Development and Validation of a Risk Prediction Model of linezolid-induced thrombocytopenia in Vietnamese patients

Saturday, March 9, 2024

Abstract

Write abstract here, note the indentation

# Checklist

TRIPOD-Cluster checklist of items to include when reporting a study developing or validating a multivariable prediction model using clustered data

| **Section/topic** | **Item No** | **Description** | **Page No** |
| --- | --- | --- | --- |
| **Title and abstract** |  |  |  |
| Title | 1 | Identify the study as developing and/or validating a multivariable prediction model, the target population, and the outcome to be predicted |  |
| Abstract | 2 | Provide a summary of research objectives, setting, participants, data source, sample size, predictors, outcome, statistical analysis, results, and conclusions\* |  |
| **Introduction** |  |  |  |
| Background and objectives | 3a | Explain the medical context (including whether diagnostic or prognostic) and rationale for developing or validating the prediction model, including references to existing models, and the advantages of the study design\* |  |
|  | 3b | Specify the objectives, including whether the study describes the development or validation of the model\* |  |
| **Methods** |  |  |  |
| Participants and data | 4a | Describe eligibility criteria for participants and datasets\* |  |
|  | 4b | Describe the origin of the data, and how the data were identified, requested, and collected |  |
| Sample size | 5 | Explain how the sample size was arrived at\* |  |
| Outcomes and predictors | 6a | Define the outcome that is predicted by the model, including how and when assessed\* |  |
|  | 6b | Define all predictors used in developing or validating the model, including how and when measured\* |  |
| Data preparation | 7a | Describe how the data were prepared for analysis, including any cleaning, harmonisation, linkage, and quality checks |  |
|  | 7b | Describe the method for assessing risk of bias and applicability in the individual clusters (eg, using PROBAST) |  |
|  | 7c | For validation, identify any differences in definition and measurement from the development data (eg, setting, eligibility criteria, outcome, predictors)\* |  |
|  | 7d | Describe how missing data were handled\* |  |
| Data analysis | 8a | Describe how predictors were handled in the analyses |  |
|  | 8b | Specify the type of model, all model building procedures (eg, any predictor selection and penalisation), and method for validation\* |  |
|  | 8c | Describe how any heterogeneity across clusters (eg, studies or settings) in model parameter values was handled |  |
|  | 8d | For validation, describe how the predictions were calculated |  |
|  | 8e | Specify all measures used to assess model performance (eg, calibration, discrimination, and decision curve analysis) and, if relevant, to compare multiple models |  |
|  | 8f | Describe how any heterogeneity across clusters (eg, studies or settings) in model performance was handled and quantified |  |
|  | 8g | Describe any model updating (eg, recalibration) arising from the validation, either overall or for particular populations or settings\* |  |
| Sensitivity analysis | 9 | Describe any planned subgroup or sensitivity analysis—eg, assessing performance according to sources of bias, participant characteristics, setting |  |
| **Results** |  |  |  |
| Participants and datasets | 10a | Describe the number of clusters and participants from data identified through to data analysed; a flowchart might be helpful\* |  |
|  | 10b | Report the characteristics overall and where applicable for each data source or setting, including the key dates, predictors, treatments received, sample size, number of outcome events, follow-up time, and amount of missing data\* |  |
|  | 10c | For validation, show a comparison with the development data of the distribution of important variables (demographics, predictors, and outcome) |  |
| Risk of bias | 11 | Report the results of the risk-of-bias assessment in the individual clusters |  |
| Model development and specification | 12a | Report the results of any assessments of heterogeneity across clusters that led to subsequent actions during the model’s development (eg, inclusion or exclusion of particular predictors or clusters) |  |
|  | 12b | Present the final prediction model (ie, all regression coefficients, and model intercept or baseline estimate of the outcome at a given time point) and explain how to use it for predictions in new individuals\* |  |
| Model performance | 13a | Report performance measures (with uncertainty intervals) for the prediction model, overall and for each cluster |  |
|  | 13b | Report results of any heterogeneity across clusters in model performance |  |
| Model updating | 14 | Report the results from any model updating (including the updated model equation and subsequent performance), overall and for each cluster\* |  |
| Sensitivity analysis | 15 | Report results from any subgroup or sensitivity analysis |  |
| **Discussion** |  |  |  |
| Interpretation | 16a | Give an overall interpretation of the main results, including heterogeneity across clusters in model performance, in the context of the objectives and previous studies\* |  |
|  | 16b | For validation, discuss the results with reference to the model performance in the development data, and in any previous validations |  |
|  | 16c | Discuss the strengths of the study and any limitations (eg, missing or incomplete data, non-representativeness, data harmonisation problems) |  |
| Implications | 17 | Discuss the potential use of the model and implications for future research, with specific view to generalisability and applicability of the model across different settings or (sub)populations |  |
| **Other information** |  |  |  |
| Supplementary information | 18 | Provide information about the availability of supplementary resources (eg, study protocol, analysis code, datasets)\* |  |
| Funding | 19 | Give the source of funding and the role of the funders for the present study |  |

