**Supplementary material**

Definitions

Comorbidities were assessed using the Charlson Comorbidity Index. Indwelling hardware was defined as vascular hardware to be in place for at least 7 days prior to CPB or ESBL-PE detection. Urinary catheterization was defined as transurethral or suprapubic catheterization within 30 days prior to detection of CPB or ESBL-PE. Recent surgeries were assessed within 12 months prior to detection of CPB or ESBL-PE. Antibiotic therapy was assessed within 3 months prior to and during the index hospitalization and immunosuppressive therapy within the prior 12 months.

A time-frame of 12 months prior to the index hospitalization was used for definition of history of colonization or infection with CPB or ESBL-PE, history of hospitalization (>1 night stay in an acute-care facility), travel history (>1 night stay outside of Switzerland) and hospitalization abroad (>1 night stay in an acute-care facility).

**Supplementary tables**

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| **Supplementary table 1** Microbiological baseline data of the CPB group and the ESBL-PE group |
|  | CPB-group (n = 50) | ESBL-PE-group (n=572) | p-value |
|  | N/median | %/IQR | N/median | %/IQR |  |
| Admission screening* Negative
* CPB
* ESBL-PE
* MRSA
* VRE
 | 338171250 | 66.016.034.024.010.00 |  |  |  |
| First detection of CPB within the hospitalization* Admission screeninga
* Consecutive screening
* Clinical samples
 | 16826 | 32.016.052.0 |  |  |  |
| Infection caused by CPB within the corresponding hospitalization | 15 | 30.0 |  |  |  |
| Speciesb* *A. baumannii*
* *C. freundii*
* *C. koseri*
* *E. cloacae*
* *E. coli*
* *K. aerogenes*
* *K. pneumoniae*
* *K. oxytoca*
* *K. variicola*
* *P. mirabilis*
* *P. stuartii*
* *P. aeruginosa*
* *P. alcaligenes*
 | 1921217-182-1181 | 38.06.53.26.534.0-36.04.0-3.23.216.02.0 | -1-55011100-32--- | -0.2-0.987.60.217.5-0.50.4--- |  |
| Carbapenemase genotypec* VIM
* NDM
* KPC
* OXA
* IMP
 | 777382 | 14.014.014.076.04.0 |  |  |  |
| VIM = Verona Integron-Encoded Metallobetalactamase, NDM = New Delhi Metallobetalactamase, KPC = *Klebsiella pneumoniae* carbapenemase, OXA = oxacillinase, CPB = carbapenemase-producing bacteria, ESBL-PE = extended-spectrum beta-lactamase-producing Enterobacterales, MRSA = methicillin-resistant *Staphylococcus aureus*, VRE = vancomycin-resistant Enterococci, IQR = interquartile rangea forone patient admission screening was performed and positive for CPB, however first detection of CPB resulted from clinical samples taken several hours prior to screening samplesb Within the CPB group, 10 patients (20.0%) were colonized with multiple species of CPB, within the ESBL-PE group 38 patients (6.6%) were colonized with multiple species of ESBL-PEc Within 8 patients (16.0%) multiple carbapenemases genotypes were detected |

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| **Supplementary table 2:** Subgroup analysis of patients of the CPB group with travel history versus without travel history within the past 12 months |
|  | **Travel (n = 31)** | **non-travel (n = 19)** | **Univariable analysis** |
|  | N/ median | %/IQR | N/ median | %/ IQR | OR (95%CI) | p-value |
| **Demographics** |
| Age | 60 | 51-71 | 70 | 56-83 | 0.98 (0.94-1.01) | 0.158 |
| Female sex | 13 | 41.9 | 11 | 57.9 | 0.53 (0.17-1.67) | 0.275 |
| ICU stay | 16 | 51.6 | 6 | 31.6 | 2.31 (0.70-7.65) | 0.170 |
| Admission from* Home
* Nursing home
* Other acute care hospital
 | 12118 | 38.73.258.1 | 1315 | 68.45.326.3 | 0.60 (0.04-10.2)3.88 (1.12-13.47) | 0.724**0.033** |
| History of hospitalizationa | 29 | 93.6 | 13 | 68.4 | 6.69 (1.19-37.71) | **0.031** |
| History of ICU staya | 5 | 17.2 | 5 | 38.5 | 0.33 (0.07-1.46) | 0.144 |
| Death * Attributable to CPB-Infection
 | 51 | 16.13.2 | 42 | 21.110.5 | 1.38 (0.32-5.97) | 0.661 |
| Length of stay (days) | 25 | 9-42 | 21 | 9-42 | 0.99 (0.98-1.01) | 0.391 |
| **Clinical characteristics** |
| Charlson Comorbidity Index | 1 | 0-2 | 2 | 1-4 | 0.87 (0.62-1.21) | 0.398 |
| Open wounds | 4 | 12.9 | 5 | 26.3 | 0.41 (0.10-1.79) | 0.239 |
| Recent surgerya | 19 | 61.3 | 8 | 42.1 | 2.18 (0.68-6.96) | 0.190 |
| Urinary catheterizationb | 15 | 48.4 | 6 | 31.6 | 2.03 (0.61-6.72) | 0.246 |
| Vascular hardwarec | 2 | 6.5 | 2 | 10.5 | 0.59 (0.08-4.55) | 0.610 |
| History of colonization with CPB/ESBL-PEa | 4 | 12.9 | 8 | 42.1 | 0.20 (0.05-0.82) | **0.025** |
| **Therapeutic data** |
| Antibiotic therapy before index hospitalizationd | 17 | 54.8 | 13 | 68.4 | 0.56 (0.17-1.86) | 0.344 |
| Antibiotics between hospital admission and CPB detection | 19 | 61.3 | 10 | 52.6 | 1.43 (0.45-4.52) | 0.548 |
| Immunosuppressive therapya | 3 | 9.7 | 7 | 36.8 | 0.18 (0.04-0.83) | **0.028** |
| Proton pump inhibitord | 11 | 35.5 | 11 | 57.9 | 0.40 (0.12-1.29) | 0.125 |
| ICU = Intensive Care Unit, OR = odds ratio, 95%CI = 95% confidence interval, CPB = carbapenemase-producing bacteria, ESBL-PE = extended-spectrum beta-lactamase-producing Enterobacteralesa within the past 12 monthsb within 30 days prior to CPB detectionc to be in place for at least 7 days prior to CPB detectiond within 3 months prior to CPB detection |

