**Supplemental digital content**

**p. 2 Supplement A.** TRIPOD (Transparent Reporting of multivariable predication model for Individual Prognosis Or Diagnosis) checklist.

**pp. 3-8 Supplement B.** Questionnaire with two items on subjective physical and mental health as well as current physical and mental health concerns [in German].

**pp. 9-12 Supplement C.** 1 supplemental figure, 3 supplemental tables**.**

* **Figure S1.** Enrolment and follow-up flowchart.
* **Table S1.** Spearman correlation matrix of the items on subjective health states, the EQ-5D index value, and the EQ-5D Visual Analog Scale.
* **Table S2.** Goodness of fit of the tested models.
* **Table S3.** Coefficients of the tested models.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Section/Topic** | **Item** |  | **Checklist Item** | **Page** |
| **Title and abstract** | | | | |
| Title | 1 | D;V | Identify the study as developing and/or validating a multivariable prediction model, the target population, and the outcome to be predicted. | 1 |
| Abstract | 2 | D;V | Provide a summary of objectives, study design, setting, participants, sample size, predictors, outcome, statistical analysis, results, and conclusions. | 1 |
| **Introduction** | | | | |
| Background and objectives | 3a | D;V | Explain the medical context (including whether diagnostic or prognostic) and rationale for developing or validating the multivariable prediction model, including references to existing models. | 1-2 |
| 3b | D;V | Specify the objectives, including whether the study describes the development or validation of the model or both. | 2 |
| **Methods** | | | | |
| Source of data | 4a | D;V | Describe the study design or source of data (e.g., randomized trial, cohort, or registry data), separately for the development and validation data sets, if applicable. | 2-3 |
| 4b | D;V | Specify the key study dates, including start of accrual; end of accrual; and, if applicable, end of follow-up. | 2-3 |
| Participants | 5a | D;V | Specify key elements of the study setting (e.g., primary care, secondary care, general population) including number and location of centres. | 2-3 |
| 5b | D;V | Describe eligibility criteria for participants. | 2-3 |
| 5c | D;V | Give details of treatments received, if relevant. | NA |
| Outcome | 6a | D;V | Clearly define the outcome that is predicted by the prediction model, including how and when assessed. | 3-4 |
| 6b | D;V | Report any actions to blind assessment of the outcome to be predicted. | 3-4 |
| Predictors | 7a | D;V | Clearly define all predictors used in developing or validating the multivariable prediction model, including how and when they were measured. | 3-4 |
| 7b | D;V | Report any actions to blind assessment of predictors for the outcome and other predictors. | 3-4 |
| Sample size | 8 | D;V | Explain how the study size was arrived at. | 4,  Fi. S1 |
| Missing data | 9 | D;V | Describe how missing data were handled (e.g., complete-case analysis, single imputation, multiple imputation) with details of any imputation method. | 4 |
| Statistical analysis methods | 10a | D | Describe how predictors were handled in the analyses. | 3-4 |
| 10b | D | Specify type of model, all model-building procedures (including any predictor selection), and method for internal validation. | 3-4 |
| 10c | V | For validation, describe how the predictions were calculated. | 3-4 |
| 10d | D;V | Specify all measures used to assess model performance and, if relevant, to compare multiple models. | 4 |
| 10e | V | Describe any model updating (e.g., recalibration) arising from the validation, if done. | NA |
| Risk groups | 11 | D;V | Provide details on how risk groups were created, if done. | NA |
| Development vs. validation | 12 | V | For validation, identify any differences from the development data in setting, eligibility criteria, outcome, and predictors. | NA |
| **Results** | | | | |
| Participants | 13a | D;V | Describe the flow of participants through the study, including the number of participants with and without the outcome and, if applicable, a summary of the follow-up time. A diagram may be helpful. | 4,  Fi. S1, Tb. 1 |
| 13b | D;V | Describe the characteristics of the participants (basic demographics, clinical features, available predictors), including the number of participants with missing data for predictors and outcome. | 4-6, Tb. 1,  Tb. 2 |
| 13c | V | For validation, show a comparison with the development data of the distribution of important variables (demographics, predictors and outcome). | NA |
| Model development | 14a | D | Specify the number of participants and outcome events in each analysis. | 4-6 |
| 14b | D | If done, report the unadjusted association between each candidate predictor and outcome. | NA |
| Model specification | 15a | D | Present the full prediction model to allow predictions for individuals (i.e., all regression coefficients, and model intercept or baseline survival at a given time point). | Tb. 3, Tb. S3 |
| 15b | D | Explain how to the use the prediction model. | 6;8-9 |
| Model performance | 16 | D;V | Report performance measures (with CIs) for the prediction model. | Tb. 3, Tb. S2 |
| Model-updating | 17 | V | If done, report the results from any model updating (i.e., model specification, model performance). | NA |
| **Discussion** | | | | |
| Limitations | 18 | D;V | Discuss any limitations of the study (such as nonrepresentative sample, few events per predictor, missing data). | 9 |
| Interpretation | 19a | V | For validation, discuss the results with reference to performance in the development data, and any other validation data. | NA |
| 19b | D;V | Give an overall interpretation of the results, considering objectives, limitations, results from similar studies, and other relevant evidence. | 6;8-9 |
| Implications | 20 | D;V | Discuss the potential clinical use of the model and implications for future research. | 6;8-9 |
| **Other information** | | | | |
| Supplementary information | 21 | D;V | Provide information about the availability of supplementary resources, such as study protocol, Web calculator, and data sets. | 9 |
| Funding | 22 | D;V | Give the source of funding and the role of the funders for the present study. | 9 |