# Introduction

## Background and objectives

# Methods

## Participants and data

## Sample size

## Outcomes and predictors

## Data preparation

## Data analysis

## Sensitivity analysis

# Results

## Participants and datasets

## Risk of bias

## Model development and specification

## Model performance

## Model updating

## Sensitivity analysis

# Discussion

## Interpretation

## Implications

# Other information

## Supplementary information

## Funding

## Objectives

1. Investigating risk factors of linezolid-induced thrombocytopenia (LI-TP)
2. Developing and validating a logistics regression model to predict LI-TP in Vietnamese patients

## Data cleaning

Source: [Article Notebook](https://AnTangQuoc.github.io/LZD-TP-pred-model/index.qmd.html)

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Source: [Article Notebook](https://AnTangQuoc.github.io/LZD-TP-pred-model/index.qmd.html)

## Descriptive statistics

Source: [Article Notebook](https://AnTangQuoc.github.io/LZD-TP-pred-model/index.qmd.html)

|  | **Thrombocytopenia Status** | | | **Univariate Regression** | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Characteristic** | **Overall**, N = 8171 | **FALSE**, N = 5531 | **TRUE**, N = 2641 | **OR**2 | **95% CI**2 | **p-value** |
| **patient\_age** | 62 (50 - 73) | 61 (47 - 72) | 64 (54 - 74) | 1.02 | 1.01, 1.03 | **<0.001** |
| **patient\_sex** | 307 (38%) | 207 (37%) | 100 (38%) | 1.02 | 0.75, 1.38 | >0.9 |
| **LZD\_dose\_per\_weight** | 21.8 (20.0 - 24.0) | 21.8 (20.0 - 24.0) | 21.8 (19.4 - 24.6) | 0.99 | 0.96, 1.03 | 0.8 |
| **baseline\_CLCR** | 48 (21 - 83) | 55 (26 - 88) | 32 (15 - 64) | 0.99 | 0.99, 0.99 | **<0.001** |
| **dept\_ER** | 140 (17%) | 95 (17%) | 45 (17%) | 0.99 | 0.67, 1.45 | >0.9 |
| **dept\_ICU** | 391 (48%) | 241 (44%) | 150 (57%) | 1.70 | 1.27, 2.29 | **<0.001** |
| **baseline\_HGB** | 102 (89 - 120) | 105 (91 - 121) | 98 (85 - 117) | 0.99 | 0.98, 0.99 | **<0.001** |
| **baseline\_WBC** | 12 (8 - 17) | 12 (8 - 17) | 12 (8 - 18) | 1.01 | 0.99, 1.03 | 0.4 |
| **baseline\_PLT** | 206 (142 - 288) | 234 (167 - 309) | 154 (103 - 211) | 0.99 | 0.99, 0.99 | **<0.001** |
| **LZD\_duration** | 9.0 (6.0 - 14.0) | 9.0 (6.0 - 13.0) | 10.0 (6.0 - 14.0) | 1.03 | 1.01, 1.06 | **0.018** |
| **invasive\_ETI** | 387 (47%) | 231 (42%) | 156 (59%) | 2.01 | 1.50, 2.72 | **<0.001** |
| **invasive\_CVC** | 424 (52%) | 247 (45%) | 177 (67%) | 2.52 | 1.86, 3.43 | **<0.001** |
| **invasive\_IHD** | 111 (14%) | 64 (12%) | 47 (18%) | 1.65 | 1.10, 2.49 | **0.016** |
| **invasive\_CRRT** | 148 (18%) | 65 (12%) | 83 (31%) | 3.44 | 2.39, 4.98 | **<0.001** |
| **comorb\_HTN** | 333 (41%) | 218 (39%) | 115 (44%) | 1.19 | 0.88, 1.60 | 0.3 |
