**Supplementary Appendix**

This appendix has been provided by the authors to give readers additional information about their work.

Supplement to:

Rebecca Grant, MPH, MSc; Stephan Harbarth, MD, MSc; Martine Aupee; Nicolas Buchs; Kristine Cooper; Marie-Christine Eisenring; Theresa Lamagni; Frédéric Ris; Juliette Tanguy; Nicolas Troillet; Mohamed Abbas, MD, MSc. **Performance of surgical site infection risk prediction models in a colorectal surgery: external validity assessment from three European national surveillance networks**

**Contents**

[Definitions of SSI 2](#_Toc530581736)

[Supplementary Table 1 3](#_Toc530581737)

[Supplementary Table 2 4](#_Toc530581738)

[Supplementary Table 3 5](#_Toc530581739)

[Supplementary Table 4 6](#_Toc530581740)

[Supplementary Figure 1 7](#_Toc530581741)

[Supplementary Figure 2: 8](#_Toc530581742)

[Supplementary Figure 3: 8](#_Toc530581743)

[Supplementary Figure 4 9](#_Toc530581744)

# Definitions of SSI

Both Swissnoso and ISO-Raisin use the US CDC definition of SSI1 with mandatory post-discharge surveillance of patients. PHE SSISS uses a slightly modified definition of the US CDC definition, where pus cells are required in addition to positive microbiology, and only detection of SSI during the inpatient stay and at readmission is mandatory.2 For superficial SSI specifically, criterion based on clinical signs requires 2 signs/symptoms (not 1) and clinician’s diagnosis or wound deliberately re-opened by the surgeon to manage the infection.2

**References**

1Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG, Andrus M, Dudeck MA. CDC definitions of nosocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections. *Infect Control Hosp Epidemiol* 1992; 13(10): 606-8.

2Meijerink H, Lamagni T, Eriksen HM, Elgohari S, Harrington P, Kacelnik O. Is It Valid to Compare Surgical Site Infections Rates Between Countries? Insights From a Study of English and Norwegian Surveillance Systems. *Infect Control Hosp Epidemiol* 2017; 38(2): 162-171.

# Supplementary Table 1

Odds ratios for surgical site infection for each level of the COLA score in the derivation cohort, and each validation cohort.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Gervaz et al.**  **Derivation cohort** | | | **Swissnoso**  **Validation cohort** | | | **ISO-Raisin**  **Validation cohort** | | | **PHE SSISS**  **Validation cohort** | | |
| **COLA score** | **Regression coefficient** | **OR**  **(95% CI)** | ***P*** | **Regression coefficient** | **OR**  **(95% CI)** | ***P*** | **Regression coefficient** | **OR**  **(95% CI)** | ***P*** | **Regression coefficient** | **OR**  **(95% CI)** | ***P*** |
|  |  |  | *<0.001* |  |  | *<0.001* |  |  | *<0.001* |  |  | *<0.001* |
| 0 | 0 | 1.00 (ref.) |  | 0 | 1.00 (ref.) |  | 0 | 1.00 (ref.) |  | 0 | 1.00 (ref.) |  |
| 1 | 0.88 | 2.40  (0.70-8.26) |  | 0.47 | 1.61  (1.42-1.81) |  | 0.84 | 2.32  (1.11-4.82) |  | 0.41 | 1.52  (1.23-1.88) |  |
| 2 | 1.40 | 4.06  (1.18-13.92) |  | 0.98 | 2.67  (2.37-3.00) |  | 1.35 | 3.88  (1.88-8.00) |  | 0.70 | 2.01  (1.62-2.48) |  |
| 3 | 2.64 | 14.07  (4.11-48.14) |  | 1.46 | 4.33  (3.83-4.88) |  | 1.42 | 4.14  (1.90-9.01) |  | 1.18 | 3.28  (2.62-4.12) |  |
| 4 | 3.63 | 37.86  (8.71-164.48) |  | 1.79 | 5.98  (4.97-7.20) |  | 1.96 | 7.15  (2.53-20.18) |  | 1.62 | 5.06  (3.57-7.18) |  |
|  | | | | | | | | | | | | |

