LACE Index Predicts High Risk of 30-Day Readmission

Subjects: Health Care Sciences & Services

Contributor: Vasuki Rajaguru , , Tae Hyun Kim , Jaeyong Shin , Sang Gyu Lee

The LACE index accounts for: Length of stay (L), Acuity of admission (A), Comorbidities (C), and recent Emergency department use (E). The incorporation of a high-risk LACE index showed favorable risk prediction and could be applied to predict 30-day readmission with chronic conditions.

30-day readmission   hospital readmissions

1. Introduction

Hospital readmissions, especially unplanned ones are costly for the healthcare industry [1]. Readmission frequency is used to judge hospital quality as 30 days of unplanned readmission indicates the initial intervention was unsuccessful [2]. The Centers for Medicare and Medicaid Services (CMS) reported annual medical expenditures of $17 billion as a result of hospital readmissions. CMS described chronic conditions with a high risk of frequent hospitalization as part of the 2010 Hospital Readmission Reduction Program (HRRP) [3].

The readmission rate metric was first developed in the United States (US) for quality improvement and cost reduction and is being used in several countries such as Canada [4], Australia [5], and the United Kingdom [6]. Policies such as the Affordable Care Act's (ACA) Hospital Readmission Reduction Program (HRRP) have attempted to improve quality by penalizing 30-day readmission rates above the national standard in the US [4][5][6][7], Continuous quality improvement in local healthcare systems can lower readmission rates and cut costs, boosting the global economy. Beyond these assuagements, more sensitive methods and algorithms are needed to predict which patients are at risk of readmission before they are discharged.

There are several tools and scoring patterns that have been reported to measure or predict the risk of readmissions [8][9][10]. The LACE index is one of the most commonly used indices in the Canada [9][10][11], and US [12][13][14][15][16][17][18]. The LACE index was first developed by van Walraven et al. [9] to predict the risk of unplanned readmission or death within 30 days after hospital discharge in medical and surgical patients. The model was derived and validated based on administrative data with a C-statistic of 0.68. The model includes the length of hospitalization stay (L), acuity of the admission (A), comorbidities of patients (C), and the number of emergency department visits in the six months before admission (E). Scores ranging from "0" to "19" and greater than ten are considered high risk for 30-day readmission [9]. The higher scores indicate a high risk of readmission. This tool is widely used primarily because of its simplicity makes it usable in day-to-day clinical practice [9][10][11][12][13][14][15][16][17][18].

To this end LACE index was utilized in various settings including The Canadian Institute for Health Information (CIHI) evaluated the quality of care by suggesting 30-day unplanned readmissions in acute care that considered patient, hospital, and community factors [4][10]. The UK used the Emergency Readmission to Hospital within 28 Days of Discharge to monitor readmissions [19]. In Australia, the Ministry of Health of the Western Australia provincial government used 30-day unplanned readmissions for surgical events and all-cause admissions as a health service quality metric [20][21][22]. However, there is a question as to whether it is appropriate to apply the indicator in other regions across a range of settings and populations.

Multiple studies have been conducted to address the unplanned 30-day readmission after discharge from the hospital, which becomes an indicator of the quality of the healthcare system in South Korea [23][24] and also stands to benefit from a reduction in hospital readmissions. However, the readmission rate is an index that can be calculated using administrative data along with the mortality rate. As a result, discussion around the appropriate use of the LACE index has been emphasized. The risk prediction for 30-day readmissions in a health care facility is a very important concern for economic as well as quality considerations.

2. LACE Index Predicts High Risk of 30-Day Readmission

Numerous studies have been reported on the performance of the LACE index for 30-day readmission risk prediction, some of these have typically been conducted in small patient populations [14][16][25] of adults [26], middle [12][14][16][18][19][20][21], and older aged [10][11][13][15][17][22][27] group. The major disease conditions were included; cardiovascular disease [11][17][18], chronic obstructive pulmonary disease [20][21][25], all-cause [10][15][16][19][26][27] and neurosurgery [26][28]. These variabilities may be due to the varied disease settings including heart failure, craniotomy, neurosurgery, COPD, and pneumonia in the included studies. Interestingly, lung disease patients such as pneumonia and COPD appear to have the greatest risk of readmission, whereas all-cause is relatively low risk as expected. Variability may also be due to the use of LACE+ in addition to standard LACE. Despite a similar name LACE+ is quite different from LACE, having been derived from a logistic regression model [16].

The LACE index was first developed by van Walraven et al. in 2010 [9] to predict the risk of unplanned readmission or death within 30 days after hospital discharge in medical and surgical patients. The model was derived and validated based on administrative data with a C-statistic of 0.68. The model includes the length of hospitalization stay (L), acuity of the admission (A), comorbidities of patients (C), and the number of emergency department visits in the six months before admission (E). All of these variables were frequently cited in all the reviewed studies. However, some studies have reported LACE index was fair to predict 30-day readmissions and poor prediction in the combination of 90 days readmissions and death as well as advanced disease conditions [12][19][25][27]. However, most of the studies found moderate to good discriminative ability. Therefore, interventions might be applied based on the LACE index scores in order to reduce the rate of early readmissions.