| **comorb\_DM** | 222 (27%) | 150 (27%) | 72 (27%) | 1.01 | 0.72, 1.40 | >0.9 |
| **comorb\_HF** | 226 (28%) | 132 (24%) | 94 (36%) | 1.76 | 1.28, 2.42 | **<0.001** |
| **comorb\_angina** | 32 (3.9%) | 19 (3.4%) | 13 (4.9%) | 1.46 | 0.69, 2.97 | 0.3 |
| **comorb\_cirr** | 48 (5.9%) | 20 (3.6%) | 28 (11%) | 3.16 | 1.75, 5.80 | **<0.001** |
| **comorb\_COPD** | 39 (4.8%) | 25 (4.5%) | 14 (5.3%) | 1.18 | 0.59, 2.28 | 0.6 |
| **comorb\_CVA** | 93 (11%) | 64 (12%) | 29 (11%) | 0.94 | 0.58, 1.49 | 0.8 |
| **comorb\_MI** | 20 (2.4%) | 15 (2.7%) | 5 (1.9%) | 0.69 | 0.22, 1.81 | 0.5 |
| **comorb\_K** | 67 (8.2%) | 44 (8.0%) | 23 (8.7%) | 1.10 | 0.64, 1.85 | 0.7 |
| **comorb\_hematological** | 46 (5.6%) | 27 (4.9%) | 19 (7.2%) | 1.51 | 0.81, 2.75 | 0.2 |
| **comorb\_hema** | 61 (7.5%) | 37 (6.7%) | 24 (9.1%) | 1.39 | 0.81, 2.37 | 0.2 |
| **infect\_sepsis** | 134 (16%) | 66 (12%) | 68 (26%) | 2.56 | 1.76, 3.74 | **<0.001** |
| **infect\_CAP** | 118 (14%) | 70 (13%) | 48 (18%) | 1.53 | 1.02, 2.28 | **0.037** |
| **infect\_HAP** | 375 (46%) | 255 (46%) | 120 (45%) | 0.97 | 0.73, 1.31 | 0.9 |
| **infect\_SSTI** | 133 (16%) | 100 (18%) | 33 (13%) | 0.65 | 0.42, 0.98 | **0.044** |
| **infect\_CNS** | 68 (8.3%) | 46 (8.3%) | 22 (8.3%) | 1.00 | 0.58, 1.68 | >0.9 |
| **infect\_IAI** | 50 (6.1%) | 34 (6.1%) | 16 (6.1%) | 0.98 | 0.52, 1.79 | >0.9 |
| **infect\_UTI** | 53 (6.5%) | 37 (6.7%) | 16 (6.1%) | 0.90 | 0.48, 1.62 | 0.7 |
| **infect\_BJI** | 11 (1.3%) | 10 (1.8%) | 1 (0.4%) | 0.21 | 0.01, 1.09 | 0.13 |
| **infect\_septicemia** | 237 (29%) | 148 (27%) | 89 (34%) | 1.39 | 1.01, 1.91 | **0.041** |
| **comed\_aspirin** | 47 (5.8%) | 30 (5.4%) | 17 (6.4%) | 1.20 | 0.64, 2.19 | 0.6 |
| **comed\_diclofenac** | 27 (3.3%) | 20 (3.6%) | 7 (2.7%) | 0.73 | 0.28, 1.66 | 0.5 |
| **comed\_ibuprofen** | 26 (3.2%) | 15 (2.7%) | 11 (4.2%) | 1.56 | 0.69, 3.42 | 0.3 |
| **comed\_paracetamol** | 355 (43%) | 244 (44%) | 111 (42%) | 0.92 | 0.68, 1.23 | 0.6 |
| **comed\_penicillin** | 123 (15%) | 78 (14%) | 45 (17%) | 1.25 | 0.83, 1.86 | 0.3 |
| **comed\_cepha** | 207 (25%) | 149 (27%) | 58 (22%) | 0.76 | 0.54, 1.08 | 0.13 |
| **comed\_carbapenem** | 584 (71%) | 382 (69%) | 202 (77%) | 1.46 | 1.05, 2.05 | **0.028** |
| **comed\_cotrimoxazol** | 65 (8.0%) | 37 (6.7%) | 28 (11%) | 1.65 | 0.98, 2.76 | 0.055 |
| **comed\_vancomycin** | 68 (8.3%) | 42 (7.6%) | 26 (9.8%) | 1.33 | 0.79, 2.21 | 0.3 |
| **comed\_levofloxacin** | 250 (31%) | 161 (29%) | 89 (34%) | 1.24 | 0.90, 1.69 | 0.2 |
| **comed\_teicoplanin** | 37 (4.5%) | 23 (4.2%) | 14 (5.3%) | 1.29 | 0.64, 2.52 | 0.5 |
| **comed\_ethambutol** | 8 (1.0%) | 5 (0.9%) | 3 (1.1%) | 1.26 | 0.26, 5.17 | 0.8 |
| **comed\_pyrazinamid** | 12 (1.5%) | 6 (1.1%) | 6 (2.3%) | 2.12 | 0.66, 6.84 | 0.2 |