# Supplementary Table 2

Bivariable logistic regression analysis of risk of deep or organ/space SSI for each level of COLA score in three external validation cohorts: Public Health England (PHE) cohort, ISO-Raisin cohort, Swissnoso cohort

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **COLA score** | **Swissnoso**  **Validation cohort** | | | **ISO-Raisin**  **Validation cohort** | | | **PHE**  **Validation cohort** | | |
| **Regression coefficient** | **OR (95% CI)** | ***P*** | **Regression coefficient** | **OR (95% CI)** | ***P*** | **Regression coefficient** | **OR (95% CI)** | ***P*** |
|  |  | *<0.001* | |  | *0.02* | |  | *<0.001* | |
| 0 | 0 | 1.00 |  | 0 | 1.00 |  | 0 | 1.00 |  |
| 1 | 0.37 | 1.44 (1.25-1.66) |  | 0.74 | 2.10 (0.79-5.62) |  | 0.16 | 1.17 (0.86-1.59) |  |
| 2 | 0.83 | 2.30 (2.00-2.65) |  | 0.97 | 2.65 (0.98-7.15) |  | 0.36 | 1.43 (1.05-1.94) |  |
| 3 | 1.35 | 3.84 (3.33-4.43) |  | 1.40 | 4.04 (1.44-11.36) |  | 0.88 | 2.40 (1.73-3.33) |  |
| 4 | 1.59 | 4.91 (3.96-6.08) |  | 1.94 | 6.93 (1.80-26.76) |  | 1.40 | 4.07 (2.50-6.60) |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| AUC (95% CI) |  | 0.57 (0.53-0.59) |  |  | 0.54 (0.43-0.66) |  |  | 0.55 (0.52-0.60) |  |
|  | | | | | | | | | |

AUC, area under the curve; CI, confidence interval; OR, odds ratio

# Supplementary Table 3

Sensitivity analysis - Bivariable logistic regression analysis of risk of SSI for each level of COLA score with 0 points attributed for missing data in external validation cohorts: Swissnoso cohort, ISO-Raisin cohort, Public Health England (PHE) cohort

Sensitivity analyses:In a ‘best case scenario’, including all patients in the databases with any of four variables of the COLA score and attributing 0 points for any missing COLA variable, the discriminative ability of the COLA score decreased, with the AUC calculated to be 0.63 for the Swissnoso cohort, 0.57 for the ISO-Raisin cohort and 0.59 for the PHE cohort.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **COLA score** | **Swissnoso**  **Validation cohort** | | | **ISO-Raisin**  **Validation cohort** | | | **PHE**  **Validation cohort** | | |
| **Regression coefficient** | **OR (95% CI)** | ***P*** | **Regression coefficient** | **OR (95% CI)** | ***P*** | **Regression coefficient** | **OR (95% CI)** | ***P*** |
|  |  | *<0.001* | |  | *<0.001* | |  | *<0.001* | |
| 0 | 0 | 1.00 |  | 0 | 1.00 |  | 0 | 1.00 |  |
| 1 | 0.53 | 1.70 (1.36-2.13) |  | 0.49 | 1.64 (1.08-2.49) |  | 0.59 | 1.81 (1.31-2.50) |  |
| 2 | 1.08 | 2.94 (2.36-3.66) |  | 0.83 | 2.30 (1.53-3.45) |  | 1.02 | 2.78 (2.03-3.81) |  |
| 3 | 1.68 | 5.39 (4.33-6.72) |  | 1.06 | 2.87 (1.89-4.37) |  | 1.54 | 4.69 (3.41-6.45) |  |
| 4 | 2.10 | 8.18 (6.35-10.54) |  | 1.53 | 4.63 (2.14-10.03) |  | 1.89 | 6.60 (4.51-9.68) |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| AUC (95% CI) |  | 0.63 (0.62-0.64) |  |  | 0.57 (0.55-0.59) |  |  | 0.59 (0.58-0.60) |  |
|  | | | | | | | | | |

