-based predictions rose across health-literacy scores at low self-efficacy, were nearly flat at mean self-efficacy, and declined at high self-efficacy. However, none of the three conditional slopes was individually distinguishable from zero, so the crossing lines in Figure 1 should not be

interpreted as three confirmed subgroup effects. The interaction did not meet the Bonferroni reference threshold of $p < 0.0125$ in the primary Stata analysis, although the identical point estimate produced $p = 0.011$ with the R robust-covariance implementation. No interaction evidence was observed for any ED use, admission, or hospital nights. Taken together, multiplicity adjustment, software sensitivity, and non-significant conditional slopes prevent a confirmatory interpretation. Figure 1 is retained because it communicates the direction of the hypothesis for future testing, not because it establishes effect modification.

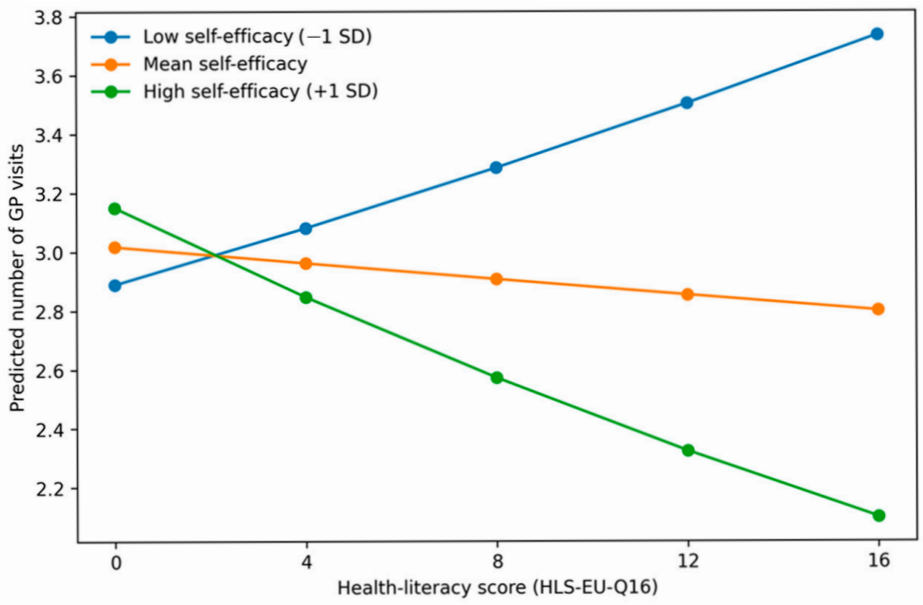


Figure 1. Exploratory adjusted predictions of general-practitioner visits across health-literacy scores at low, mean, and high chronic-disease self-efficacy. Note. Predictions are from the fully adjusted GP negative-binomial interaction model. Low and high self-efficacy represent one standard deviation below and above the mean. The interaction was exploratory and estimator-sensitive: $p = 0.018$ in the primary Stata analysis and $p = 0.011$ in the R robust-covariance replication. It did not meet the Bonferroni reference threshold of $p < 0.0125$ in the primary analysis, and none of the conditional health-literacy slopes was individually significant.

3.10. Cross-Software Reproducibility

Stata and R produced effectively identical primary point estimates and the same model-specific sample sizes. The main exposure conclusions were unchanged despite small differences in robust confidence intervals and p values. This agreement strengthens confidence that the findings were not caused by a single software implementation or coding pathway. The only practically relevant discrepancy concerned whether the exploratory GP interaction crossed the multiplicity-adjusted threshold, reinforcing the decision to treat that result as provisional.

3.11. Integrated Answers to the Research Questions

Across the seven research questions, the evidence supported a coherent distinction between service entry and subsequent intensity. Table 6 summarises the direct answer to each question and the principal qualification that should accompany interpretation.

Table 6. Integrated answers to the seven research questions.

