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Can the LACE Index help Identify Uninsured Patients at Risk of Loss to Follow-Up during a Pharmacist-led Transitions of Care Program?

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Abstract

Background—Uninsured patients are susceptible to being lost to follow-up (LTFU). In addition to being uninsured, follow-up is especially critical among this population during transitions of care when patients are discharged from the hospital setting back to home because follow-up care post-discharge has been proven to prevent readmissions. The LACE tool has historically been used to predict readmissions, but the LACE tool has not been used to evaluate patients' risk of LTFU.

Objective—To understand the potential translation of the LACE tool for use in uninsured patients' follow-up care, we assessed the association between LACE index scores and patients' risk of LTFU during a pharmacist-led transitions of care program for uninsured patients.

Methods—Data were extracted from a randomized controlled trial implementing a pharmacist-led transitions of care program at an indigent care clinic. The study population included uninsured adult (> 18 years old) patients who spoke English and attended a clinical visit with a pharmacist

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within 16-days post-discharge from a community hospital. Analyses sought to determine factors associated with the patient's LTFU status.

Results—Among 88 enrolled participants, 29 (32.95%) participants were LTFU. Thirty-two patients (36.4%) had a high LACE index score at baseline, indicating an increased risk of 30-day readmission. Of the remaining 56 (63.6%) patients with low/moderate LACE index scores, 54 (61.4%) had a moderate LACE index score, and only 2 (2.3%) had a low LACE index score. Uninsured patients with high LACE index scores had 70% lower odds of being LTFU than uninsured patients with low/moderate LACE index scores (exact odds ratio = 0.297; 95% CI, 0.081-0.947).

Conclusions—The LACE index score was inversely related to the risk of LTFU during a pharmacist-led transitions of care program. Pharmacists may use the LACE tool to identify patients at high risk of LTFU.

Keywords

LACE index; Loss to follow-up; uninsured; transitions of care; readmission risk; randomized controlled trial

BACKGROUND

As of 2019, 29.8 million individuals remain uninsured in the United States.¹ Uninsured patients are susceptible to being lost to follow-up (LTFU) because of cost or lack of access to care, leading to inadequate communication of therapeutic plans and undesired treatment outcomes.² In addition to being uninsured, follow-up is especially critical among this population during transitions of care when patients are discharged from the hospital setting back to home because follow-up care post-discharge has been proven to prevent readmissions.³ Therefore, an enhanced ability to identify uninsured patients at risk of LTFU could be essential in maintaining care continuity since it will assist pharmacists and other healthcare providers in preventing potential LTFU.

Aside from the potential influence of insurance status on patients' likeliness to follow-up,⁴⁻⁶ previous studies have identified several demographic characteristics that may also result in LTFU, such as age,^{7,8} gender,^{6,9} race,^{4,10} education level,^{4,7,11} and income or employment status.^{4,11} Moreover, clinical indicators like disease stage^{4,8-11} or patient reported outcomes^{8,11} were potential factors leading to LTFU that have been identified in previous research. However, those influencing factors were identified based on the analytical results of different population groups with specific diseases, so the findings may suffer from potential bias due to study limitation or lack of generalizability, which could be observed from some existing mixed results in different work.⁹

To ameliorate concerns about building correlation between identified factors and LTFU from previous studies, adding a valid tool or factor for analysis would be a feasible choice. The LACE tool is an index used to quantify the risk of readmission or death after hospital discharge to assist pharmacists in identifying patients who might benefit from more intensive post-discharge care.¹² The LACE index stands for "L" (length of stay), "A" (acuity of admission), "C" (comorbidities), and "E" (emergency department visits).¹² Although the

LACE tool has historically been used for its predictive abilities of readmissions, it has not been used to evaluate the risk of LTFU.

OBJECTIVE

To understand the potential translation of the LACE tool for use in uninsured patients' follow-up care, we assessed the association between LACE index scores and patients' risk of LTFU during a pharmacist-led transitions of care program for uninsured patients. It is hypothesized that the score from the LACE tool would be related to LTFU.

METHODS

Data for this study were extracted from a randomized controlled trial (RCT) examining the impact of a pharmacist-led transitions of care program on readmissions at an indigent care clinic in the Southeast region of the U.S. ([ClinicalTrials.gov ID: NCT04556786](https://clinicaltrials.gov/ct2/show/study/NCT04556786)).¹³ Details of the pharmacist-led transitions of care program have been published elsewhere.¹³ Briefly, eligible patients were > 18 years old, uninsured, English-speaking, and attending a clinical visit with a pharmacist within 16-days post-discharge from a community hospital. All participants were required to participate in the clinical visit with a pharmacist within 16-days of hospital discharge. During this initial clinical visit, participants providing informed consent were allocated to the intervention or control group, and baseline data were collected during the same visit. Data from the hospital's electronic medical records were used to calculate LACE index scores. The originally published report¹³ of the RCT followed the CONSORT guidelines.¹⁴ Information pertaining to the present investigation of the LACE tool and LTFU status is included as applicable in this report. This research was approved by the Institutional Review Board at the authors' institution.