\*Items relevant only to the development of a prediction model are denoted by D, items relating solely to a validation of a prediction model are denoted by V, and items relating to both are denoted D;V. We recommend using the TRIPOD Checklist in conjunction with the TRIPOD Explanation and Elaboration document.

**Supplement B.** Questionnaire with two items on subjective physical and mental health as well as current physical and mental health concerns [in German].

**Sehr geehrte Patientin!**

**Sehr geehrter Patient!**

Um die Nachsorge auf Ihre Bedürfnisse und Wünsche abstimmen zu können, setzen wir Fragebögen und Übungen ein, die sich mit Ihrer Gesundheit und Ihrem Wohlbefinden beschäftigen.

Deshalb möchten wir Sie bitten, die folgenden Fragebögen auszufüllen. Verbringen Sie bitte nicht zu viel Zeit bei den einzelnen Punkten. Die Erfahrung hat gezeigt, dass es am besten ist, die Fragen zügig zu beantworten, ohne lange darüber nachzugrübeln.

Ihre erste Antwort ist die beste.

Bitte beantworten Sie die Fragen alleine, ohne andere Personen um ihr Urteil oder Ihre Meinung zu bitten. Für uns ist es wichtig, Sie zu verstehen. Seien Sie daher bitte offen und scheuen Sie nicht die Ehrlichkeit.

Hier interessieren nur Ihre ganz persönlichen, ehrlichen Einschätzungen und Erfahrungen.

Sollten Sie noch Fragen haben, können Sie diese gern der Arzthelferin oder auch ihrem Hausarzt stellen.

Herzlichen Dank für Ihre Teilnahme!

**Fragebogen zum Gesundheitszustand**

**Sehr geehrte Patientin, sehr geehrter Patient,**

um Ihr derzeitiges körperliches und psychisches Befinden besser einschätzen zu können,

benötigen wir Informationen aus unterschiedlichen Bereichen. Es ist wichtig, dass Sie alle Beschwerden möglichst vollständig beschreiben.

Wir bedanken uns herzlich für Ihre Teilnahme.

**Teil 1 I Fragen zur Person**

***Geschlecht:*** ⭘ männlich ⭘ weiblich ⭘ anderes

Alter:

***Konnten Sie nach der Intensivstation/schweren Erkrankung Ihre ursprüngliche berufliche Tätigkeit wieder ausüben?***

⭘ Ja ⭘ Nein ⭘ nicht zutreffend, ich bin im Rentenstand

***Familienstand:***

⭘ ledig ⭘ verheiratet/ Partnerschaft ⭘ geschieden ⭘ verwitwet

***Aktuelle Lebenssituation:***

⭘ alleinlebend zusammenlebend mit (Mehrfachnennungen möglich):

⭘ Partner ⭘ Kindern ⭘ Eltern

⭘ Anderes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Teil 2 I Ihre körperliche Gesundheit**

|  |  |  |  |
| --- | --- | --- | --- |
| **Ich leide derzeit unter folgenden Beschwerden (Mehrfachnennungen möglich):** | | | |
| ⭘ Keine  ⭘ Schwierigkeiten beim Gehen |  | ⭘ Inkontinenz |
| ⭘ Schwierigkeiten beim Treppensteigen |  | ⭘ schnelle Ermüdbarkeit |
| ⭘ Schluckschwierigkeiten |  | ⭘ Kraftmangel |
| ⭘ Verdauungsprobleme |  | ⭘ Schmerzen |
| wenn ja, seit wann: \_\_\_\_\_\_\_\_\_\_\_\_\_ | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Überhaupt nicht erschwert** | **Etwas erschwert** | **Relativ stark erschwert** | **Sehr stark erschwert** |
| Wenn eines oder mehrere dieser körperlichen Beschwerden bei Ihnen vorliegen, geben Sie bitte an, wie sehr die Beschwerden es Ihnen erschwert haben, Ihre Arbeit zu erledigen, Ihren Haushalt zu regeln oder mit anderen Menschen zurecht zu kommen | **□**  **0** | **□**  **1** | **□**  **2** | **□**  **3** |

Bitte kreuzen Sie auf dieser Skala Ihren **körperlichen Gesundheitszustand** an.