| **comed\_rifampin** | 17 (2.1%) | 10 (1.8%) | 7 (2.7%) | 1.48 | 0.53, 3.89 | 0.4 |
| **comed\_heparin** | 207 (25%) | 108 (20%) | 99 (38%) | 2.47 | 1.78, 3.43 | **<0.001** |
| **comed\_clopidogrel** | 40 (4.9%) | 30 (5.4%) | 10 (3.8%) | 0.69 | 0.31, 1.38 | 0.3 |
| **comed\_enoxaparin** | 350 (43%) | 233 (42%) | 117 (44%) | 1.09 | 0.81, 1.47 | 0.6 |
| **comed\_dexamethason** | 105 (13%) | 71 (13%) | 34 (13%) | 1.00 | 0.64, 1.54 | >0.9 |
| **comed\_amiodaron** | 36 (4.4%) | 17 (3.1%) | 19 (7.2%) | 2.45 | 1.25, 4.83 | **0.009** |
| **comed\_furosemid** | 436 (53%) | 260 (47%) | 176 (67%) | 2.25 | 1.66, 3.07 | **<0.001** |
| **comed\_haloperidol** | 52 (6.4%) | 35 (6.3%) | 17 (6.4%) | 1.02 | 0.55, 1.83 | >0.9 |
| **comed\_valproic** | 32 (3.9%) | 23 (4.2%) | 9 (3.4%) | 0.81 | 0.35, 1.73 | 0.6 |
| **comed\_aceclofenac** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_naproxen** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_daptomycin** | 1 (0.1%) | 0 (0%) | 1 (0.4%) |  |  |  |
| **comed\_cetirizin** | 6 (0.7%) | 5 (0.9%) | 1 (0.4%) |  |  |  |
| **comed\_simvas** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_bisoprolol** | 6 (0.7%) | 4 (0.7%) | 2 (0.8%) |  |  |  |
| **comed\_diltiazem** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_eptifibatid** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_quinidin** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_carbamazepin** | 8 (1.0%) | 8 (1.4%) | 0 (0%) |  |  |  |
| **comed\_phenytoin** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_mirtazapin** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_quetiapin** | 4 (0.5%) | 4 (0.7%) | 0 (0%) |  |  |  |
| **comed\_ondansetron** | 6 (0.7%) | 4 (0.7%) | 2 (0.8%) |  |  |  |
| **comed\_palonosetron** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_oseltamivir** | 3 (0.4%) | 1 (0.2%) | 2 (0.8%) |  |  |  |
| **comed\_quinin** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_pembrolizumab** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_trastuzumab** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_atezolizumab** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_durvalumab** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_IVIG** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_tacrolimus** | 1 (0.1%) | 0 (0%) | 1 (0.4%) |  |  |  |
| **comed\_fluorouracil** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_irinotecan** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_leucovorin** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| **comed\_oxaliplatin** | 0 (0%) | 0 (0%) | 0 (0%) |  |  |  |
| 1Median (IQR); n (%) | | | | | | |
| 2OR = Odds Ratio, CI = Confidence Interval | | | | | | |