Intervention group participants received the pharmacist-led transitions of care program, which involved medication reconciliation, monitoring devices, medication and monitoring schedules, reminder call to attend follow-up visit with a primary care provider (PCP), and follow-up calls from a clinical pharmacist at 60- and 90-days post-discharge. Because of disparities in access to care among this patient population,¹⁵ the follow-up visits with a PCP served to improve access to continuity of care or to establish care among the uninsured as many participants did not previously have access to a care provider. The follow-up calls from a clinical pharmacist served to address any concerns, barriers, or questions from the patients in addition to a self-reported assessment of recent hospital readmission and emergency department utilization. Control group participants received usual care (education about medications, medical conditions, and symptoms) and follow-up calls from a research assistant 60- and 90-days post-discharge, but the calls only assessed self-reported recent hospital readmission and emergency department utilization. For calls, at least four separate attempts were made to reach the patient by telephone.

After study completion, data were retrospectively analyzed to determine relationships between LTFU status and baseline characteristics, including LACE index scores. All patients enrolled in the parent trial were included in the present analyses. LTFU was defined as losing contact with a study participant after attempting communication via telephone four

times within 90-days post-discharge. In some circumstances, contact with patients was lost but later regained during the study period, such as a patient who did not follow up via telephone at 60-days post-discharge but later followed up at 90-days. These patients were categorized as not LTFU because contact was re-established. Attendance at PCP visit was not included in the categorization of LTFU. Patients were initially categorized based on their LACE index scores into low- (scores = 0-4), moderate- (scores = 5-9), and high-risk groups (scores = 10). The low- and moderate-risk groups were consolidated due to only two patients in the low-risk group. Therefore, the present investigation categorized patients into two groups based on their LACE index scores: low/moderate-risk (score = 0-9) or high-risk (score = 10).

Statistical Analysis

Chi-square tests were used to determine the associations of LTFU with categorical variables, including gender, race, LACE index score, attendance at primary care visit, and group allocation. Comparisons between patients with versus without LTFU were conducted using student's t-tests for mean differences in age, self-efficacy score (General Self Efficacy: GSE), health literacy score (Rapid Estimate of Adult Literacy in Medicine-Short Form: REALM-SF), and days from discharge to pharmacist visit at the indigent care clinic.

For the adjusted analysis, backward elimination was used for the selection of independent variables or covariates included in the model. Based on data available from the parent trial, covariates included in the 'global model'¹⁶ were age, gender, race, LACE index score, attendance at primary care visit, self-efficacy score, health literacy score, days from discharge to pharmacist visit, and group allocation. The backward elimination yielded inclusion of the following independent variables: LACE index score, days from discharge to pharmacist visit, and group allocation. The stopping criteria for the backward elimination was set at a significance level of 0.157, which is recommended to optimize model fit.¹⁶ An exact logistic regression model was applied to determine factors associated with LTFU among uninsured patients. One participant was excluded from the exact logistic regression model due to the participant exceeding the 16-day post-discharge follow-up required for eligibility.

RESULTS

A total of 88 study participants were recruited in the RCT (44 in the intervention group and 44 in the control group). Participants were White or Black/African American race with a mean age of 47 years old (Table 1). At baseline, participants reported high self-efficacy as measured by the GSE, and participants read at a seventh/eighth-grade level as measured by the REALM-SF. During the study period, 29 (32.95%) participants were LTFU. Thirty-two patients (36.4%) had a high LACE index score at baseline, indicating an increased risk of 30-day readmission. Of the remaining 56 (63.6%) patients with low/moderate LACE index scores, 54 (61.4%) had a moderate LACE index score, and only 2 (2.3%) had a low LACE index score.

When comparing patients' baseline characteristics between with versus without LTFU, gender, race, age, self-efficacy, health literacy, days until visit with pharmacist post-

discharge, attendance at primary care visit within 30-days post-discharge, and group allocation to intervention versus control group were not significantly different between groups ($p > 0.05$ for all). On the other hand, patients' readmission risk at baseline, assessed from the LACE index score, was significantly different between LTFU status ($p = 0.032$). Patients who were LTFU were significantly more likely to have low/moderate LACE index scores than high LACE index scores (79.31% versus 20.69%, respectively).

After controlling for covariates, the LACE index score remained the only significant factor of patients being LTFU ($p = 0.038$). Uninsured patients with high LACE index scores had 70% lower odds of being LTFU than uninsured patients with low or moderate LACE index scores (exact odds ratio = 0.297; 95% CI, 0.081-0.947) (Table 2). Therefore, a higher risk of readmission was associated with lower odds of LTFU, while a low/moderate readmission risk was associated with higher odds of LTFU. There were no significant differences in being LTFU based on days from discharge to pharmacist visit or group allocation at baseline.

