**SUPPLEMENTARY TABLES AND FIGURES**

**Table S1.** Definition of potential exposure variables

| **Level** | **Variable** | **Definition** | **Category** |
| --- | --- | --- | --- |
| Individual | Age | Age at enrolment, in years. | 1 = ≤70 (Ref)  2 = 70 - 84  3 = 85 or above |
| Sex | Biological sex. | 1 = Male (Ref)  2 = Female |
| Education level | The highest level of education attained. | 1 = Low (Primary level or below) (Ref)  2 = Intermediate (Lower secondary, upper secondary, or diploma)  3 = High (Bachelor degree or above) |
| Length of residence | Duration residing at the long-term care facility prior to enrolment, in years. | 1 = ≤1 (Ref)  2 = 1 - 2  3 = 3 - 6  4 = ≥7 |
| Self-care dependence | Measured with the Minimum Data Set Activities of Daily Living (MDS-ADL) items. The Total MDS-ADL score is a sum of the responses to seven items, which ranges from 0 (total independence) to 4 (total dependence). The sum of the scores range from 0 to 28, with higher scores indicating greater dependence. The MDS-ADL score was then categorised into three groups. | 1 = 0 (Ref)  2 = 1-4  3 = ≥5 |
| Any enteral feeding tubes | Use of any enteral feeding tubes including nasogastric tubes, gastrotomy tubes, jejunostomy tubes. | 0 = No (Ref)  1 = Yes |
| Any urethral catheters | Use of any urethral catheters, excluding suprapubic catheters. | 0 = No (Ref)  1 = Yes |
| Any peritoneal dialysis catheters | Use of any peritoneal dialysis catheters, excluding haemodialysis catheters. | 0 = No (Ref)  1 = Yes |
| Any chronic skin breakdowns | Any open pressure ulcer (stage two or above), excluding stage one ulcers without any open wounds. | 0 = No (Ref)  1 = Yes |
| Any history of multidrug-resistant (MDR) bacteria colonisation | Any MDR bacteria colonisation status. MDR bacteria refers to multidrug-resistant bacteria including methicillin-resistant Staphylococcus aureus, vancomycin-resistant Enterococcus, multi-drug resistant Acinetobacter, etc. | 0 = No (Ref)  1 = Yes |
| Receipt of seasonal influenza vaccine | Receipt of the 2020/21 seasonal influenza vaccine. | 0 = No (Ref)  1 = Yes |
| **Co-morbidities** | | |
| Cancer | Malignant tumours included carcinoma, sarcoma, leukaemia, and lymphoma. Benign tumours were excluded. | 0 = No (Ref)  1 = Yes |
| Chronic heart failure | Chronic heart failure (congestive heart failure). Acute heart failure was excluded. | 0 = No (Ref)  1 = Yes |
| Chronic respiratory condition | Chronic respiratory conditions included any chronic diseases of the airways and other parts of the lung, including asthma, chronic obstructive pulmonary diseases, and other occupational lung diseases. Lung cancer was excluded (for this variable). | 0 = No (Ref)  1 = Yes |
| Dementia | Clinical diagnosis of dementia. | 0 = No (Ref)  1 = Yes |
| Diabetes mellitus | Includes both type 1 and type 2 diabetes controlled by oral medication and insulin injection. We excluded mild cases without the use of medications to control the blood sugar level. | 0 = No (Ref)  1 = Yes |
| Hepatitis B | Hepatitis B carrier status. | 0 = No (Ref)  1 = Yes |
| Hypertension | Hypertension with the use of oral medication to control blood pressure. | 0 = No (Ref)  1 = Yes |
| Stroke | History of stroke included both haemorrhagic stroke and ischemic stroke. | 0 = No (Ref)  1 = Yes |
| **Antibiotic prescriptions within 6 months of enrolment** | | |
| Number of prescription episodes | Number of prescriptions for a systemic antibacterial agent within 6 months of enrolment | 0 = None (Ref)  1 = One  2 = Two or more |
| **Hospitalisations within 12 months of enrolment** | | |
| Number of recent hospitalisation episodes | Each episode is a period of care in hospital lasting for more than 24 hours under one consultation and occurring within the past 12 months. | 1 = None (Ref)  2 = One  3 = Two or more |
| Any surgical procedures | Any surgical procedure during the hospital stay within 12 months of enrolment. Surgical procedures were any type of surgery, including endoscopies. | 0 = No (Ref)  1 = Yes |
| Facility | District | Geographic location of the facility. | 1 = Hong Kong Island (Ref)  2 = Kowloon  3 = New Territories |
| Facility size | Measured in square feetand categorised into three groups: small, medium, large. | 1 = Small (< 5,000) (Ref)  2 = Medium (5,000 – 15,000)  3 = Large (≥ 15,000) |
| Basin-to-size ratio | The ratio of wash basins to facility size in the facility (per 1,000 square feet). | 1 = <1 (Ref)  2 = ≥1 |
| Provision of portable alcohol-based hand rub to staff | Provision of portable alcohol-based hand rub to staff. | 0 = No (Ref)  1 = Yes |

