# Supplementary files

*Table S1*    Results of the univariate and multivariate logistic regression for quality indicator 1 (indication)

| Variables | Univariate | | Multivariate[a] | |
|---|---|---|---|---|
| | OR (95% CI) | *p* value | OR (95% CI) | *p* value |
| **Sex** | | | | |
|   Male | *ref* | | | |
|   Female | 1.208 (0.477-3.061) | 0.690 | | |
| | 0.886 (0.686-1.138) | 0.329 | | |
| **Body mass index** | 1.062 (0.985-1.145) | 0.120 | 1.075 (0.972-1.189) | 0.159 |
| **ASA classification** | | 0.976 | | |
|   1 | *ref* | | | |
|   2 | 1.158 (0.320-4.195) | 0.823 | | |
|   3 | 0.917 (0.227-3.704) | 0.903 | | |
|   4 | 1.000 (0.050-19.963) | 1.000 | | |
| **AZV (health insurance)** | | | | |
|   Yes | *ref* | | | |
|   No | 1.026 (0.195-5.406) | 0.976 | | |
| **Renal function (GFR)[c]** | 0.605 (0.211-1.741) | 0.352 | | |
| **Knowledge renal function** | | | | |
|   Yes | 1.432 (0.594-3.449) | 0.424 | | |
|   No | *ref* | | | |
| **Preoperative antibiotic use** | | | | |
|   Yes | 1.727 (0.272-10.974) | 0.562 | | |
|   No | *ref* | | | |
| **Surgical ward** | | 0.054 | | |
|   ENT | 0.000 (0.000-.) | 0.999 | | |
|   Neurosurgery | 0.071 (0.006-0.881) | 0.039 | | |
|   Orthopaedic surgery | 0.019 (0.001-0.357) | 0.008 | | |
|   Gynaecologic surgery | 0.185 (0.019-1.848) | 0.151 | | |
|   General surgery | 0.472 (0.047-4.770) | 0.525 | | |
|   Urologic surgery | 0.667 (0.032-14.033) | 0.794 | | |
|   Cardiologic surgery | 0.000 (0.000-.) | 0.999 | | |
|   Plastic surgery | *ref* | | | |
| **Type of surgery** | | 0.997 | | |
|   Elective surgery | *ref* | | | |
|   Emergency surgery | 1.056 (0.245-4.540) | 0.942 | | |
|   Acute surgery | $1.705*10^9$ (0.000-.) | 1.000 | | |
| **Duration of procedure[d]** | 1.000 (1.000-1.000) | 0.120 | 1.000 (1.000-1.010) | 0.063 |
| **Blood loss[e]** | 1.647 (0.740-3.639) | 0.243 | | |
| **Use of implant** | | | | |
|   Yes | 0.000 (0.000-.) | 0.999 | | |
|   No | *ref* | | | |
| **Duration of preoperative stay** | 1.031 (0.991-1.073) | 0.134 | 1.022 (0.972-1.074) | 0.402 |

*Nr.* number, *CI* confidence interval, *OR* odds ratio, *ref* reference

[a] Model consists of body mass index, duration of procedure and duration of preoperative stay.

[b] OR per 10 years increase in age (per 1-year increase in age: univariate OR 0.988; 95% CI: 0.963-1.013)

[c] OR per 10 ml/min increase in GFR (per 1 ml/min increase in GFR: univariate OR 0.951; 95% CI: 0.856-1.057)

[d] OR per 10 minutes increase in duration of the surgical procedure (per 1 minute increase in duration: univariate OR 1.000; 95%CI: 1.000-1.000/multivariate OR 1.000; 95%: 1.000-1.010)

[e] OR per 100 millilitre increase in blood loss (per 1 millilitre increase in blood loss: univariate OR 1.005; 95% CI: 0.997-1.013)