Research Question	Main Result	Direct Answer	Interpretive Qualification
RQ1	Counts were right-skewed and overdispersed; ED and hospital outcomes had many zeros.	Different outcome components required different models.	Distributional checks guide model choice but do not establish substantive associations.
RQ2	HL: IRR 1.002, $p = 0.820$; CDSE: IRR 0.909, $p = 0.002$.	Self-efficacy, but not health literacy, was associated with GP frequency.	Fewer visits are not necessarily better, and causality cannot be inferred.
RQ3	HL ORs 1.092–1.112; CDSE ORs 0.636–0.731 for acute/hospital occurrence.	The two exposures had opposite adjusted associations with reporting any service use.	ORs are not absolute probabilities; residual need and reverse causation remain plausible.
RQ4	No exposure association with ED frequency or hospital nights; HL associated with admissions among admitted users.	Most exposure associations did not extend to intensity after entry.	Positive-count results apply only to users; admission analysis had N = 142.
RQ5	Full-count and discordance-exclusion analyses preserved the main directions.	Principal conclusions were not dependent on one specification or 12 discordant records.	Sensitivity agreement strengthens robustness but does not remove confounding.
RQ6	HL coefficients increased after CDSE was added.	Adding self-efficacy increased the conditional HL odds ratio in sequential models.	This is a change across nested logistic models, not proof of mediation or a causal suppression mechanism.
RQ7	GP interaction $p = 0.018$ in Stata and $p = 0.011$ in R; conditional slopes non-significant.	No confirmatory evidence of effect modification.	Figure 1 is hypothesis-generating and requires external confirmation.

Note. HL = health literacy; CDSE = chronic-disease self-efficacy; OR = odds ratio; IRR = incidence-rate ratio. All model results are adjusted associations.

4. Discussion

4.1. Main Findings

Health literacy and chronic-disease self-efficacy were positively associated in the parent study [1], yet they showed different conditional associations with recalled healthcare use when entered simultaneously in adjusted models. Higher self-efficacy was associated with fewer GP visits and lower odds of any ED or hospital use; higher health literacy was not

associated with GP-visit frequency but was associated with higher odds of any acute or hospital use. Among participants with service use, neither exposure was significantly associated with ED visit frequency or hospital-night duration; health literacy was associated with the number of admissions among admitted participants. The primary contribution of this analysis is to distinguish the occurrence of acute or hospital utilisation from its intensity after an initial episode. This distinction identifies where associations were concentrated and avoids interpreting a single service count as though it represented one clinical process. The observed associations cannot establish whether the measured patient capacities preceded healthcare use, whether visits were clinically appropriate, or whether the findings generalise beyond the five-centre Albanian cohort.

4.2. Self-Efficacy and the Threshold into Urgent Care

Higher self-efficacy was associated with lower odds of reported ED and hospital use, a pattern consistent with but not evidence for the hypothesis that confidence in symptom monitoring, action planning, and help-seeking may be relevant to care decisions. Previous evidence has linked patient activation to lower ED and hospital use [19], while treatment-burden research shows that practical demands can exceed the resources available to individuals with multimorbidity [21]. These observations should not be framed as a matter of individual responsibility. Self-efficacy may reflect symptoms, function, previous illness experiences, social support, and the feasibility of prescribed care. The reverse direction is equally plausible: an admission, difficult recovery, or repeated illness instability could diminish subsequent confidence, consistent with research documenting lower self-efficacy among older people receiving acute and inpatient care [20]. Importantly, utilisation was reported for the preceding six months, whereas self-efficacy was assessed at the survey. Consequently, the present data cannot determine whether lower confidence preceded greater utilisation or followed the healthcare experiences reported.

4.3. Why Was Higher Health Literacy Associated with Acute and Hospital Use?

The positive association between health literacy and acute or hospital service use requires interpretation without assuming that utilisation indicates either benefit or harm. Earlier reviews have associated limited health literacy with adverse health outcomes and emergency care [10–13], but such associations vary with the population, outcome definition, and healthcare context [14,15]. In the present study, the outcomes recorded whether an ED visit or hospital episode occurred, not whether the contact was preventable, delayed, clinically appropriate, or associated with improved health. Several non-exclusive explanations are plausible. Greater health literacy could assist some individuals in recognising concerning symptoms, describing them clearly, communicating with clinicians, or navigating referrals; health-literacy-related participation and navigation have been discussed in previous research [44,45]. Equally, repeated healthcare contacts during the previous six months could have increased familiarity with clinical information and service pathways before the survey-time literacy assessment. Unmeasured disease severity, frailty, treatment burden, access barriers, and differences in care coordination may have influenced both capacities and service use [21,30,31,46]. Neither the available data nor the adjusted models can distinguish these mechanisms. The sequential models additionally showed that the estimated positive health-literacy association became stronger after self-efficacy was included. This pattern is compatible with statistical suppression or negative confounding [40], but it is a conditional modelling observation rather than evidence that self-efficacy mediates any effect of health literacy or that a particular causal pathway has been established.