*The information presented in this table is based on the documentation found in the facility’s records.*

**Table S2.** TRIPOD checklist - prediction model development and validation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Section/Topic** |  |  | **Checklist Item** |  |
| **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. | **✓** |
| Abstract | 2 | D;V | Provide a summary of objectives, study design, setting, participants, sample size, predictors, outcome, statistical analysis, results, and conclusions. | **✓** |
| **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. | **✓** |
| 3b | D;V | Specify the objectives, including whether the study describes the development or validation of the model or both. | **✓** |
| **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. | **✓** |
| 4b | D;V | Specify the key study dates, including start of accrual; end of accrual; and, if applicable, end of follow-up. | **✓** |
| 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. | **✓** |
| 5b | D;V | Describe eligibility criteria for participants. | **✓** |
| 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. | **✓** |
| 6b | D;V | Report any actions to blind assessment of the outcome to be predicted. | NA |
| Predictors | 7a | D;V | Clearly define all predictors used in developing or validating the multivariable prediction model, including how and when they were measured. | **✓** |
| 7b | D;V | Report any actions to blind assessment of predictors for the outcome and other predictors. | NA |
| Sample size | 8 | D;V | Explain how the study size was arrived at. | **✓** |
| 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. | **✓** |
| Statistical analysis methods | 10a | D | Describe how predictors were handled in the analyses. | **✓** |
| 10b | D | Specify type of model, all model-building procedures (including any predictor selection), and method for internal validation. | **✓** |
| 10c | V | For validation, describe how the predictions were calculated. | NA |
| 10d | D;V | Specify all measures used to assess model performance and, if relevant, to compare multiple models. | **✓** |
| 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. | **✓** |
| 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. | **✓** |
| 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. | **✓** |
| 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. | **✓** |
| 14b | D | If done, report the unadjusted association between each candidate predictor and outcome. | **✓** |
| 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). | **✓** |
| 15b | D | Explain how to the use the prediction model. | **✓** |
| Model performance | 16 | D;V | Report performance measures (with CIs) for the prediction model. | **✓** |
| 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 non-representative sample, few events per predictor, missing data). | **✓** |
| 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. | **✓** |
| Implications | 20 | D;V | Discuss the potential clinical use of the model and implications for future research. | **✓** |
| **Other information** | | | | |
| Supplementary information | 21 | D;V | Provide information about the availability of supplementary resources, such as study protocol, Web calculator, and data sets. | **✓** |
| Funding | 22 | D;V | Give the source of funding and the role of the funders for the present study. | **✓** |

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.

**Table S3.** Development of the best fixed-effects model using backward elimination for MRSA colonisation.a

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Model 1 (Full model)** | | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** | **Model 7** | **Model 8**  **(Best model)** | **Model 9** |
|  | Number of hospitalisation episodes | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Number of antibiotic prescriptions | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | History of MDR bacteria colonisation | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | History of stroke | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Receipt of influenza vaccine | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Length of residence | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Age | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Self-care dependence | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |  |
|  | Any chronic skin breakdowns | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |  |  |
|  | Diabetes mellitus | | ✓ | ✓ | ✓ | ✓ | ✓ |  |  |  |
|  | Dementia | | ✓ | ✓ | ✓ | ✓ |  |  |  |  |
|  | Any enteral feeding tubes | | ✓ | ✓ | ✓ |  |  |  |  |  |
|  | Any urethral catheters | | ✓ | ✓ |  |  |  |  |  |  |
|  | Sex | | ✓ |  |  |  |  |  |  |  |
|  | Peritoneal dialysis | |  |  |  |  |  |  |  |  |
| *AIC* | | *594.6181* | *592.6281* | *590.6829* | *588.8408* | *587.1368* | *585.9663* | *585.8454* | *585.6885* | *586.3699* |
| Δ *AIC b* | | *8.9296* | *6.9396* | *4.9944* | *3.1523* | *1.4483* | *0.2778* | *0.1569* | *0* | *0.6814* |