Most of the study findings performed the predictive model [11][17][18][19][20][21][22][23][24][25][26][28][29][30][31], the LACE index [10][11][12][13][14][15][16][17][18][19][20][21][22][25][26][27] although validated combined with hospital score [13][16][17], LACE index+ [13] by logistic regression analysis. A study compared the 30-day readmission and no readmission

with different disease conditions, the overall pooled relative risk showed favorability in the prediction risk of 30-day readmissions. The variation in LACE score to predict all-cause readmissions [10][15][16][19][26][27] were cardiovascular, pulmonary conditions, and neurological conditions including surgery. Despite the potential heterogeneity of the meta-regression, it showed a significant and incremental effect of "favorable support" on reducing 30-day readmissions.

3. Conclusions

Numerous tools and models have been developed to predict hospital readmissions. However, some models are promising and easy to use with adequate discrimination such as the LACE index. It has the advantage of being available to identify the patients at high risk of readmission to receive interventions and potentially avoidable readmission The LACE index can be applied to all hospitals that strive to optimize value-based medical care.

References

1. Hospital Readmissions—Healthcare.gov Glossary. Available online: https://www.healthcare.gov/glossary/hospital-readmissions/ (accessed on 10 December 2021).

2. Ashton, C.M.; Del Junco, D.J.; Souchek, J.; Wray, N.P.; Mansyur, C.L. The association between the quality of inpatient care and early readmission. Med. Care 1997, 35, 1044–1059.

3. Weiss, A.J.; Jiang, H.J. Overview of Clinical Conditions with Frequent and Costly Hospital Readmissions by Payer, 2018. HCUP Statistical Brief #278 . Healthcare Cost and Utilization Project—HCUP-us.ahrq.gov. Agency for Healthcare Research and Quality, Rockville, MD, USA. 2021. Available online: https://www.hcup-us.ahrq.gov/reports/statbriefs/sb278-Conditions-Frequent-Readmissions-By-Payer-2018.pdf (accessed on 10 December 2021).

4. The Canadian Institute for Health Information (CIHI), 2019–2020: Patients Urgently Readmitted to Hospital within 30 Days of Discharge. Available online: https://www.cihi.ca/en/indicators/all-patients-readmitted-to-hospital (accessed on 19 October 2021).

5. Australian Commission on Safety and Quality in Health Care. National Core, Hospital-Based Outcome Indicator Specification. Available online: https://www.safetyandquality.gov.au/publications-and-resources/resource-library/national-core-hospital-based-outcome-indicator-specification/ (accessed on 15 December 2021).

6. NHS Digital ; Indicator Quality Improvement; Emergency Readmissions within 30 Days of Discharge from Hospital. Available online: https://digital.nhs.uk/data-and-information/publications/statistical/ccg-outcomes-indicator-set/march-2020/domain-3-helping-people-to-recover-from-episodes-of-ill-health-or-following-injury-ccg/3-2-emergency-readmissions-within-30-days-of-discharge-from-hospital (accessed on 22 December 2021).

7. McIlvennan, C.K.; Eapen, Z.J.; Allen, L.A. Hospital readmissions reduction program. Circulation 2015, 131, 1796–1803.

8. Boyle, J.; Le Padellec, R.; Ireland, D. Statewide validation of a patient admissions prediction tool. In Proceedings of the 2010 Annual International Conference of the IEEE Engineering in Medicine and Biology, Buenos Aires, Argentina, 31 August–4 September 2010; Volume 2010, pp. 3887–3890.

9. Van Walraven, C.; Dhalla, I.A.; Bell, C.; Etchells, E.; Stiell, I.G.; Zarnke, K.; Austin, P.C.; Forster, A.J. Derivation, and validation of an index to predict early death or unplanned readmission after discharge from hospital to the community. Can. Med. Assoc. J. 2010, 182, 551–557.

10. Gruneir, A.; Dhalla, I.A.; van Walraven, C.; Fischer, H.D.; Camacho, X.; A Rochon, P.; Anderson, G.M. Unplanned readmissions after hospital discharge among patients identified as being at high risk for readmission using a validated predictive algorithm. Open Med. 2011, 5, e104–e111.

11. Yazdan-Ashoori, P.; Lee, S.F.; Ibrahim, Q.; Van Spall, H.G. Utility of the LACE index at the bedside in predicting 30-day readmission or death in patients hospitalized with heart failure. Am. Heart J. 2016, 179, 51–58.

12. Caplan, I.F.; Zadnik Sullivan, P.; Glauser, G.; Choudhri, O.; Kung, D.; O'Rourke, D.M.; Osiemo, B.; Goodrich, S.; McClintock, S.D.; Malhotra, N.R.; et al. The LACE+ index fails to predict 30–90-day readmission for supratentorial craniotomy patients: A retrospective series of 238 surgical procedures. Clin. Neurol. Neurosurg. 2019, 182, 79–83.

13. Ibrahim, A.M.; Koester, C.; Al-Akchar, M.; Tandan, N.; Regmi, M.; Bhattarai, M.; Al-Bast, B.; Kulkarni, A.; Robinson, R. HOSPITAL Score, LACE Index and LACE+ Index as predictors of 30-day readmission in patients with heart failure. BMJ Evid.-Based Med. 2020, 25, 166–167.