*Table S2* Results of the univariate and multivariate logistic regression for quality indicator 2 (agent)

| Variables | Univariate | | Multivariate[a] | |
|---|---|---|---|---|
| | OR (95% CI) | *p* value | OR (95% CI) | *p* value |
| **Sex** | | | | |
| Male | *ref* | | | |
| Female | 1.560 (0.448-5.431) | 0.485 | | |
| **Age**[b] | 0.505 (0.302-0.842) | 0.009 | 0.516 (0.305-0.869) | 0.013 |
| **Body mass index** | 1.018 (0.928-1.116) | 0.705 | | |
| **ASA classification** | | 0.313 | | |
| 1 | *ref* | | | |
| 2 | 0.000 (0.000-.) | 0.999 | | |
| 3 | 0.000 (0.000-.) | 0.999 | | |
| 4 | 0.000 (0.000-.) | 0.999 | | |
| **AZV (health insurance)** | | | | |
| Yes | *ref* | | | |
| No | 0.394 (0.070-2.209) | 0.290 | | |
| **Renal function (GFR)**[c] | 0.860 (0.272-2.739) | 0.801 | | |
| **Knowledge renal function** | | | | |
| Yes | 0.286 (0.056-1.466) | 0.133 | 0.353 (0.059-2.123) | 0.255 |
| No | *ref* | | | |
| **Preoperative antibiotic use** | | | | |
| Yes | 1.036 (0.086-12.414) | 0.978 | | |
| No | *ref* | | | |
| **Surgical ward** | | 0.366 | | |
| Neurosurgery | 1.000 (0.000-.) | 1.000 | | |
| Orthopaedic surgery | 0.000 (0.000-.) | 0.999 | | |
| Gynaecologic surgery | 1.000 (0.000-.) | 1.000 | | |
| General surgery | 0.000 (0.000-.) | 0.999 | | |
| Urologic surgery | 1.000 (0.000-.) | 1.000 | | |
| Cardiologic surgery | 0.000 (0.000-.) | 0.999 | | |
| Plastic surgery | *ref* | | | |
| **Type of surgery** | | 0.592 | | |
| Elective surgery | *ref* | | | |
| Emergency surgery | 0.406 (0.072-2.281) | 0.306 | | |
| Acute surgery | 656286655 (0.000-.) | 1.000 | | |
| **Duration of procedure**[d] | 1.000 (1.000-1.000) | 0.908 | | |
| **Blood loss**[e] | 1.020 (0.942-1.105) | 0.618 | | |
| **Use of implant** | | | | |
| Yes | 0.000 (0.000-.) | 0.998 | | |
| No | *ref* | | | |
| **Duration of preoperative stay** | 1.007 (0.971-1.044) | 0.711 | | |

*Nr.* number, *CI* confidence interval, *OR* odds ratio, *ref* reference

[a] Model consists of age and knowledge of renal function.

[b] OR per 10 years increase in age (per 1 year increase in age: univariate OR 0.934; 95% CI: 0.887-0.983/multivariate OR 0.936; 95%: 0.888-0.986)

[c] OR per 10 ml/min increase in GFR (per 1 ml/min increase in GFR: univariate OR 0.985; 95% CI: 0.878-1.106)

[d] OR per 10 minutes increase in duration of the surgical procedure (per 1 minute increase in duration: univariate OR 1.000; 95%CI: 1.000-1.000)

[e] OR per 100 millilitre increase in blood loss (per 1 millilitre increase in blood loss: univariate OR 1.002; 95% CI: 0.994-1.010)

*Table S3* Results of the univariate and multivariate logistic regression for quality indicator 4 (timing)

| Variables | Univariate | | Multivariate[a] | |
|---|---|---|---|---|
| | OR (95% CI) | *p* value | OR (95% CI) | *p* value |
| **Sex** | | | | |
| Male | *ref* | | | |
| Female | 0.514 (0.131-2.020) | 0.341 | | |
| **Age**[b] | 1.842 (1.127-2.997) | 0.014 | 1.791 (1.094-2.917) | 0.020 |
| **Body mass index** | 0.959 (0.865-1.063) | 0.428 | | |
| **ASA classification** | | 0.495 | | |
| 1 | *ref* | | | |
| 2 | 0.242 (0.029-2.027) | 0.191 | | |
| 3 | 0.667 (0.084-5.301) | 0.702 | | |
| 4 | $1.077*10^9$ (0.000-.) | 1.000 | | |
| **AZV (health insurance)** | | | | |
| Yes | *ref* | | | |
| No | 4.615 (0.432-49.296) | 0.206 | 2.906 (0.256-32.952) | 0.389 |
| **Renal function (GFR)**[c] | 0.923 (0.027-31.503) | 0.964 | | |
| **Knowledge renal function** | | | | |
| Yes | 1.733 (0.360-8.351) | 0.493 | | |
| No | *ref* | | | |
| **Preoperative antibiotic use** | | | | |
| Yes | 0.000 (0.000-.) | 1.000 | | |
| No | *ref* | | | |
| **Surgical ward** | | | | |
| Neurosurgery | | | | |
| Orthopaedic surgery | | | | |
| Gynaecologic surgery | | | | |
| General surgery | | | | |
| Urologic surgery | | | | |
| Cardiologic surgery | | | | |
| Plastic surgery | | | | |
| **Type of surgery** | | | | |
| Elective surgery | *ref* | | | |
| Emergency surgery | 3.167 (0.500-20.036) | 0.221 | | |
| **Duration of procedure**[d] | 1.000 (1.000-1.000) | 0.367 | | |
| **Blood loss**[e] | 0.819 (0.448-1.491) | 0.649 | | |
| **Use of implant** | | | | |
| Yes | 1.385 (0.240-7.985) | 0.716 | | |
| No | *ref* | | | |
| **Duration of preoperative stay** | 0.995 (0.961-1.030) | 0.770 | | |