MDR: multidrug-resistant.

a Variables with the highest p-value from the multivariate regression model, which included all individual-level exposure variables, were removed first.

b The Delta AIC (ΔAIC) is the difference in AIC value between the best model (Model 8) and the model being compared.

**Table S4.** Results of mixed-effects modelling.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Modela** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Null** | **Random Intercepts and Fixed Slopes** | | | | | | | | | | **Random Intercepts and Random Slopes b,c** | | | | | | | | | | | | | | | | | | **Cross-level interactions** |
| 1 | 2 | | 3 | | 4 | | 5 | | 6† | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | | | 13 | | 14 | | 15 | |
| **Individual level** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Intercept | -6.928\*\*\*  (0.125) | -4.417\*\*\*  (0.391) | | -4.006\*\*\*  (0.415) | | -3.551\*\*\*  (0.450) | | -4.829\*\*\*  (0.381) | | -4.035\*\*\*  (0.361) | | -3.841\*\*\*  (0.387) | | -4.003\*\*\*  (0.392) | | -4.035\*\*\*  (0.361) | | -4.035\*\*\*  (0.361) | | -3.729\*\*\*  (0.428) | | -4.035\*\*\*  (0.361) | | | -4.035\*\*\*  (0.361) | | -3.971\*\*\*  (0.363) | | -4.074\*\*\*  (0.375) | |
| **Number of hospitalisation episodes (ref: 0)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 |  | 1.075  (0.266) | | 1.051  (0.265) | | 1.060  (0.267) | | 1.082  (0.265) | | 1.083  (0.267) | | 0.590  (0.438) | | 1.241  (0.272) | | 1.083  (0.267) | | 1.083  (0.267) | | 1.142  (0.272) | | 1.083  (0.267) | | | 1.083  (0.267) | | 1.070  (0.269) | | 1.341  (0.369) | |
| ≥ 2 |  | 2.603\*\*  (0.283) | | 2.543\*  (0.281) | | 2.636\*\*  (0.283) | | 2.529\*  (0.283) | | 2.678\*\*  (0.284) | | 2.483\*  (0.300) | | 2.836\*\*  (0.290) | | 2.678\*\*  (0.284) | | 2.678\*\*  (0.284) | | 2.786\*\*  (0.290) | | 2.678\*\*  (0.284) | | | 2.678\*\*  (0.284) | | 2.649\*\*  (0.287) | | 2.004\*  (0.423) | |
| **Number of antibiotic prescriptions (ref: 0)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 |  | 1.104  (0.299) | | 1.114  (0.297) | | 1.185  (0.301) | | 1.192  (0.298) | | 1.350  (0.302) | | 1.618  (0.315) | | 1.193  (0.382) | | 1.350  (0.302) | | 1.350  (0.302) | | 1.491  (0.311) | | 1.350  (0.302) | | | 1.350  (0.302) | | 1.403  (0.306) | | 1.401  (0.304) | |
| ≥ 2 |  | 2.245\*  (0.434) | | 2.314\*  (0.427) | | 2.195\*  (0.434) | | 2.202\*  (0.430) | | 2.449\*  (0.433) | | 2.482\*  (0.442) | | 2.063  (0.656) | | 2.449\*  (0.433) | | 2.449\*  (0.433) | | 2.534\*  (0.453) | | 2.449\*  (0.433) | | | 2.449\*  (0.433) | | 2.444\*  (0.435) | | 2.478\*  (0.435) | |
| **History of stroke** |  | 2.585\*\*  (0.237) | | 2.608\*\*  (0.236) | | 2.649\*\*  (0.237) | | 2.660\*\*  (0.237) | | 2.751\*\*  (0.239) | | 2.716\*\*  (0.243) | | 2.621\*\*  (0.245) | | 2.751\*\*  (0.239) | | 2.751\*\*  (0.239) | | 2.663\*\*  (0.243) | | 2.751\*\*  (0.239) | | | 2.751\*\*  (0.239) | | 2.704\*\*  (0.240) | | 2.700\*\*  (0.239) | |
| **Receipt of influenza vaccine** |  | -2.543\*\* (0.253) | | -2.913\*\*  (0.243) | | -2.723\*\*  (0.242) | | -3.219\*\*  (0.233) | | -2.319\*  (0.238) | | -2.440\*  (0.244) | | -1.875 (0.250) | | -2.319\*  (0.238) | | -2.319\*  (0.238) | | -2.291\*  (0.243) | | -2.319\*  (0.238) | | | -2.319\*  (0.238) | | -2.328\*  (0.244) | | -2.311\*  (0.240) | |
