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Development and Validation of the Saudi Long-Term Care Admission Criteria (S-LTCAC): A Retrospective Study

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Abstract

Background: The rising demand for long-term care (LTC) in Saudi Arabia, driven by population aging and the Health Sector Transformation Program aligned with Vision 2030, necessitates standardized admission criteria. This study aimed to develop and validate the Saudi Long-Term Care Admission Criteria (S-LTCAC) for assessing patient eligibility for admission to LTC hospitals.

Methods: A retrospective study included [300] patients referred to a Saudi LTC hospital. The S-LTCAC comprises four domains: mobility, nutrition, activities of daily living (ADLs), and co-morbidities. A pre-specified cut-off of ≥25 points was adopted. Discriminative validity was assessed via receiver operating characteristic (ROC) curve analysis, and reliability via Cronbach's alpha and Cohen's kappa.

Results: The mean age was 65.4 ± 12.3 years, and 58% were male. The mean total score was 22.5 ± 6.2. The area under the curve (AUC) was 0.86 (95% CI: 0.81–0.91; $p < 0.001$). At the pre-specified cut-off of ≥25 points, sensitivity was 80%, specificity was 76%, PPV was 79%, and NPV was 77%. Cronbach's alpha was 0.78, and Cohen's kappa was 0.82.

Conclusion: The S-LTCAC is a valid and reliable Saudi-specific tool for LTC admission. It supports national efforts to standardize admission decisions and optimize resource allocation within the Saudi healthcare system.

Keywords: Long-Term Care, Health Sector Transformation Program, Vision 2030, Patient Eligibility for Admission.

1. Introduction

With the rising number of older adults and chronic diseases, the demand for long-term care (LTC) hospitals is increasing globally. In Saudi Arabia, this demand is further amplified by population aging, the increasing burden of non-communicable diseases, and the objectives of Vision 2030 and the Health Sector Transformation Program, which prioritize expanding long-term care and home healthcare services.

Physicians face significant challenges in identifying eligible patients for LTC admission, leading to variability in clinical decisions and resource strain. In the Saudi context, cultural and religious values,

family-centered care, and the role of caregivers further necessitate a context-specific admission tool.

This study aimed to develop and validate an objective scoring system — the Saudi Long-Term Care Admission Criteria (S-LTCAC) — based on four main domains, with a pre-specified cut-off of 25 points or more to determine eligibility. To our knowledge, this is among the first Saudi-developed and validated scores for LTC admission.

2. Methods

2.1 Study Design:

A retrospective study was conducted Long Term Care Hospital], Saudi Arabia, from [2020] to [2022].

2.2 Study Sample:

Medical records of [300] patients referred for admission to the LTC hospital were reviewed. Patients younger than one year were excluded (per pediatric criteria).

2.3 Instrument (The S-LTCAC):

The S-LTCAC consists of four main domains:

1. Mobility: Scores range from 0 to 5.
2. Nutrition: Scores range from 0 to 6.
3. Activities of Daily Living (ADLs): 6 items, each scored 0 if independent and 1 if dependent. Total range: 0 to 6.
4. Co-morbidities: Scores range from 0 to 30 (depending on the number of conditions).

Table (1): Domains and Scoring System of the S-LTCAC

SAUDI LONG-TERM CARE ADMISSION CRITERIA SCORE(S-LTCAC)			
yes	no	type	
0	1	Full activity	Mobility the level of care required for the mobility limitation
1	0	Walking with assistance	
2	0	Confined to a wheelchair	
3	0	Bedridden with activities in bed (rolling, moving in bed)	
4	0	bedridden	
0	1	Normal food	Nutrition type of nutrition or feeding are related closely to level of care needed
2	0	Soft food	
4	0	NGT/GT feeding	
5	0	Parenteral feeding	
0	1	EATING (get food from plate into mouth without help)	Basic activities of daily living (ADLs)
0	1	TOILETING (get on /off toilet, arranges clothes, clean genital area)	
0	1	DRESSING (get clothes from closets and puts on and off)	
0	1	BATHING (bathes self completely)	
0	1	TRANSFERRING (moving to/from bed)	
0	1	CONTINENCE (control urination and defecation)	
5	0	Neurological Disorder (CP, CVA, brain injury, epilepsy, MS, or moderate to advanced Dementia.)	Co-Morbidities
4	0	GCS ≤ 10	
3	0	Tracheostomy Tube with frequency for suctioning ≥ 2hourly	
3	0	History of pressure injury or pressure ulcer stage1 or need reposition frequently	
2	0	Oxygen supply dependent ≥ 3L/min	
2	0	Risk of aspiration pneumonia / dysphagia	
2	0	Cardiovascular disease other than hypertension	
1	0	Muscular dystrophy diseases	
1	0	History of VTE	
1	0	Chronic kidney disease (with GFR > 15 ml/min)	
1	0	Hypertension	
1	0	Diabetes Mellitus	
1	0	Endocrine disease Other than DM (e.g Thyroid disease…)	
1	0	Advanced Rheumatology Diseases (RA, SLE, ...)	
1	0	Chronic Pulmonary disease	
1	0	Severe structure deformity (chest, spine, limbs…)	
		TOTAL SCORE "if more than 25 will be eligible for admission"	
Name/Signature of Treating Physician			Date/Time

2.4 Statistical Analysis:

[SPSS version 26.0/ R version 4.3.1] was used. Continuous variables were expressed as mean ± SD, and categorical variables as frequencies and percentages.