Wenn Sie den besten denkbaren Gesundheitszustand mit 10 Punkten bewerten und den schlechtesten denkbaren mit 0 Punkten: Wie viele Punkte vergeben Sie dann:

für den körperlichen Gesundheitszustand **in der letzten Woche?**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ |
|  |  |  |  |  |  |  |  |  |  |  |
| schlechtester  denkbarer  Gesundheitszustand | | | | | |  | bester  denkbarer  Gesundheitszustand | | | | | |

für den körperlichen Gesundheitszustand in der Zeit **vor der Intensivstation/schweren Erkrankung?**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ |
|  |  |  |  |  |  |  |  |  |  |  |
| schlechtester  denkbarer  Gesundheitszustand | | | | | |  | bester  denkbarer  Gesundheitszustand | | | | | |

|  |
| --- |
|  |

**Waren Sie nach der Intensivstation/Ihrer schweren Erkrankung zu einer Kur oder Rehabilitation?**

⭘ Ja ⭘ Nein

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Teil 3 | Ihre seelische Gesundheit**  **Seit der Behandlung auf der Intensivstation/der schweren Erkrankung leide ich unter (Mehrfachnennungen möglich):**  ⭘ Keine | | | | | | | |
|  | ⭘ Albträumen |  | ⭘ Störungen des Kurzzeitgedächtnisses (z.B. sich eine neue Telefonnummer merken) | | | |
|  | ⭘ Stimmungsschwankungen |  | ⭘ Schwierigkeiten, mich an bekannte Namen zu erinnern | |
|  | ⭘ Angstattacken |  | ⭘ Konzentrationsschwierigkeiten | |
|  | ⭘ Wutausbrüchen |  | ⭘ Schwierigkeiten beim Lesen von Büchern/ Zeitschriften | |
|  | ⭘ Depressionen |  | ⭘ Ich habe weniger Kontakt zu Freunden und Bekannten. |
|  | ⭘ Schlafstörungen |  | ⭘ Ich versuche, nicht an die Intensivstation zu denken. | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Überhaupt nicht erschwert** | **Etwas erschwert** | **Relativ stark erschwert** | **Sehr stark erschwert** |
| Wenn eines oder mehrere dieser körperlichen Beschwerden bei Ihnen vorliegen, geben Sie bitte an, wie sehr die Beschwerden es Ihnen erschwert haben, Ihre Arbeit zu erledigen, Ihren Haushalt zu regeln oder mit anderen Menschen zurecht zu kommen | **□**  **0** | **□**  **1** | **□**  **2** | **□**  **3** |

Bitte kreuzen Sie auf dieser Skala Ihren **seelischen Gesundheitszustand** an.

Wenn Sie den besten denkbaren Gesundheitszustand mit 10 Punkten bewerten und den schlechtesten denkbaren mit 0 Punkten: Wie viele Punkte vergeben Sie dann:

für den seelischen Gesundheitszustand **in der letzten Woche?**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | |  |  | | | | |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ |
|  |  |  |  |  |  |  |  |  |  |  |
| schlechtester  denkbarer  Gesundheitszustand | | | | | |  | bester  denkbarer  Gesundheitszustand | | | | | |

für den seelischen Gesundheitszustand in der Zeit **vor der Intensivstation/schweren Erkrankung?**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | |  |  | | | | |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ |
|  |  |  |  |  |  |  |  |  |  |  |
| schlechtester  denkbarer  Gesundheitszustand | | | | | |  | bester  denkbarer  Gesundheitszustand | | | | | |

**Supplement C.** 1 supplemental figure, 3 supplemental tables.

**Figure S1.** Enrolment and follow-up flowchart.



**Table S1.** Spearman correlation matrix of the items on subjective health states, the EQ-5D index value, and the EQ-5D Visual Analog Scale.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Subjective mental health state | Subjective physical health state | EQ-5D Visual Analog Scale | EQ-5D-5L index value |
| Subjective mental health state |  | 0.64 | 0.52 | 0.59 |
| Subjective physical health state |  |  | 0.74 | 0.68 |
| EQ-5D Visual Analog Scale |  |  |  | 0.65 |

EQ-5D = EuroQol 5-Dimension.