| **History of MDR bacteria colonisation** | | 2.144\*  (0.384) | | 2.130\*  (0.376) | | 2.360\*  (0.379) | | 2.269\*  (0.380) | | 2.469\*  (0.379) | | 2.466\*  (0.397) | | 2.088\*  (0.250) | | 2.469\*  (0.379) | | 2.469\*  (0.379) | | 2.411\*  (0.389) | | 2.469\*  (0.379) | | | 2.469\*  (0.379) | | 2.484\*  (0.383) | | 2.465\*  (0.385) | |
| **Self-care dependence (ref: 0)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 - 4 |  | -0.563 (0.386) | | -0.616 (0.384) | | -0.504  (0.387) | | -0.601  (0.384) | | -0.524 (0.387) | | -0.341  (0.394) | | -0.450 (0.394) | | -0.524  (0.387) | | -0.524 (0.387) | | -0.142  (0.447) | | -0.524  (0.387) | | | -0.524  (0.387) | | -0.557  (0.389) | | -0.484  (0.388) | |
| ≥ 5 |  | 1.383  (0.238) | | 1.335  (0.238) | | 1.397  (0.239) | | 1.362  (0.238) | | 1.310  (0.240) | | 1.486  (0.246) | | 1.288  (0.244) | | 1.310  (0.240) | | 1.310  (0.240) | | 1.258  (0.376) | | 1.310  (0.240) | | | 1.310  (0.240) | | 1.313  (0.241) | | 1.292  (0.240) | |
| **Age group, years (ref: <70)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 70 - 84 |  | -1.352 (0.316) | | -1.493  (0.310) | | -1.415  (0.312) | | -1.500  (0.311) | | -1.028  (0.316) | | -1.041  (0.324) | | -1.020  (0.322) | | -1.028  (0.316) | | -1.028  (0.316) | | -1.024  (0.323) | | -1.028  (0.316) | | | -1.028  (0.316) | | -1.063  (0.319) | | -1.004  (0.317) | |
| ≥ 85 |  | 0.104  (0.318) | | -0.041  (0.306) | | 0.017  (0.306) | | -0.075  (0.305) | | 0.475  (0.313) | | 0.482  (0.321) | | 0.558  (0.320) | | 0.475  (0.313) | | 0.475  (0.313) | | 0.441  (0.321) | | 0.475  (0.313) | | | 0.475  (0.313) | | 0.402  (0.317) | | 0.493  (0.314) | |
| **Length of residence, years (ref: <1)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 - 2 |  | 2.154\*  (0.298) | | 2.377\*  (0.300) | | 2.313\*  (0.298) | | 2.366\*  (0.297) | | 2.015\*  (0.299) | | 1.994\*  (0.303) | | 2.058\* (0.302) | | 2.015\*  (0.299) | | 2.015\*  (0.299) | | 2.023\*  (0.303) | | 2.015\*  (0.299) | | | 2.015\*  (0.299) | | 1.998\*  (0.310) | | 1.951  (0.348) | |
| 3 - 6 |  | 2.375\*  (0.310) | | 2.624\*\*  (0.314) | | 2.479\*  (0.310) | | 2.611\*\*  (0.309) | | 2.321\*  (0.308) | | 2.258\*  (0.312) | | 2.289\*  (0.313) | | 2.321\*  (0.308) | | 2.321\*  (0.308) | | 2.474\*  (0.317) | | 2.321\*  (0.308) | | | 2.321\*  (0.308) | | 2.205\*  (0.320) | | 2.304\*  (0.309) | |
| ≥ 7 |  | 2.467\*\*  (0.349) | | 2.695\*\*  (0.349) | | 2.680\*\*  (0.348) | | 2.617\*\*  (0.345) | | 2.406\*  (0.347) | | 2.404\*  (0.352) | | 2.241\*  (0.354) | | 2.406\*  (0.347) | | 2.406\*  (0.347) | | 2.588\*\*  (0.356) | | 2.406\*  (0.347) | | | 2.406\*  (0.347) | | 2.367\*  (0.365) | | 2.397\*  (0.348) | |
| **Facility level** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **District (ref: Hong Kong Island)** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kowloon |  |  | -0.569  (0.262) | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  |  | |  | |
| New Territories |  |  | 0.524  (0.298) | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  |  | |  | |
| **Facility size (ref: Small)** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Medium |  |  |  | | 0.203  (0.335) | |  | |  | |  | |  | |  | |  | |  | |  | |  |  | |  | |
| Large |  |  |  | | -1.429  (0.350) | |  | |  | |  | |  | |  | |  | |  | |  | |  |  | |  | |
| **Basin-to-size ratio (ref: <1)** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ≥ 1 per 1000 square feet | |  |  | |  | | 1.823  (0.214) | |  | |  | |  | |  | |  | |  | |  | |  |  | |  | |