DISCUSSION

The results indicate that the LACE index score is significantly associated with LTFU among an uninsured population. Specifically, the key finding from this study is that the LACE index score was inversely related to the risk of LTFU. This finding means that uninsured patients at low/moderate risk of readmission are less likely to follow-up during transitions of care, and uninsured patients at high risk of readmission are seemingly more likely to follow up during transitions of care. Thus, there is potentially more utility in transitions of care services among patients with high readmission risks.

This study highlights an innovative use of the LACE tool in identifying patients at risk of LTFU based on findings among an uninsured population during a pharmacist-led transitions of care program. Previous studies identified factors from demographic characteristics and disease state, where results may have limited generalizability because of the sample population or specific disease state. Unlike these previous studies, the LACE index considers factors other than a given disease state or personal characteristics, making it a practical and largely applicable tool to identify LTFU. Using the LACE tool to identify patients at high risk of LTFU can help pharmacists devise new and innovative ways of communicating with and engaging patients. Through these efforts to prevent uninsured patients from being LTFU, there is potential for improvement of subsequent health outcomes after transitions of care. An additional study is ongoing to determine barriers to care with hopes to reveal potential contributors to LTFU in uninsured patients.

A surprising finding in this study was the lack of association between patients' LTFU status and their attendance at the PCP visit. Therefore, follow-up at the PCP visit did not seem to influence follow-up through the entire study period of 90-days. The lack of influence maybe because the pharmacist and PCP were part of the collaborative care team and located in the same office of the indigent care clinic.

The present analyses do not attempt to develop a clinical prediction model of any sort. These findings highlight the interesting association found between the LACE index scores and patients' risk of LTFU from an RCT. The exact logistic regression model was only completed to assess the association between the LACE index scores and LTFU while adjusting for covariates and potential confounders.

Limitations

The small sample size is a limitation of this study and warrants further investigation. This investigation was limited to data captured in the parent trial, so future studies should consider assessing how social determinants of health might impact uninsured patients' access to care and likelihood of follow-up. Findings may have limited generalizability outside of uninsured populations. Another limitation of this RCT is the inability to assess mortality, which could directly impact patients' ability to follow up. A final potential limitation could be the incentive provided to participants who completed follow-up if this influenced participants' motivation to follow-up.

CONCLUSIONS

The LACE index score is significantly associated with uninsured patients being LTFU during a pharmacist-led transitions of care program, but further research is needed to make more definitive claims about the use of the LACE tool in identifying patients at risk of LTFU. The LACE tool is a clinically practical resource to healthcare providers, especially pharmacists as shown in findings from this RCT. Pharmacists may use the ease-to-use LACE tool to identify patients at high risk of LTFU.

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Data availability:

Patient data are confidential and will not be shared.

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Table 1.

Patient Baseline Characteristics, Stratified by Loss to Follow-up Status

Characteristic	Loss to Follow-up Status		p-value [^]
	Lost to Follow-up N = 29 N (%)	Not Lost to Follow-up N = 59 N (%)	
Gender			
Male	14 (48.28)	38 (64.41)	0.148
Female	15 (51.72)	21 (35.59)	
Race			
White	15 (51.72)	23 (38.98)	0.257
Black or African American	14 (48.28)	36 (61.02)	
Age			
Mean (SD)	48.21 (10.37)	46.47 (10.71)	0.473
GSE			
Mean (SD)	31.79 (5.67)	32.50 (4.80)	0.544
Realm-SF			
Mean (SD)	5.86 (1.66)	5.40 (2.06)	0.302
Readmission risk (from LACE tool)			
Low/Moderate (scores 0-9)	23 (79.31)	33 (55.93)	0.032
High (scores 10)	6 (20.69)	26 (44.07)	
Days until visit with pharmacist post-discharge			
Mean (SD)	9.10 (3.54)	7.92 (3.86)	0.167
Attendance at primary care visit within 30-days post-discharge			
Yes	16 (55.17)	32 (54.24)	0.934
No	13 (44.83)	27 (45.76)	
Group allocation at baseline			
Intervention	17 (58.62)	27 (45.76)	0.257
Control	12 (41.38)	32 (54.24)	

[^] Chi-square test for categorical variables; Student's t-test for continuous variables.

Abbreviations: SD = Standard Deviation; LACE = readmission risk calculator; REALM-SF = Rapid Estimate of Adult Literacy in Medicine- Short Form; GSE = General Self-Efficacy Scale.

Table 2.

Exact Logistic Regression Model for Uninsured Patients being Lost to Follow-up

Factors	Exact Odds Ratio (95% CI)
Readmission risk (from LACE tool)	0.297 (0.081-0.947) **
Days until visit with pharmacist post-discharge	1.149 (0.995-1.334)
Group allocation at baseline	0.383 (0.120-1.132)

* For model: N = 87; excluded one participant due to exceeding the 16-day post-discharge follow-up required for eligibility. Backward elimination was used for the selection of independent variables included in the model. Outcome variable = Loss to Follow-up Status [yes (ref.) or no]. Independent variables = Readmission risk (categorized from LACE index score) [high or low/moderate (ref.)], days until visit with pharmacist post-discharge (continuous), and group allocation at baseline [intervention (ref.) or control].

**
p < 0.05

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