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| **Characteristic** | **Overall**, N = 8171 | **BM1**, N = 1251 | **BM2**, N = 771 | **ND1**, N = 1801 | **ND2**, N = 1161 | **TN1**, N = 1001 | **TN2**, N = 2191 | **p-value**2 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **patient\_age** | 62 (50 - 73) | 58 (43 - 69) | 60 (45 - 72) | 60 (45 - 68) | 59 (46 - 68) | 69 (60 - 78) | 66 (58 - 78) | **<0.001** |
| **patient\_sex** | 307 (38%) | 54 (43%) | 27 (35%) | 74 (41%) | 28 (24%) | 48 (48%) | 76 (35%) | **0.004** |
| **LZD\_dose\_per\_weight** | 21.8 (20.0 - 24.0) | 22.6 (20.0 - 25.5) | 21.4 (19.0 - 24.0) | 21.4 (19.4 - 24.0) | 21.8 (20.0 - 24.0) | 24.0 (20.0 - 24.6) | 21.8 (19.7 - 24.0) | **0.027** |
| **baseline\_CLCR** | 48 (21 - 83) | 50 (24 - 80) | 40 (17 - 86) | 70 (41 - 104) | 60 (27 - 95) | 29 (14 - 54) | 35 (17 - 67) | **<0.001** |
| **dept\_ER** | 140 (17%) | 7 (5.6%) | 9 (12%) | 67 (37%) | 15 (13%) | 16 (16%) | 26 (12%) | **<0.001** |
| **dept\_ICU** | 391 (48%) | 10 (8.0%) | 23 (30%) | 74 (41%) | 42 (36%) | 77 (77%) | 165 (75%) | **<0.001** |
| **baseline\_HGB** | 102 (89 - 120) | 105 (91 - 124) | 99 (83 - 118) | 105 (89 - 122) | 100 (88 - 118) | 99 (89 - 116) | 104 (91 - 120) | 0.2 |
| **baseline\_WBC** | 12 (8 - 17) | 11 (7 - 16) | 11 (7 - 17) | 12 (8 - 18) | 11 (7 - 15) | 12 (8 - 18) | 13 (9 - 18) | **0.024** |
| **baseline\_PLT** | 206 (142 - 288) | 195 (139 - 247) | 234 (160 - 318) | 207 (129 - 292) | 225 (127 - 310) | 172 (122 - 245) | 225 (161 - 299) | **<0.001** |
| **LZD\_duration** | 9.0 (6.0 - 14.0) | 8.0 (6.0 - 13.0) | 10.0 (6.0 - 14.0) | 10.0 (6.0 - 14.0) | 9.0 (6.0 - 12.0) | 11.0 (6.0 - 15.0) | 9.0 (6.0 - 12.0) | 0.3 |
| **invasive\_ETI** | 387 (47%) | 63 (50%) | 30 (39%) | 112 (62%) | 49 (42%) | 48 (48%) | 85 (39%) | **<0.001** |
| **invasive\_CVC** | 424 (52%) | 75 (60%) | 30 (39%) | 100 (56%) | 48 (41%) | 50 (50%) | 121 (55%) | **0.008** |
| **invasive\_IHD** | 111 (14%) | 17 (14%) | 16 (21%) | 9 (5.0%) | 0 (0%) | 27 (27%) | 42 (19%) | **<0.001** |
| **invasive\_CRRT** | 148 (18%) | 17 (14%) | 9 (12%) | 53 (29%) | 5 (4.3%) | 20 (20%) | 44 (20%) | **<0.001** |
| **comorb\_HTN** | 333 (41%) | 42 (34%) | 31 (40%) | 49 (27%) | 28 (24%) | 59 (59%) | 124 (57%) | **<0.001** |
| **comorb\_DM** | 222 (27%) | 28 (22%) | 24 (31%) | 28 (16%) | 27 (23%) | 31 (31%) | 84 (38%) | **<0.001** |
| **comorb\_HF** | 226 (28%) | 55 (44%) | 11 (14%) | 15 (8.3%) | 7 (6.0%) | 70 (70%) | 68 (31%) | **<0.001** |
| **comorb\_angina** | 32 (3.9%) | 0 (0%) | 0 (0%) | 1 (0.6%) | 0 (0%) | 13 (13%) | 18 (8.2%) | **<0.001** |