| **Provision of portable ABHR to staff** | | |  | |  | |  | | -3.175\*\*  (0.231) | | -3.206\*\*  (0.239) | | -3.059\*\*  (0.255) | | -3.175\*\*  (0.231) | | -3.175\*\*  (0.231) | | -3.319\*\*\*  (0.253) | | -3.175\*  (0.231) | | -3.175\*  (0.231) | -3.108\*\*  (0.235) | | -1.823  (0.317) | |
| **Cross-level interactions** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Provision of portable ABHR to staff × number of hospitalisation episodes (1 episode) | | | | | | | | | | | | | | | | | | | | | | | | | | -0.808  (0.522) | |
| Provision of portable ABHR to staff × number of hospitalisation episodes (≥2 episodes) | | | | | | | | | | | | | | | | | | | | | | | | | | -0.350  (0.538) | |
| **Variance components** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Random intercept | 0.040 | 0.045 | 0 | | 0 | | 0 | | 0 | | <0.001 | | <0.001 | | 0 | | 0 | | <0.001 | | 0 | | 0 | <0.001 | | 0 | |
| **Slope variance** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Number of hospitalisation episodes** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 |  |  |  | |  | |  | |  | | 0.1012 | |  | |  | |  | |  | |  | |  |  | |  | |
| 1 |  |  |  | |  | |  | |  | | 0.4037 | |  | |  | |  | |  | |  | |  |  | |  | |
| ≥ 2 |  |  |  | |  | |  | |  | | 0.0145 | |  | |  | |  | |  | |  | |  |  | |  | |
| **Number of antibiotic prescriptions** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 |  |  |  | |  | |  | |  | |  | | 0.0902 | |  | |  | |  | |  | |  |  | |  | |
| 1 |  |  |  | |  | |  | |  | |  | | 0.1003 | |  | |  | |  | |  | |  |  | |  | |
| ≥ 2 |  |  |  | |  | |  | |  | |  | | 0.5379 | |  | |  | |  | |  | |  |  | |  | |
| **History of stroke** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No |  |  |  | |  | |  | |  | |  | |  | | 0 | |  | |  | |  | |  |  | |  | |
| Yes |  |  |  | |  | |  | |  | |  | |  | | <0.001 | |  | |  | |  | |  |  | |  | |
| **History of MDR bacteria colonisation** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No |  |  |  | |  | |  | |  | |  | |  | |  | | 0 | |  | |  | |  |  | |  | |
| Yes |  |  |  | |  | |  | |  | |  | |  | |  | | <0.001 | |  | |  | |  |  | |  | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Self-care dependence score** | | | | | | | | | | | | | | | |
| 0 |  |  |  |  |  |  |  |  |  |  | 0.3063 |  |  |  |  |
| 1 - 4 |  |  |  |  |  |  |  |  |  |  | 0.0018 |  |  |  |  |
| ≥ 5 |  |  |  |  |  |  |  |  |  |  | 0.0315 |  |  |  |  |
| **Receipt of influenza vaccine** | | | | | | | | | | | | | | | |
| No |  |  |  |  |  |  |  |  |  |  |  | 0 |  |  |  |
| Yes |  |  |  |  |  |  |  |  |  |  |  | <0.001 |  |  |  |
| **Age group, years** | | | | | | | | | | | | | | | |
| < 70 |  |  |  |  |  |  |  |  |  |  |  |  | <0.001 |  |  |
| 70 - 84 |  |  |  |  |  |  |  |  |  |  |  |  | <0.001 |  |  |
| ≥ 85 |  |  |  |  |  |  |  |  |  |  |  |  | <0.001 |  |  |
| **Length of residence, years** | | | | | | | | | | | | | | | |
| < 1 |  |  |  |  |  |  |  |  |  |  |  |  |  | <0.001 |  |
| 1 – 2 |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.0392 |  |
| 3 – 6 |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.0346 |  |
| ≥ 7 |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.0519 |  |
| **Additional information** | | | | | | | | | | | | | | | |
| ICC d | 0.012 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AIC | 617.1 | 587.9 | 591.3 | 586.6 | 587.3 | 580.4g | 587.8 | 587.9 | 586.4 | 586.4 | 588.7 | 586.4 | 592.4 | 600.2 | 583.8 |
| Δ AIC e | 36.7 | 7.5 | 10.9 | 6.2 | 6.9 | 0 | 7.4 | 7.5 | 6.0 | 6.0 | 8.3 | 6.0 | 12.0 | 19.8 | 3.4 |