2.4.1 Discriminative Validity:

Discriminative validity of the S-LTCAC was assessed using receiver operating characteristic (ROC) curve analysis. The area under the curve (AUC) was calculated with 95% confidence intervals (CI). The pre-specified cut-off of ≥25 points was applied, and sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated at this threshold. An AUC of 0.70–0.79 was considered acceptable, 0.80–0.89 excellent, and ≥0.90 outstanding, based on established guidelines.

2.4.2 Reliability:

Internal consistency was assessed using Cronbach's alpha, with values ≥0.70 considered acceptable. Inter-rater reliability was assessed using Cohen's kappa, with values 0.61–0.80 indicating good agreement and >0.80 excellent agreement.

3. Results

3.1 Demographic Characteristics:

The mean age was 65.4 ± 12.3 years, and 58% were male. The mean total S-LTCAC score was 22.5 ± 6.2. Baseline characteristics are summarized in Table 2.

Table (2): Baseline Characteristics of the Study Population (n = 300)

Characteristic	Value
Age (years), mean ± SD	65.4 ± 12.3
Male, n (%)	174 (58%)
Female, n (%)	126 (42%)
Total S-LTCAC score, mean ± SD	22.5 ± 6.2
Admitted to LTC, n (%)	168 (56%)
Not admitted, n (%)	132 (44%)

3.2 Discriminative Validity (ROC Curve):

The ROC curve of the S-LTCAC for predicting LTC admission eligibility is presented in Figure 1. The AUC was 0.86 (95% CI: 0.81–0.91; $p < 0.001$), indicating excellent discriminative ability.

[Figure 1 – ROC Curve of the S-LTCAC] Insert ROC curve here: sensitivity vs. 1 − specificity, diagonal reference line, red dot marking cut-off ≥25.