| **comorb\_cirr** | 48 (5.9%) | 6 (4.8%) | 1 (1.3%) | 10 (5.6%) | 5 (4.3%) | 12 (12%) | 14 (6.4%) | 0.080 |
| **comorb\_COPD** | 39 (4.8%) | 3 (2.4%) | 0 (0%) | 2 (1.1%) | 2 (1.7%) | 9 (9.0%) | 23 (11%) | **<0.001** |
| **comorb\_CVA** | 93 (11%) | 19 (15%) | 11 (14%) | 6 (3.3%) | 4 (3.4%) | 16 (16%) | 37 (17%) | **<0.001** |
| **comorb\_MI** | 20 (2.4%) | 10 (8.0%) | 3 (3.9%) | 2 (1.1%) | 0 (0%) | 1 (1.0%) | 4 (1.8%) | **0.002** |
| **comorb\_K** | 67 (8.2%) | 5 (4.0%) | 5 (6.5%) | 8 (4.4%) | 6 (5.2%) | 11 (11%) | 32 (15%) | **<0.001** |
| **comorb\_hematological** | 46 (5.6%) | 9 (7.2%) | 12 (16%) | 10 (5.6%) | 5 (4.3%) | 8 (8.0%) | 2 (0.9%) | **<0.001** |
| **comorb\_hema** | 61 (7.5%) | 13 (10%) | 17 (22%) | 14 (7.8%) | 2 (1.7%) | 13 (13%) | 2 (0.9%) | **<0.001** |
| **infect\_sepsis** | 134 (16%) | 10 (8.0%) | 14 (18%) | 16 (8.9%) | 15 (13%) | 44 (44%) | 35 (16%) | **<0.001** |
| **infect\_CAP** | 118 (14%) | 7 (5.6%) | 6 (7.8%) | 11 (6.1%) | 1 (0.9%) | 26 (26%) | 67 (31%) | **<0.001** |
| **infect\_HAP** | 375 (46%) | 38 (30%) | 33 (43%) | 93 (52%) | 59 (51%) | 52 (52%) | 100 (46%) | **0.004** |
| **infect\_SSTI** | 133 (16%) | 33 (26%) | 34 (44%) | 1 (0.6%) | 4 (3.4%) | 23 (23%) | 38 (17%) | **<0.001** |
| **infect\_CNS** | 68 (8.3%) | 0 (0%) | 5 (6.5%) | 24 (13%) | 20 (17%) | 4 (4.0%) | 15 (6.8%) | **<0.001** |
| **infect\_IAI** | 50 (6.1%) | 8 (6.4%) | 8 (10%) | 1 (0.6%) | 2 (1.7%) | 12 (12%) | 19 (8.7%) | **<0.001** |
| **infect\_UTI** | 53 (6.5%) | 6 (4.8%) | 8 (10%) | 10 (5.6%) | 5 (4.3%) | 4 (4.0%) | 20 (9.1%) | 0.3 |
| **infect\_BJI** | 11 (1.3%) | 3 (2.4%) | 0 (0%) | 0 (0%) | 2 (1.7%) | 1 (1.0%) | 5 (2.3%) | 0.2 |
| **infect\_septicemia** | 237 (29%) | 35 (28%) | 24 (31%) | 57 (32%) | 60 (52%) | 7 (7.0%) | 54 (25%) | **<0.001** |
| **comed\_aspirin** | 47 (5.8%) | 8 (6.4%) | 9 (12%) | 3 (1.7%) | 0 (0%) | 5 (5.0%) | 22 (10%) | **<0.001** |
| **comed\_diclofenac** | 27 (3.3%) | 24 (19%) | 0 (0%) | 0 (0%) | 1 (0.9%) | 0 (0%) | 2 (0.9%) | **<0.001** |
| **comed\_ibuprofen** | 26 (3.2%) | 0 (0%) | 0 (0%) | 0 (0%) | 2 (1.7%) | 0 (0%) | 24 (11%) | **<0.001** |
| **comed\_paracetamol** | 355 (43%) | 66 (53%) | 0 (0%) | 90 (50%) | 69 (59%) | 47 (47%) | 83 (38%) | **<0.001** |
| **comed\_penicillin** | 123 (15%) | 0 (0%) | 5 (6.5%) | 34 (19%) | 19 (16%) | 17 (17%) | 48 (22%) | **<0.001** |
| **comed\_cepha** | 207 (25%) | 12 (9.6%) | 10 (13%) | 35 (19%) | 33 (28%) | 11 (11%) | 106 (48%) | **<0.001** |
| **comed\_carbapenem** | 584 (71%) | 52 (42%) | 46 (60%) | 154 (86%) | 78 (67%) | 80 (80%) | 174 (79%) | **<0.001** |
| **comed\_cotrimoxazol** | 65 (8.0%) | 0 (0%) | 5 (6.5%) | 18 (10%) | 14 (12%) | 9 (9.0%) | 19 (8.7%) | **0.010** |