Numbers in the table are estimated coefficients with standard errors in brackets unless specified. ABHR: alcohol-based hand rub; MDR: multidrug-resistant.

† Model 6, which contains a random intercept with a fixed slope (provision of portable ABHR for staff), performed significantly better than the model without the random intercept (p=0.002), according to the results of the likelihood ratio test. Therefore, it was considered to be the best model.

a \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001

b The random slope includes the following predictors: number of hospitalisation episodes (Model 7), number of antibiotic prescriptions (Model 8), history of stroke (Model 9), any MDR bacteria colonisation history (Model 10), self-care dependence (Model 11), receipt of seasonal influenza vaccine (Model 12), age (Model 13), and length of residence (Model 14).

c Different random slopes were added to Model 6 to explore whether they improved the fit.

d The intra-class correlation coefficient (ICC) measures variance and quantifies the degree to which data at the lower level are correlated.

e Delta AIC (Δ AIC) is the difference in AIC value between the best model (the one with the lowest AIC) and the model being compared. A delta AIC of less than two indicates the difference between the candidate model and the ‘best’ model is not significant.

# **Table S5**. Risk stratification for RCHEs with varying risk score thresholds and proportions of high-risk residents

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | **Facility** | | | | | | | | | | | | | | | | | | | | |
|  | | **A** | | | **B** | | **C** | | **D** | | **E** | | **F** | | **G** | | **H** | | **I** | | **J** | |
| Total number of residents in the facility, n (%) **a** | | 88 (18) | | | 15 (3) | | 81 (16) | | 49 (10) | | 17 (3) | | 87 (17) | | 91 (18) | | 25 (5) | | 25 (5) | | 24 (5) | |
| Number of residents with MRSA carriage, n (%) **b** | | 35 (40) | | | 2 (13) | | 23 (28) | | 21 (43) | | 5 (29) | | 26 (30) | | 21 (23) | | 6 (24) | | 7 (28) | | 5 (21) | |
| Risk category based on the proportion of residents with MRSA carriage | | High | | | Low | | Low | | High | | Low | | Low | | Low | | Low | | Low | | Low | |
| **Residents with an individual risk score ≥8 are categorised as high-risk** | | | | | | | | | | | | | | | | | | | | | | | |
| Number of high-risk residents, n (%) **d** | 35 (40) | | | 5 (33) | | 16 (20) | | 29 (59) | | 5 (29) | | 19 (22) | | 13 (14) | | 7 (28) | | 5 (20) | | 3 (13) | |
| **Facilities are categorised as High-risk if…** |  | | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 100% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥90% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥80% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥70% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥60% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥50% of residents are high-risk | Low | | | Low | | Low | | High | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥40% of residents are high-risk\* | High | | | Low | | Low | | High | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥30% of residents are high-risk | High | | | High | | Low | | High | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥20% of residents are high-risk | High | | | High | | High | | High | | High | | High | | Low | | High | | High | | Low | |
| ≥10% of residents are high-risk | High | | | High | | High | | High | | High | | High | | High | | High | | High | | High | |
| **Residents with individual risk score ≥14 are categorised as high-risk** | | | | | | | | | | | | | | | | | | | | | | | |
| Number of high-risk residents, n (%) **d** | 11 (13) | | | 1 (7) | | 1 (1) | | 14 (29) | | 2 (12) | | 7 (8) | | 1 (1) | | 0 (0) | | 11 (13) | | 1 (7) | |
| **Facilities are categorised as high-risk if…** | | | | | | | | | | | | | | | | | | | | | | | |
| 100% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥90% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥80% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥70% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥60% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥50% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥40% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥30% of residents are high-risk | Low | | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥20% of residents are high-risk | Low | | | Low | | Low | | High | | Low | | Low | | Low | | Low | | Low | | Low | |
| ≥10% of residents are high-risk\* | High | | | Low | | Low | | High | | High | | Low | | Low | | Low | | Low | | Low | |