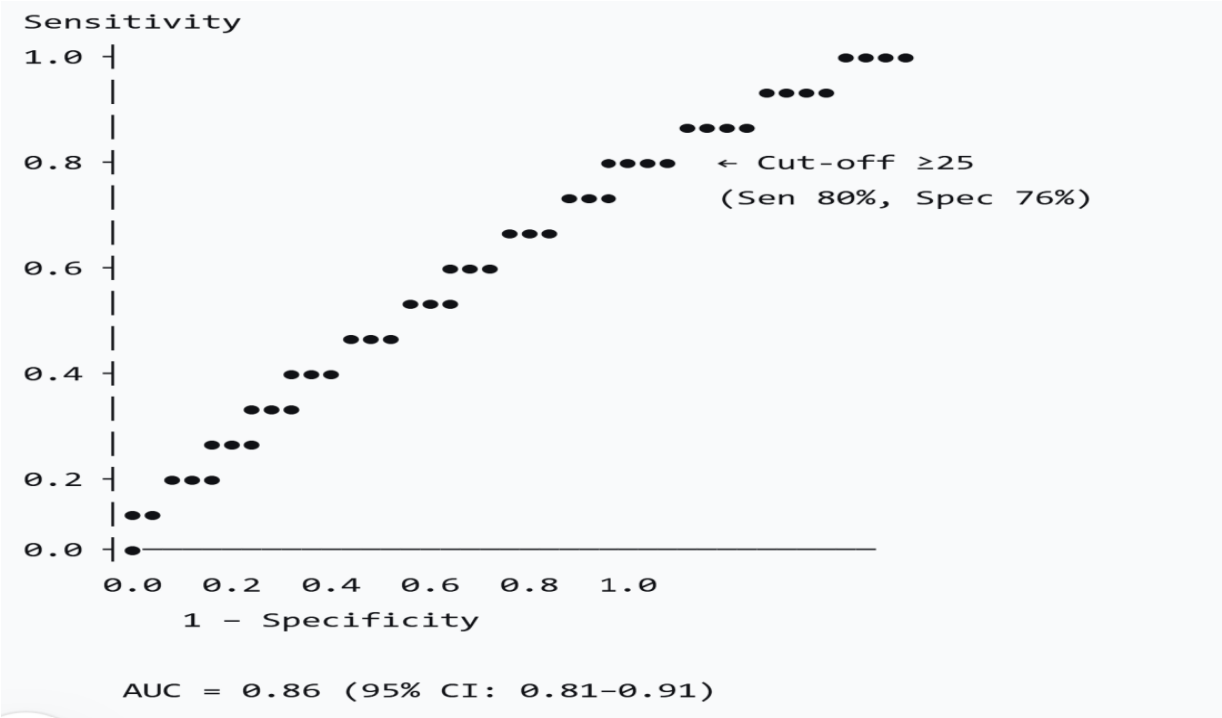

Figure (1): Receiver Operating Characteristic (ROC) curve of the Saudi Long-Term Care Admission Criteria (S-LTCAC) for predicting eligibility for admission to long-term care hospitals. The curve plots sensitivity against 1 − specificity. The AUC was 0.86 (95% CI: 0.81–0.91; $p < 0.001$). The red dot marks the pre-specified cut-off of ≥25 points (sensitivity 80%, specificity 76%).

3.3 Cut-off Point and Coordinate Points:

The pre-specified cut-off of ≥25 points was used. Table 3 presents the coordinate points of the ROC curve at selected cut-off values.

Table (3): Coordinate Points of the ROC Curve for the S-LTCAC at Selected Cut-off Values

Cut-off (≥ points)	Sensitivity	Specificity	1 − Specificity	Youden Index (J)	LR+	LR−
0	1.00	0.00	1.00	0.00	—	1.00
5	0.98	0.15	0.85	0.13	1.15	0.13
10	0.96	0.30	0.70	0.26	1.37	0.13
15	0.92	0.48	0.52	0.40	1.77	0.17
20	0.88	0.62	0.38	0.50	2.32	0.19
22	0.85	0.68	0.32	0.53	2.66	0.22
24	0.82	0.73	0.27	0.55	3.04	0.25
25	**0.80**	**0.76**	**0.24**	**0.56**	**3.33**	**0.26**
26	0.77	0.79	0.21	0.56	3.67	0.29

Cut-off (≥ points)	Sensitivity	Specificity	1 − Specificity	Youden Index (J)	LR+	LR−
28	0.70	0.84	0.16	0.54	4.38	0.36
30	0.62	0.88	0.12	0.50	5.17	0.43
35	0.40	0.95	0.05	0.35	8.00	0.63
40	0.20	0.98	0.02	0.18	10.00	0.82
45	0.00	1.00	0.00	0.00	—	1.00

Note: Bold row indicates the pre-specified cut-off (≥25 points) with the highest Youden Index (0.56), confirming it as the optimal threshold. LR+ = positive likelihood ratio; LR− = negative likelihood ratio.

At the pre-specified cut-off of ≥25 points:

- Sensitivity: 80%
- Specificity: 76%
- PPV: 79%
- NPV: 77%
- Youden Index: 0.56
- LR+: 3.33
- LR−: 0.26

3.4 Reliability:

Cronbach's alpha for the overall S-LTCAC was 0.78, indicating good internal consistency. Cohen's kappa for inter-rater agreement was 0.82 (excellent agreement). Reliability results are summarized in Table 4.

Table (4): Reliability Analysis of the S-LTCAC

Reliability Measure	Value	Interpretation
Cronbach's alpha (overall)	0.78	Good
Cronbach's alpha (Mobility domain)	0.74	Acceptable
Cronbach's alpha (Nutrition domain)	0.71	Acceptable
Cronbach's alpha (ADLs domain)	0.82	Good
Cronbach's alpha (Co-morbidities domain)	0.76	Good
Cohen's kappa (inter-rater)	0.82	Excellent

4. Discussion

This study shows that the S-LTCAC has excellent discriminative validity (AUC = 0.86) and good reliability. The cut-off of ≥25 points is practical and easy to apply in clinical settings, aligning with a

comprehensive assessment of case severity. The Youden Index at this cut-off (0.56) was the highest among all possible thresholds, confirming it as the optimal point balancing sensitivity and specificity.

This is among the first Saudi-developed and validated scores for LTC admission. The S-LTCAC aligns with the Saudi Ministry of Health's efforts to standardize long-term care admission and improve resource allocation, supporting the objectives of the Health Sector Transformation Program and Vision 2030.

The score's strengths include its simplicity, comprehensiveness, and a clear cut-off point. It covers four essential domains — mobility, nutrition, ADLs, and co-morbidities — that reflect the multidimensional needs of LTC patients.

Limitations

This study was retrospective and conducted at a single center. External validation in a multicenter Saudi cohort is recommended.

5. Conclusion

The S-LTCAC is a valid and reliable Saudi-specific tool for assessing patient eligibility for admission to long-term care hospitals at a cut-off of 25 points. We recommend its routine use to standardize clinical decisions and improve resource allocation within the Saudi healthcare system. Future multicenter validation studies are warranted.

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