4.4. Healthcare Utilisation Is a Layered System Outcome

Healthcare use is often discussed as though less were always better. That assumption is unsafe in older adults with multimorbidity. A lower ED rate may reflect effective self-management and timely primary care, but it can also reflect transport barriers, cost, low trust, or delayed help-seeking. More GP contact may signal greater clinical need, but it may also represent monitoring and continuity; studies of navigation in multimorbidity show that care trajectories can involve substantial practical complexity [45].

The intervention literature reinforces the need for this distinction. A systematic review and meta-analysis of multimorbidity interventions found that changes in hospital, emergency, and outpatient use did not uniformly move in the same direction; combined care coordination and self-management support was associated with fewer hospitalisations and ED visits but more outpatient and GP visits [23]. Thus, a change in utilisation can reflect redistribution of care rather than a straightforward improvement or deterioration. Research involving emergency-department patients has also documented variation in health-literacy levels [47], but such cross-sectional evidence does not identify whether any particular visit was appropriate. Relevant patient outcomes include function, confidence, quality of life, and care experience as well as service counts [28]. GP visits, ED contacts, admissions, and hospital nights involve different pathways shaped by clinical severity, healthcare access, referral decisions, and institutional practices [30,31].

4.5. Occurrence and Intensity After Entry into Care

The two-part analysis found stronger adjusted associations for whether any ED or hospital use was reported than for positive frequencies or duration among users. Neither health literacy nor self-efficacy was significantly associated with ED visit frequency in the 268 ED users, or with hospital nights among the 142 participants reporting such nights. One possible explanation is that clinical need and service organisation become more influential once a patient is receiving emergency or inpatient care; however, these mechanisms were not measured directly and cannot be established from the present data. The absence of a statistically significant conditional association is not proof of no relationship, particularly given the smaller samples and resulting uncertainty.

Among the 142 participants with at least one admission, health literacy was positively associated with admission frequency (IRR 1.085, 95% CI 1.014–1.160; $p = 0.018$). This is a conditional association in a selected subgroup, estimated with a relatively extensive covariate set; it should not be interpreted as a population-wide effect or as evidence that higher literacy causes repeat admissions. Unmeasured disease severity, access, and previous healthcare experiences remain plausible explanations. The alternative full-count negative-binomial models retained the broad direction of the main findings, while the two-part specifications showed that the clearest associations concerned whether care occurred at all. These are complementary estimands, and neither identifies a causal pathway [35–37].

4.6. Primary-Care Organisation and Centre Variation

Health-centre indicators were associated with GP-visit rates and the occurrence of ED and hospital use after adjustment. These findings are compatible with differences in access, referral practice, capacity, and case mix, but the analyses cannot identify which of these factors contributed. Existing Albanian studies have reported variation in primary-care access and barriers in multimorbidity management [30,31], while reviews of utilisation management point to the importance of service-level arrangements [48]. The present analysis used fixed effects for the five participating centres to adjust for mean between-centre differences; it did not use cluster-robust standard errors. The resulting uncertainty estimates may not fully reflect within-centre correlation, and the small number of centres

limits reliable cluster-based inference. Centre coefficients must not be interpreted as quality rankings or as demonstrated organisational causes of individual healthcare use.

4.7. Implications for Clinical Practice and Service Design

Primary care should assess health literacy and self-efficacy separately, as patients may understand instructions but lack confidence to act, or feel confident while misunderstanding when to seek care. Brief questions on symptom management, medication use, exercise, communication, and access to support may identify needs missed by total scores. Support should combine health-literacy-responsive communication and teach-back with rehearsal, graded goals, problem-solving, caregiver involvement, and timely advice [49,50]. Tailored, multicomponent and nurse-led or multidisciplinary approaches may further strengthen self-management and continuity [24,29]. The goal should not be to reduce healthcare use overall, but to prevent avoidable crisis care while maintaining timely access and strengthening planned primary and community care [26,27].