a Proportion of residents in each RCHE across all facilities.

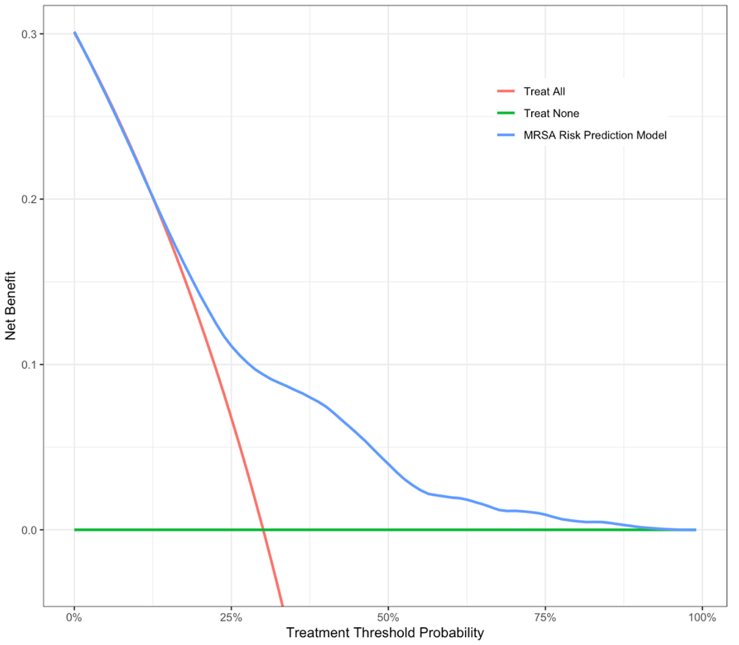
b Proportion of residents colonised with methicillin-resistant Staphylococcus aureus (MRSA) in each facility.

c Proportion of residents colonised with MRSA across all facilities.

d Proportion of high-risk residents in each facility.

† Compared to the overall prevalence of MRSA carriage (30.1%).

\* This percentage resulted in the optimum performance of the risk tool for the given risk score threshold in identifying facilities with the highest proportion of residents with MRSA carriage.