| **comed\_vancomycin** | 68 (8.3%) | 8 (6.4%) | 3 (3.9%) | 11 (6.1%) | 22 (19%) | 3 (3.0%) | 21 (9.6%) | **<0.001** |
| **comed\_levofloxacin** | 250 (31%) | 27 (22%) | 6 (7.8%) | 24 (13%) | 20 (17%) | 34 (34%) | 139 (63%) | **<0.001** |
| **comed\_teicoplanin** | 37 (4.5%) | 0 (0%) | 0 (0%) | 7 (3.9%) | 2 (1.7%) | 0 (0%) | 28 (13%) | **<0.001** |
| **comed\_ethambutol** | 8 (1.0%) | 0 (0%) | 0 (0%) | 2 (1.1%) | 6 (5.2%) | 0 (0%) | 0 (0%) | **<0.001** |
| **comed\_pyrazinamid** | 12 (1.5%) | 0 (0%) | 0 (0%) | 5 (2.8%) | 7 (6.0%) | 0 (0%) | 0 (0%) | **<0.001** |
| **comed\_rifampin** | 17 (2.1%) | 0 (0%) | 0 (0%) | 7 (3.9%) | 9 (7.8%) | 1 (1.0%) | 0 (0%) | **<0.001** |
| **comed\_heparin** | 207 (25%) | 12 (9.6%) | 2 (2.6%) | 74 (41%) | 24 (21%) | 33 (33%) | 62 (28%) | **<0.001** |
| **comed\_clopidogrel** | 40 (4.9%) | 7 (5.6%) | 4 (5.2%) | 1 (0.6%) | 0 (0%) | 8 (8.0%) | 20 (9.1%) | **<0.001** |
| **comed\_enoxaparin** | 350 (43%) | 33 (26%) | 13 (17%) | 117 (65%) | 44 (38%) | 40 (40%) | 103 (47%) | **<0.001** |
| **comed\_dexamethason** | 105 (13%) | 0 (0%) | 0 (0%) | 74 (41%) | 20 (17%) | 2 (2.0%) | 9 (4.1%) | **<0.001** |
| **comed\_amiodaron** | 36 (4.4%) | 8 (6.4%) | 0 (0%) | 14 (7.8%) | 5 (4.3%) | 4 (4.0%) | 5 (2.3%) | **0.026** |
| **comed\_furosemid** | 436 (53%) | 72 (58%) | 15 (19%) | 81 (45%) | 49 (42%) | 71 (71%) | 148 (68%) | **<0.001** |
| **comed\_haloperidol** | 52 (6.4%) | 3 (2.4%) | 4 (5.2%) | 20 (11%) | 4 (3.4%) | 5 (5.0%) | 16 (7.3%) | **0.034** |
| **comed\_valproic** | 32 (3.9%) | 0 (0%) | 1 (1.3%) | 10 (5.6%) | 5 (4.3%) | 3 (3.0%) | 13 (5.9%) | **0.024** |
| **comed\_aceclofenac** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_naproxen** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_daptomycin** | 1 (0.1%) | 0 (0%) | 0 (0%) | 0 (0%) | 1 (0.9%) | 0 (0%) | 0 (0%) | 0.4 |
| **comed\_cetirizin** | 6 (0.7%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 6 (2.7%) | **0.016** |
| **comed\_simvas** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_bisoprolol** | 6 (0.7%) | 4 (3.2%) | 0 (0%) | 1 (0.6%) | 1 (0.9%) | 0 (0%) | 0 (0%) | **0.031** |
| **comed\_diltiazem** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_eptifibatid** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_quinidin** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_carbamazepin** | 8 (1.0%) | 0 (0%) | 0 (0%) | 7 (3.9%) | 0 (0%) | 0 (0%) | 1 (0.5%) | **0.005** |
| **comed\_phenytoin** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_mirtazapin** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_quetiapin** | 4 (0.5%) | 1 (0.8%) | 1 (1.3%) | 0 (0%) | 0 (0%) | 0 (0%) | 2 (0.9%) | 0.5 |