4.8. Methodological Contribution and Strengths

A principal methodological contribution is the separation of any service use from subsequent positive frequency or duration, allowing the modelling strategy to match the distinct research questions rather than treating all utilisation counts as equivalent [35–37]. GP consultations were common, whereas emergency and hospital counts were strongly right-skewed with many zero observations. Other strengths included complete data for the primary analyses, simultaneous examination of the two patient-level measures, a prespecified adjustment set, alternative count-model specifications, sensitivity analyses excluding 12 discordant hospital records, and independent replication of the principal estimates in Stata and R. These procedures support robustness to selected modelling and data-quality choices, but they do not establish causality, appropriateness of service use, or the validity of the measures in every Albanian subgroup.

4.9. Limitations

The central limitation is the cross-sectional survey design, coupled with a retrospective six-month assessment of healthcare use. Health literacy and self-efficacy were measured at the survey, after the period to which utilisation counts referred; therefore, temporal ordering is unknown, reverse causation is plausible, and causal or prospective interpretations are not justified. Self-reported service counts may be affected by recall and telescoping biases, and 12 admission/hospital-night records were internally discordant, although exclusion sensitivity analyses did not materially change the broad conclusions. The outcomes did not identify clinical appropriateness, preventability, illness acuity, or patient benefit. Adjustment for self-rated health and chronic-disease count cannot fully account for severity, frailty, functional limitations, cognition, medication burden, socioeconomic position, transport, or service access. The occurrence models used all 464 participants, but positive admission and hospital-night models each included only 142 participants; estimates from these selected subgroups may be imprecise or sensitive to the number of covariates. Participants were recruited from five centres in one municipality, limiting external generalisability. Although centre fixed effects accounted for average differences among sites, heteroskedasticity-robust standard errors did not account for within-centre dependence, and there were too few centres for conventional cluster-robust inference to be considered reliable. Both main exposures were self-reported: the HLS-EU-Q16 measures perceived difficulty with health-information tasks rather than directly tested literacy. Internal consistency does not establish translation quality, cultural validity, structural validity, or measurement invariance. The Albanian-language adaptation record remains to be documented by the co-author before submission. Secondary

covariate analyses and interaction tests were exploratory; the GP interaction did not meet the prespecified multiplicity-adjusted threshold in the primary analysis.

4.10. Future Research

Future research should use prospective, record-linked designs across care settings, distinguishing planned from unplanned and potentially avoidable use. Larger multicentre studies, with enough independent centres to support appropriate within-centre variance estimation, should measure illness severity, frailty, access, and organisational factors. Qualitative research should explore symptom interpretation and healthcare decision-making, and independent psychometric studies should evaluate the Albanian versions of the questionnaire instruments. Interventions should integrate health-literacy-responsive communication, self-efficacy support, and care coordination, with outcomes including function, quality of life, safety, and patient experience alongside healthcare utilisation [28].

5. Conclusions

Health literacy and chronic-disease self-efficacy showed distinct adjusted associations with retrospectively reported healthcare utilisation among Albanian older adults with multimorbidity. Higher self-efficacy was associated with fewer GP visits and lower odds of any ED or hospital use; higher health literacy was not associated with GP-visit frequency but was associated with greater odds of reporting an ED or hospital episode. The two-part models indicated that most associations were concentrated in whether any use occurred, rather than in positive visit frequency or hospital-night duration, although health literacy was also associated with admission frequency among admitted participants. These findings advance understanding by separating the occurrence of care from its subsequent intensity and by demonstrating that two positively correlated capacities should not be assumed to have identical utilisation associations. No inference can be made about causal direction, the appropriateness of contacts, or whether the patient capacities preceded the recalled service use. Interpretation must also consider unmeasured health need and service access, within-centre dependence, and uncertainty in the smaller hospital-user analyses. The findings support evaluating understandable communication, practical self-management support, coordinated follow-up, and timely access together, rather than seeking an indiscriminate reduction in service contacts. Prospective, record-linked, multicentre research should assess clinical severity, preventability, patient-valued outcomes, and the direction of these relationships before they are used to guide service redesign.

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Abbreviations

The following abbreviations are used in this manuscript:

BMI	body mass index
CDSE	chronic-disease self-efficacy
CI	confidence interval
ED	emergency department
GP	general practitioner
HL	health literacy
HLS-EU-Q16	European Health Literacy Survey Questionnaire, 16-item short form
IRR	incidence-rate ratio
OR	odds ratio
PHC	primary healthcare
SD	standard deviation
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology

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