*Nr.* number, *CI* confidence interval, *OR* odds ratio, *ref* reference

[a] Model consists of age and AZV insurance.

[b] OR per 10 years increase in age (per 1-year increase in age: univariate OR 1.063; 95% CI: 1.012-1.116/multivariate OR 1.060; 95%: 1.009-1.113)

[c] OR per 10 ml/min increase in GFR (per 1 ml/min increase in GFR: univariate OR 0.992; 95% CI: 0.697-1.412)

[d] OR per 10 minutes increase in duration of the surgical procedure (per 1 minute increase in duration: univariate OR 1.000; 95%CI: 1.000-1.000)

[e] OR per 100 millilitres increase in blood loss (per 1 millilitre increase in blood loss: univariate OR 0.998; 95% CI: 0.992-1.004)

*Table S4* Results of the univariate and multivariate logistic regression for quality indicator 5 (duration)

| Variables | Univariate | | Multivariate[a] | |
|---|---|---|---|---|
| | OR (95% CI) | *p* value | OR (95% CI) | *p* value |
| **Sex** | | | | |
| Male | *ref* | | | |
| Female | 0.000 (0.000-.) | 0.998 | | |
| **Age**[b] | 0.599 (0.319-1.127) | <u>0.109</u> | 0.745 (0.365-1.524) | 0.420 |
| **Body mass index** | 1.067 (0.935-1.218) | 0.333 | | |
| **ASA classification** | | 1.000 | | |
| 1 | *ref* | | | |
| 2 | 1.150 (0.105-12.619) | 0.909 | | |
| 3 | $3.231 \times 10^8$ (0.000-.) | 0.998 | | |
| 4 | $3.231 \times 10^8$ (0.000-.) | 0.999 | | |
| **AZV (health insurance)** | | | | |
| Yes | *ref* | | | |
| No | 0.543 (0.053-5.625) | 0.609 | | |
| **Renal function (GFR)**[c] | 0.000 (0.000-.) | 0.994 | | |
| **Knowledge renal function** | | | | |
| Yes | 0.000 (0.000-.) | 0.998 | | |
| No | *ref* | | | |
| **Preoperative antibiotic use** | | | | |
| Yes | 0.000 (0.000-.) | 0.999 | | |
| No | *ref* | | | |
| **Surgical ward** | | | | |
| Neurosurgery | | | | |
| Orthopaedic surgery | | | | |
| Gynaecologic surgery | | | | |
| General surgery | | | | |
| Urologic surgery | | | | |
| Cardiologic surgery | | | | |
| Plastic surgery | | | | |
| **Type of surgery** | | | | |
| Elective surgery | *ref* | | | |
| Emergency surgery | $2.254 \times 10^8$ (0.000-.) | 0.999 | | |
| Acute surgery | $2.254 \times 10^8$ (0.000-.) | 1.000 | | |
| **Duration of procedure**[d] | 0.834 (0.000-$7.536 \times 10^{12}$) | 0.990 | | |
| **Blood loss**[e] | 0.905 (0.405-2.009) | 0.716 | | |
| **Use of implant** | | | | |
| Yes | 0.080 (0.012-0.519) | <u>0.008</u> | 0.111 (0.015-0.807) | <u>0.030</u> |
| No | *ref* | | | |
| **Duration of preoperative stay** | 1.009 (0.951-1.070) | 0.777 | | |

*Nr.* number, *CI* confidence interval, *OR* odds ratio, *ref* reference

[a] Model consists of age and use of implant.