14. Linzey, J.R.; Foshee, R.L.; Srinivasan, S.; Fiestan, G.O.; Mossner, J.M.; Gemmete, J.J.; Burke, J.F.; Sheehan, K.M.; Rajajee, R.; Pandey, A.S. The predictive value of the hospital score and Lace Index for an adult neurosurgical population: A prospective analysis. World Neurosurg. 2020, 137, e166–e175.

15. Miller, W.D.; Nguyen, K.; Vangala, S.; Dowling, E. Clinicians can independently predict 30-day hospital readmissions as well as the LACE index. BMC Health Serv. Res. 2018, 18, 32.

16. Robinson, R.; Hudali, T. The HOSPITAL score and LACE index as predictors of 30 day readmission in a retrospective study at a university-affiliated community hospital. PeerJ 2017, 5, e3137.

17. Regmi, M.R.; Bhattarai, M.; Parajuli, P.; Garcia, O.E.L.; Tandan, N.; Ferry, N.; Cheema, A.; Chami, Y.; Robinson, R. Heart Failure with Preserved Ejection Fraction and 30-Day Readmission. Clin. Med. Res. 2020, 18, 126–132.

18. Wang, H.; Robinson, R.D.; Johnson, C.; Zenarosa, N.R.; Jayswal, R.D.; Keithley, J.; A Delaney, K. Using the LACE index to predict hospital readmissions in congestive heart failure patients. BMC Cardiovasc. Disord. 2014, 14, 97.

19. Damery, S.; Combes, G. Evaluating the predictive strength of the LACE index in identifying patients at high risk of hospital readmission following an inpatient episode: A retrospective cohort study. BMJ Open 2017, 7, e016921.

20. Dobler, C.C.; Hakim, M.; Singh, S.; Jennings, M.; Waterer, G.; Garden, F.L. Ability of the LACE index to predict 30-day hospital readmissions in patients with community-acquired pneumonia. ERJ Open Res. 2020, 6, 00301–02019.

21. Hakim, M.A.; Garden, F.L.; Jennings, M.D.; Dobler, C.C. Performance of the LACE index to predict 30-day hospital readmissions in patients with chronic obstructive pulmonary disease. Clin. Epidemiol. 2018, 10, 51–59.

22. Labrosciano, C.; Air, T.; Tavella, R.; Beltrame, J.F.; Ranasinghe, I. Readmissions following hospitalizations for cardiovascular disease: A scoping review of the Australian literature. Aust. Health Rev. 2020, 44, 93–103.

23. Jang, J.G.; Ahn, J.H. Reasons and Risk Factors for Readmission Following Hospitalization for Community-acquired Pneumonia in South Korea. Tuberc. Respir. Dis. 2020, 83, 147–156.

24. Health Insurance Review & Assessment Service, "Results of Appropriateness for Risk-Standardized Readmission Ratio in 2017(Second),". December 2018. Available online: https://www.hira.or.kr/cms/open/04/04/12/2018_10.pdf (accessed on 3 January 2022).

25. Low, L.L.; Liu, N.; Wang, S.; Thumboo, J.; Ong, M.E.H.; Lee, K.H. Predicting 30-Day readmissions in an Asian Population: Building a Predictive Model by incorporating markers of hospitalization severity. PLoS ONE 2016, 11, e0167413.

26. Tan, S.Y.; Low, L.L.; Yang, Y.; Lee, K.H. Applicability of a previously validated readmission predictive index in medical patients in Singapore: A retrospective study. BMC Health Serv. Res. 2013, 13, 366.

27. Cotter, P.E.; Bhalla, V.K.; Wallis, S.J.; Biram, R.W. Predicting readmissions: Poor performance of the lace index in an older UK population. Age Ageing 2012, 41, 784–789.

28. Moher, D.; Liberati, A.; Tetzlaff, J.; Altman, D.G.; PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. Int. J. Surg. 2010, 8, 336–341.

29. Page, M.J.; McKenzie, J.; Bossuyt, P.; Boutron, I.; Hoffmann, T.; Mulrow, C.D.; Shamseer, L.; Tetzlaff, J.M.; Akl, E.A.; Brennan, S.E.; et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ 2021, 372, n71.

30. Sterne, J.A.C.; Higgins, J.P.T.; Reeves, B.C.; on behalf of the Development Group for ACROBAT-NRSI. A Cochrane Risk of Bias Assessment Tool: For Non-Randomized Studies of Interventions (ACROBAT-NRSI), Version 1.0.0. 24 September 2014. Available online: http://www.bristol.ac.uk/population-health-sciences/centres/cresyda/barr/riskofbias/robins-i/acrobat-nrsi/ (accessed on 12 December 2021).

31. Higgins, J.P.; Thompson, S.G.; Spiegelhalter, D.J. A re-evaluation of random-effects meta-analysis. J. R. Stat. Soc. Ser. A Stat. Soc. 2009, 172, 137–159.

Retrieved from https://encyclopedia.pub/entry/history/show/55073