AUC, area under the curve; CI, confidence interval; OR, odds ratio

# Supplementary Table 4

Sensitivity analysis - Bivariable logistic regression analysis of risk of SSI for each level of COLA score with 1 point attributed for missing data in external validation cohorts: Swissnoso cohort, ISO-Raisin cohort, Public Health England (PHE) cohort.

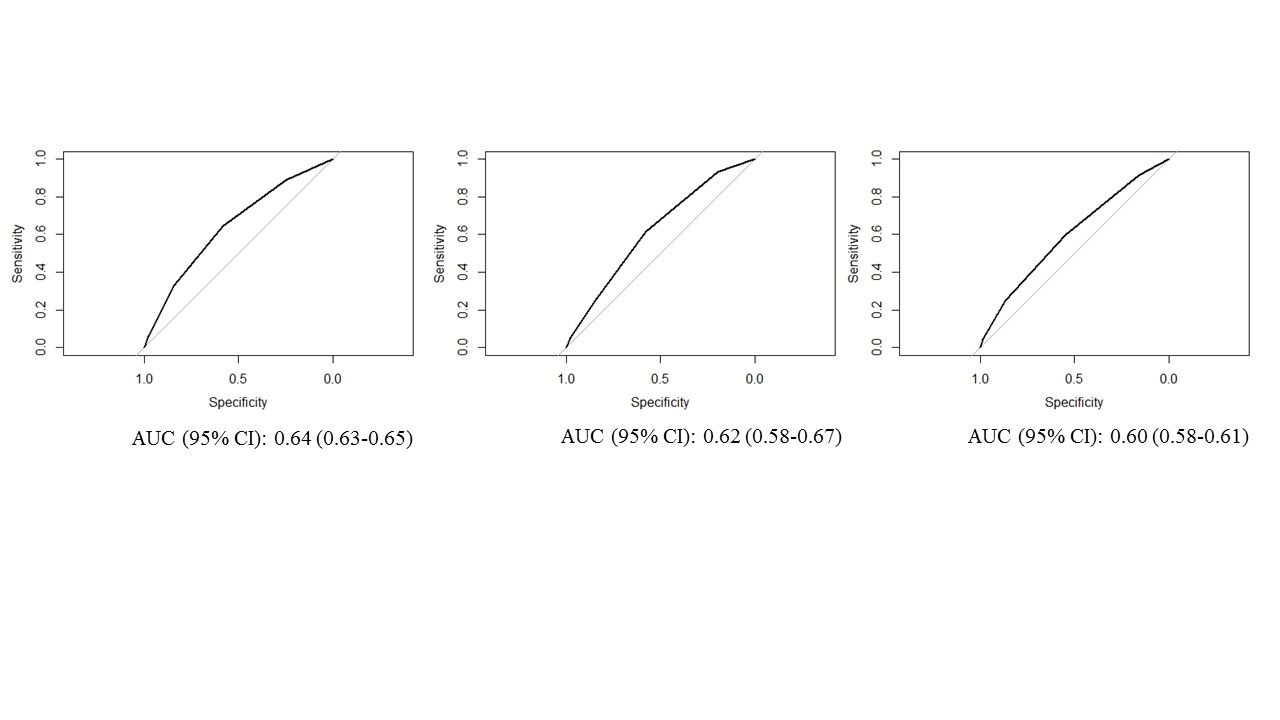
Similarly, in a ‘worst case scenario’, attributing 1 point for any missing COLA variable to the same larger study population also decreased the discriminative ability of the COLA score, with the AUC calculated to be 0.62 for the Swissnoso cohort, 0.54 for the ISO-Raisin cohort and 0.58 for the PHE cohort.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **COLA score** | **Swissnoso**  **Validation cohort** | | | | **ISO-Raisin**  **Validation cohort** | | | | **PHE**  **Validation cohort** | | | |
| **Regression coefficient** | **OR (95% CI)** | | ***P*** | **Regression coefficient** | **OR (95% CI)** | | ***P*** | **Regression coefficient** | **OR (95% CI)** | | ***P*** |
|  |  | | *<0.001* | |  | | *<0.001* | |  | | *<0.001* | |
| 0 | 0 | 1.00 | |  | 0 | 1.00 | |  | 0 | 1.00 | |  |
| 1 | 0.30 | 1.36 (1.22-1.53) | |  | 0.83 | 2.31 (1.16-4.59) | |  | 0.26 | 1.30 (1.06-1.60) | |  |
| 2 | 0.71 | 2.03 (1.82-2.26) | |  | 1.15 | 3.16 (1.61-6.19) | |  | 0.50 | 1.64 (1.35-2.00) | |  |
| 3 | 1.15 | 3.16 (2.84-3.53) | |  | 1.24 | 3.45 (1.76-6.76) | |  | 0.76 | 2.13 (1.75-2.60) | |  |
| 4 | 1.44 | 4.26 (3.76-4.82) | |  | 1.22 | 3.38 (1.69-6.76) | |  | 1.20 | 3.33 (2.68-4.13) | |  |
|  |  |  | |  |  |  | |  |  |  | |  |
|  |  |  | |  |  |  | |  |  |  | |  |
| AUC (95%CI) |  | 0.62 (0.61-0.63) | |  |  | 0.54 (0.52-0.56) | |  |  | 0.58 (0.57-0.59) | |  |
|  | | | | | | | | | | | | |