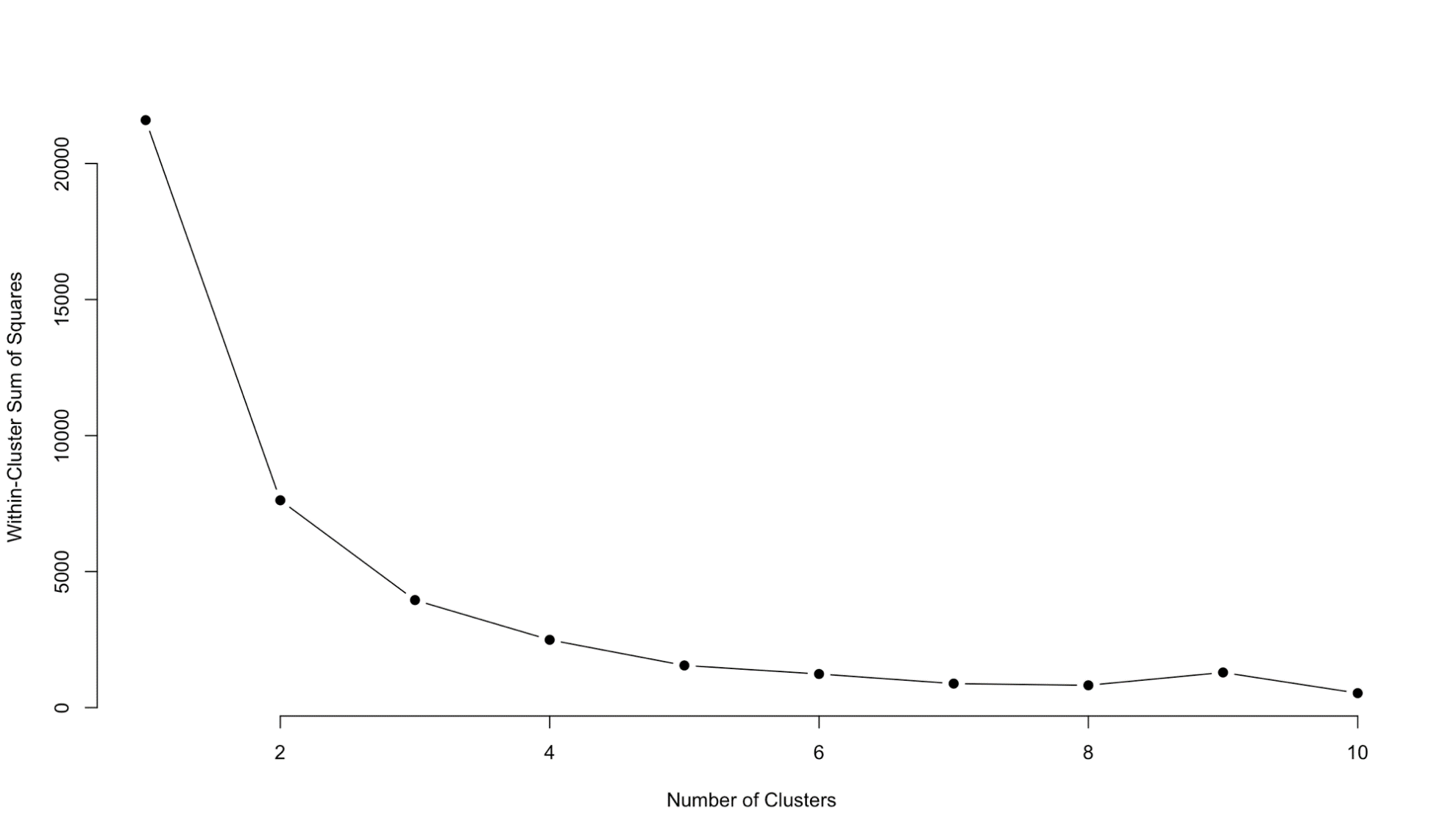


**Figure S1.** Decision curve for the model to predict MRSA colonisation in RCHEs

The MRSA model results are represented by the blue line, while the red and green lines represent two competing strategies; the red line assumes all residents are colonised with MRSA (treat all) and the green line assumes no residents are colonised with MRSA (treat none). These two strategies intersect at the prevalence, which is represented on the *x*-axis as the treatment threshold probability.

The graph shows the expected net benefit per resident relative to the strategy of ‘treat none’ for each of the three strategies. The MRSA model (blue line) is comparable to the strategy of screening all residents at low threshold probabilities (< ~13%) of MRSA colonization and is comparable to the strategy of treating none at high threshold probabilities (> ~90%). However, between these two extremes, there is a range of threshold probabilities (~13% to ~90%) where the MRSA model provides added value.

If a resident has a high certainty of MRSA carriage, clinicians would opt for interventions such as an MRSA culture test or decolonization directly, and the model would have no clinical role. However, the risk score can be the first step in identifying high-risk residents for further MRSA culture tests. The potential benefit of identifying true positive cases is a reduction in the number of residents who need to be screened for MRSA culture in resource-strained settings such as LTCFs. Therefore, the MRSA model would be most useful for identifying high-risk residents where a lower level of certainty is in place, and clinicians would like to target screening resources to those who are most likely to benefit.



**Figure S2.** Elbow plot revealing a clear straightening of the points after four clusters.