[b] OR per 10 years increase in age (per 1-year increase in age: univariate OR 0.950; 95% CI: 0.892-1.012/multivariate OR 0.971; 95%: 0.904-1.043)

*Table S4* Results of the univariate and multivariate logistic regression for cumulative appropriateness

| Variables | Univariate | | Multivariate[a] | |
|---|---|---|---|---|
| | OR (95% CI) | *p* value | OR (95% CI) | *p* value |
| **Sex** | | | | |
| **Male** | *ref* | | | |
| **Female** | 0.979 (0.370-2.594) | 0.967 | | |
| **Age**[b] | 1.172 (0.904-1.524) | 0.222 | 1.041 (0.776-1.384) | 0.810 |
| **Body mass index** | 1.048 (0.969-1.133) | 0.241 | 1.014 (0.928-1.107) | 0.758 |
| **ASA classification** | | 0.584 | | |
| **1** | *ref* | | | |
| **2** | 1.929 (0.524-7.096) | 0.323 | | |
| **3** | 2.833 (0.655-12.263) | 0.164 | | |
| **4** | $1.615 \times 10^9$ (0.000-.) | 0.999 | | |
| **AZV (health insurance)** | | | | |
| **Yes** | *ref* | | | |
| **No** | 2.857 (0.318-25.700) | 0.349 | | |
| **Renal function (GFR)**[c] | 0.644 (0.155-2.690) | 0.549 | | |
| **Knowledge renal function** | | | | |
| **Yes** | 3.083 (1.209-7.861) | <u>0.018</u> | | |
| **No** | *ref* | | | |
| **Preoperative antibiotic use** | | | | |
| **Yes** | 2.455 (0.261-23.127) | 0.433 | | |
| **No** | *ref* | | | |
| **Surgical ward** | | 0.061 | | |
| **ENT** | 0.000 (0.000-.) | 0.999 | | |
| **Neurosurgery** | 0.071 (0.006-0.881) | 0.039 | | |
| **Orthopaedic surgery** | 0.389 (0.032-4.796) | 0.461 | | |
| **Gynaecologic surgery** | 0.185 (0.019-1.848) | 0.151 | | |
| **General surgery** | 1.750 (0.134-22.778) | 0.669 | | |
| **Urologic surgery** | 0.667 (0.032-14.033) | 0.794 | | |
| **Cardiologic surgery** | 0.167 (0.012-2.368) | 0.186 | | |
| **Plastic surgery** | *ref* | | | |
| **Type of surgery** | | 0.417 | | |
| **Elective surgery** | *ref* | | | |
| **Emergency surgery** | 4.261 (0.498-36.481) | 0.186 | | |
| **Acute surgery** | 983332513 (0.000-.) | 1.000 | | |
| **Duration of procedure**[d] | 1.000 (1.000-1.010) | <u>0.040</u> | | |
| **Blood loss**[e] | 25.706 (0.088-7278.069) | 0.257 | | |
| **Use of implant** | | | | |
| **Yes** | 1.507 (0.367-6.182) | 0.569 | | |
| **No** | *ref* | | | |
| **Duration of preoperative stay** | 2.739 (1.217-6.166) | <u>0.015</u> | 2.101 (0.942-4.685) | 0.070 |

*Nr.* number, *CI* confidence interval, *OR* odds ratio, *ref* reference

[a] Model consists of age, body mass index and duration of preoperative stay.

[b] OR per 10 years increase in age (per 1-year increase in age: univariate OR 1.016; 95% CI: 0.990-1.043)

[c] OR per 10 ml/min increase in GFR (per 1 ml/min increase in GFR: univariate OR 0.957; 95% CI: 0.830-1.104)

[d] OR per 10 minutes increase in duration of the surgical procedure (per 1 minute increase in duration: univariate OR 1.000; 95%CI: 1.000-1.001)

[e] OR per 100 millilitre increase in blood loss (per 1 millilitre increase in blood loss: univariate OR 1.033; 95% CI: 0.976-1.093)