AUC, area under the curve; CI, confidence interval; OR, odds ratio

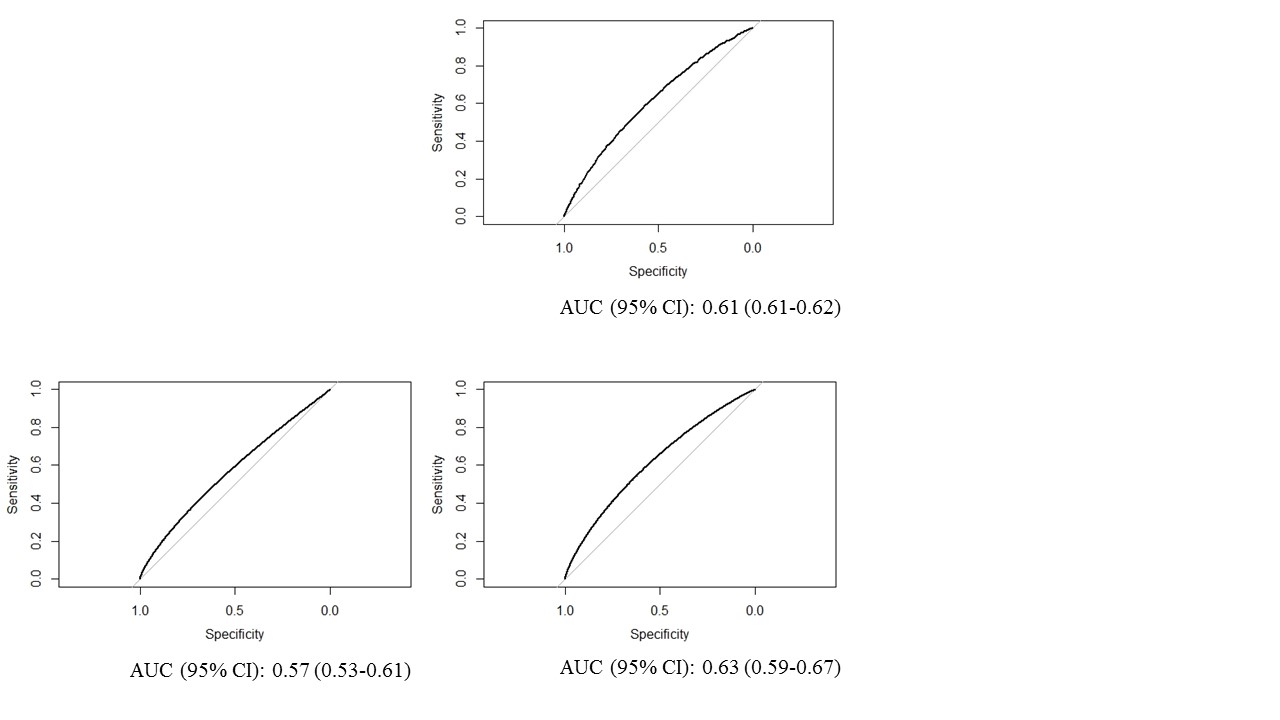
# Supplementary Figure 1

Receiver operating characteristic (ROC) curves and area under ROC