| **comed\_ondansetron** | 6 (0.7%) | 2 (1.6%) | 1 (1.3%) | 0 (0%) | 3 (2.6%) | 0 (0%) | 0 (0%) | **0.020** |
| **comed\_palonosetron** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_oseltamivir** | 3 (0.4%) | 1 (0.8%) | 1 (1.3%) | 1 (0.6%) | 0 (0%) | 0 (0%) | 0 (0%) | 0.4 |
| **comed\_quinin** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_pembrolizumab** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_trastuzumab** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_atezolizumab** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_durvalumab** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_IVIG** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_tacrolimus** | 1 (0.1%) | 1 (0.8%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0.5 |
| **comed\_fluorouracil** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_irinotecan** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_leucovorin** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **comed\_oxaliplatin** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |  |
| **flag\_ADR\_TP\_ID** | 264 (32%) | 34 (27%) | 22 (29%) | 59 (33%) | 35 (30%) | 38 (38%) | 76 (35%) | 0.5 |
| **ADR\_CTCAE\_max** |  |  |  |  |  |  |  | **<0.001** |
| 1 | 85 (32%) | 11 (32%) | 9 (41%) | 17 (29%) | 7 (20%) | 7 (18%) | 34 (45%) |  |
| 2 | 78 (30%) | 10 (29%) | 6 (27%) | 12 (20%) | 6 (17%) | 17 (45%) | 27 (36%) |  |
| 3 | 49 (19%) | 4 (12%) | 3 (14%) | 17 (29%) | 7 (20%) | 6 (16%) | 12 (16%) |  |
| 4 | 52 (20%) | 9 (26%) | 4 (18%) | 13 (22%) | 15 (43%) | 8 (21%) | 3 (3.9%) |  |
| **ADR\_onset\_first** | 4.0 (2.0 - 10.0) | 2.0 (1.0 - 9.8) | 3.5 (2.0 - 7.8) | 4.0 (2.0 - 9.0) | 6.0 (2.5 - 11.0) | 4.0 (2.0 - 9.0) | 6.0 (2.0 - 11.0) | 0.15 |
| **ADR\_PLT\_ratio** | 0.36 (0.22 - 0.52) | 0.55 (0.26 - 0.64) | 0.39 (0.21 - 0.58) | 0.37 (0.26 - 0.50) | 0.30 (0.16 - 0.45) | 0.36 (0.20 - 0.48) | 0.35 (0.25 - 0.50) | 0.077 |
| 1Median (IQR); n (%) | | | | | | | | |
| 2Kruskal-Wallis rank sum test; Pearson's Chi-squared test; Fisher's Exact Test for Count Data with simulated p-value  (based on 2000 replicates) | | | | | | | | |

Source: [Article Notebook](https://AnTangQuoc.github.io/LZD-TP-pred-model/index.qmd.html)

## Model Performance

| performance\_type | C\_index | calibration\_intercept | calibration\_slope |
| --- | --- | --- | --- |
| Apparent | 0.7805907 | 0.0000000 | 1.0000000 |
| Bootstrap | 0.7460291 | -0.0133039 | 0.8155761 |
| K-fold | 0.7508108 | -0.0206981 | 0.9113817 |

Source: [Article Notebook](https://AnTangQuoc.github.io/LZD-TP-pred-model/index.qmd.html)