**Table S2.** Goodness of fit of the tested models.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model** | **nRMSE** | **nMAE** | **R2adj** | **95% LoA empirical** | **95% LoA theoretical** |
| EQ-5D VAS regression (linear) | 0.175 | 0.124 | 0.351 | -0.588; 0.529 | ± 0.513 |
| Two-item regression (linear) | 0.164 | 0.118 | 0.428 | -0.508; 0.499 | ± 0.483 |
| Two-item regression (quadratic) | 0.167 | 0.124 | 0.404 | -0.514; 0.514 | ± 0.496 |
| Two-item regression (cubic) | 0.171 | 0.131 | 0.374 | -0.523; 0.531 | ± 0.512 |
| Stepwise regression (linear) | 0.133 | 0.1 | 0.509 | -0.47; 0.486 | ± 0.461 |
| Stepwise regression (quadratic) | 0.136 | 0.104 | 0.498 | -0.475; 0.492 | ± 0.467 |
| Stepwise regression (cubic) | 0.142 | 0.109 | 0.483 | -0.478; 0.503 | ± 0.474 |
| Adaptive lasso (linear) | 0.158 | 0.113 | 0.452 | -0.469; 0.492 | ± 0.478 |
| Adaptive lasso (quadratic) | 0.161 | 0.118 | 0.436 | -0.471; 0.502 | ± 0.485 |
| Adaptive lasso (cubic) | 0.165 | 0.123 | 0.412 | -0.475; 0.513 | ± 0.497 |

EQ-5D = EuroQol 5-Dimension; LoA = limits of agreement; nMAE = normalized mean absolute error; nRMSE = normalized root mean squared error; VAS = Visual Analog Scale.

**Table S3.** Coefficients of the tested models.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Model | EQ-5D VAS | Physical health state *a* | Mental health state *a* | Organ systems affected prior to ICU admission, n *b* | Age,  years | BMI, kg/m2 | Length of MV, hours | SAPS II | Time since ICU dis-charge, days | ICU LOS, days | Ad-mission due to trauma, yes/no | Delirium, yes/no *c* | Fe-male, yes/no | Univ. degree, yes/no | Partner-ship/ marriage, yes/no | Constant |
| EQ-5D VAS regression (linear) | 0.008 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.189 |
| Two-item regression (linear) |  | 0.067 | 0.029 |  |  |  |  |  |  |  |  |  |  |  |  | 0.083 |
| Two-item regression (quadratic) |  | 0.468 | 0.213 |  |  |  |  |  |  |  |  |  |  |  |  | 0.287 |
| Two-item regression (cubic) |  | 0.38 | 0.187 |  |  |  |  |  |  |  |  |  |  |  |  | 0.397 |
| Stepwise regression (linear) |  | 0.057 | 0.035 | -0.018 |  | -0.004 | <-0.001 |  |  |  |  |  |  |  |  | 0.27 |
| Stepwise regression (quadratic) |  | 0.39 | 0.259 | -0.002 | -0.001 | -0.006 |  |  |  |  |  |  |  |  |  | 0.448 |
| Stepwise regression (cubic) |  | 0.314 | 0.219 | -0.0003 | -0.0002 | -0.001 |  |  |  |  |  |  |  |  | 0.006 | 0.5 |
| Adaptive lasso (linear) |  | 0.136 | 0.075 | -0.025 | -0.014 | -0.017 | -0.02 |  |  |  |  |  |  |  | 0.011 | 0 |
| Adaptive lasso (quadratic) |  | 0.125 | 0.079 | -0.026 | -0.024 | -0.019 | -0.01 |  |  |  |  |  | -0.02 |  | 0.007 | 0 |
| Adaptive lasso (cubic) |  | 0.112 | 0.081 | -0.028 | -0.035 | -0.021 | -0.009 |  |  |  | -0.006 |  | -0.019 | 0.011 | 0.014 | 0 |

Coefficients are displayed when covariates reached significance of p < 0.05. *a*From 0 (worst) to 10 (best). *b*As assessed by the general practitioner or study personnel. Organ systems were defined as: (1) pulmonary system, (2) metabolic system, (3) kidneys and urogenital system, (4) cardiovascular system, (5) bones, joints, and muscles, (6) central nervous system. *c* At least one positive delirium screening using the CAM-ICU or Nu-DESC during ICU stay. BMI = body mass index; EQ-5D = EuroQol 5-Dimensions; ICU = intensive care unit; lasso = least absolute shrinkage and selection operator; LOS = length of stay; MV = mechanical ventilation; SAPS II = Simplified Acute Physiology Score II; VAS = Visual Analog Scale.