curve (AUC) for the COLA score in three external validation cohorts (L to R): Swissnoso cohort, ISO-Raisin cohort and PHE cohort

****

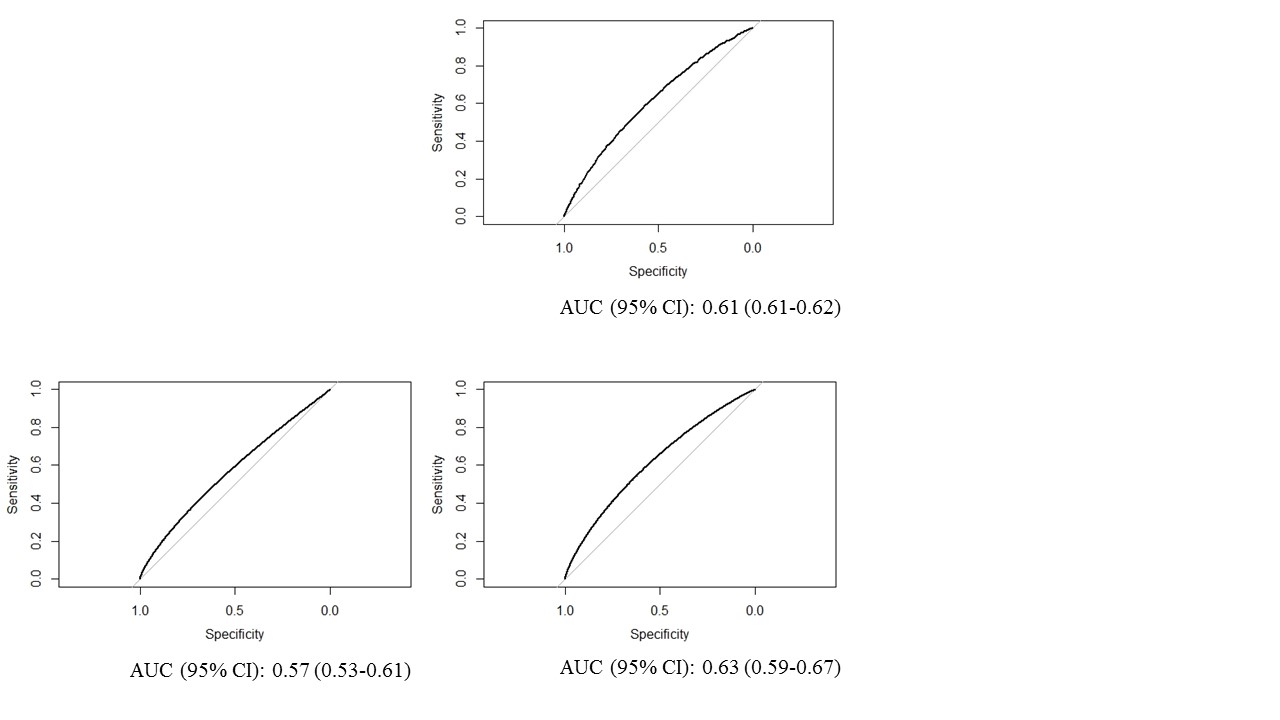
# Supplementary Figure 2:

