Preventive Medicine Reports 15 (2019) 100920

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: www.elsevier.com/locate/pmedr

Correspondence

Letter to the Editor: A follow-up to 'The ability of triggers to predict potentially preventable adverse events in a sample of deceased patients'

The article titled "The ability of triggers to predict potentially preventable adverse events in a sample of deceased patients"(Klein et al., 2017), published in the November 2017 issue of Preventive Medicine Reports, found a positive predictive value (PPV) of a trigger system in deceased patients to be 47%. Thereafter, we tried to optimize this PPV by adding characteristics (urgent admission, admission specialism) to the equation. However, this resulted only in a slightly better performance and the trigger method remained labor-intensive. Further research to optimize this system concerning the combination of triggers with patient characteristics and lab values seemed warranted. Additionally, literature showed that International Normalized Ratio (INR) (Oden and Fahlen, 2002), albumin- (Seo et al., 2016), creatinine- (Santopinto et al., 2003) and hemoglobin (Hb) levels (Ammann et al., 2014) could be indicators for adverse events (AEs). Based on this information we decided to analyze our data with these variables. Instead of INR we included the use of anticoagulants and the number of different anticoagulants.

For this report, we extended the dataset to include a total of 4438 medical records of deceased patients (2011–2018). We created six models using logistic regression with backward stepwise elimination to evaluate which variables contributed significantly to the prediction of the presence of AEs. Lab values were entered in the model once as being measured yes or no, and once categorized as unmeasured, measured but normal, measured and abnormal using cut-off values used in the laboratory of our centre.

Table 1 shows the area under the curve (AUC) for these models and sensitivity and specificity for a cut-off point chosen to optimize the model's sensitivity. The AUC for the best predictive model (model 2) showed a value of 0.66 (with a p-value of < 0.001). Adding lab results to the equation did not improve this and even the use of anticoagulants had no influence on the prediction. Therefore, we think adding lab results or use of anticoagulants to the equation does not improve the selection of cases with an AE.

Table 1
Models for the prediction of the presence of AEs.

Models	AUC	95% CI	p-Value	Sensitivity	Specificity	Cut-point
1: based on age and gender	0.52	0.503–0.541	0.022	0.60	0.46	0.27
2: 1 + length of stay	0.66	0.646–0.682	< 0.001	0.70	0.54	0.23
3: 2 + measurement of lab values	0.66	0.646–0.682	< 0.001	0.70	0.54	0.23
4: 2 + albumin, Hb, glucose, creatinine, CRP	0.66	0.644–0.680	< 0.001	0.70	0.53	0.23
5: 4 + use of anticoagulants and number of different anticoagulants.	0.67	0.648–0.684	< 0.001	0.70	0.53	0.23
6: 3 + use of anticoagulants and number of different anticoagulants.	0.67	0.649–0.685	< 0.001	0.70	0.53	0.23

Declaration of Competing Interest

None.

References

Ammann, R.A., Niggli, F.K., Leibundgut, K., Teuffel, O., Bodmer, N., 2014. Exploring the association of hemoglobin level and adverse events in children with cancer presenting with fever in neutropenia. PLoS One 9 (7), e101696.

Klein, D.O., Rennenberg, R., Koopmans, R.P., Prins, M.H., 2017. The ability of triggers to retrospectively predict potentially preventable adverse events in a sample of deceased patients. Prev. Med. Rep. 8, 250–255.

Oden, A., Fahlen, M., 2002. Oral anticoagulation and risk of death: a medical record linkage study. BMJ 325 (7372), 1073–1075.

Santopinto, J.J., Fox, K.A., Goldberg, R.J., Budaj, A., Pinero, G., Avezum, A., et al., 2003. Creatinine clearance and adverse hospital outcomes in patients with acute coronary syndromes: findings from the global registry of acute coronary events (GRACE). Heart 89 (9), 1003–1008.

Seo, S.H., Kim, S.E., Kang, Y.K., Ryoo, B.Y., Ryu, M.H., Jeong, J.H., et al., 2016. Association of nutritional status-related indices and chemotherapy-induced adverse events in gastric cancer patients. BMC Cancer 16 (1), 900.

D.O. Klein[a,*], R.J.M.W. Rennenberg[b]

[a] *Department of Clinical Epidemiology and Medical Technology Assessment (KEMTA), Maastricht University Medical Centre+, Maastricht, the Netherlands*

[b] *Department of Internal Medicine, Maastricht University Medical Centre+, Maastricht, the Netherlands*

E-mail address: dorthe.klein@mumc.nl (D.O. Klein).

* Corresponding author.

https://doi.org/10.1016/j.pmedr.2019.100920
Received 11 April 2019; Accepted 15 June 2019
Available online 16 June 2019