ROC curve and AUC for the NHSN multivariable model for predicting risk of SSI after colon surgery validated in Swissnoso cohort

****

# Supplementary Figure 3:

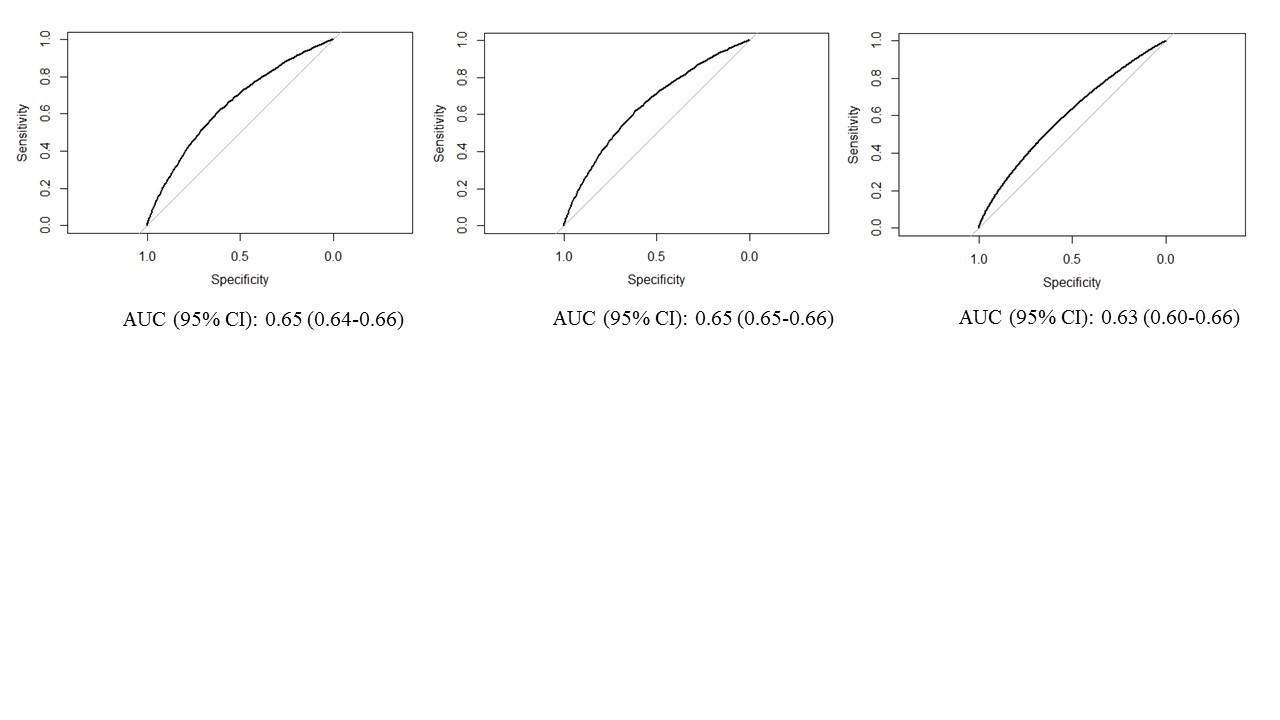
ROC curve and AUC for the NHSN multivariable model for predicting risk of SSI after rectal surgery validated in Swissnoso cohort (L to R): all SSI, deep or organ/space SSI only

****

# Supplementary Figure 4

ROC curves and AUC for multivariable logistic regression models for predicting risk of SSI using the Swissnoso database (L to R):

colorectal surgery, colon surgery, rectal surgery

****