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| **Supplementary table 3:** Subgroup analysis of microbiological data of patients of the CPB group with travel history versus without travel history |
|  | **Travel** **(n = 31)** | **non-travel** **(n = 19)** | **Univariable analysis** |
|  | N / median | % / IQR | N / median | % / IQR | OR (95%CI) | p-value |
| **Microbiological data** |
| CPB species * *A. baumannii*
* *C. freundii*
* *C. koseri*
* *E.cloacae*
* *E. coli*
* *K.pneumoniae*
* *K. oxytoca*
* *P. mirabilis*
* *P. stuartii*
* *P. aeruginosa*
* *P. alcaligenes*
 | 1721281211150 | 54.86.53.26.525.838.73.23.23.216.1 | 20009610031 | 10.547.431.65.315.85.3 | 10.32 (2.03-52.52)---0.37 (0.12-1.29)1.37 (0.41-4.58)0.60 (0.04-10.20)--1.03 (0.22-4.89)- | **0.005**---0.1230.6110.724--0.975- |
| Carbapenemase genotype* VIM
* NDM
* KPC
* OXA
* IMP
 | 264272 | 6.519.412.987.112.5 | 513110 | 26.35.315.857.9 | 0.19 (0.03-1.12)4.32 (0.48-39.07)0.79 (0.16-4.00)4.90 (1.22-19.71)- | 0.0670.1930.776**0.025**- |
| VIM = Verona Integron-Encoded Metallobetalactamase, NDM = New Delhi Metallobetalactamase, KPC = *Klebsiella pneumoniae* carbapenemase, OXA = oxacillinase, CPB = carbapenemase-producing bacteria, ESBL-PE = extended-spectrum beta-lactamase-producing EnterobacteralesIQR = interquartile range, OR = odds ratio, 95%CI = 95% confidence interval |

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| **Supplementary table 4:** Comparison of risk-factors between patients with detection of carbapenemases-producing Enterobacterales (n=30) versus patients with detection of ESBL-PE (n=572) |
|  | Univariable analysis | Multivariable analysis |
|  | OR (95% CI) | p-value | OR (95% CI) | p-value |
| Demographics and clinical data |
| Female sex | 1.22 (0.58-2.54) | 0.601 |  |  |
| Age | 0.99 (0.97-1.01) | 0.456 |  |  |
| Ward | 0.98 (0.64-1.50) | 0.912 |  |  |
| History of hospitalizationa | 1.46 (0.62-3.47) | 0.391 |  |  |
| History of ICU staya | 1.39 (0.55-3.51) | 0.481 |  |  |
| Hospitalisation abroada | 11.73 (5.28-26.09) | **<0.001** | 11.26 (4.83-26.28) | **<0.001** |
| Charlson Comorbidity Index | 1.07 (0.91-1.26) | 0.399 |  |  |
| Open wounds | 1.18 (0.40-3.49) | 0.765 |  |  |
| Surgerya | 2.56 (1.23-5.39) | **0.012** | 1.56 (0.70-3.48) | 0.282 |
| Urinary catheterizationb | 1.15 (0.53-2.52) | 0.720 |  |  |
| Vascular hardwarec | 1.79 (0.40-7.98) | 0.448 |  |  |
| Dialysis | 1.94 (0.24-15.66) | 0.535 |  |  |
| Allogeneic stem cell transplantation | 1.20 (0.15-9.35) | 0.863 |  |  |
| History of colonization with ESBL-PE/CPBa,d | 0.43 (0.18-1.02) | 0.055 |  |  |
| History of infection with ESBL-PE/CPBa,d | 0.34 (0.08-1.46) | 0.146 |  |  |
| History of antibiotic therapye | 2.45 (1.10-5.44) | **0.028** | 2.72 (1.17-6.34) | **0.020** |
| Duration of antibiotic therapy (days) | 1.01 (1.00-1.02) | 0.112 |  |  |
| Immunosuppressive therapya | 0.99 (0.43-2.26) | 0.975 |  |  |
| Proton pump inhibitore | 0.54 (0.25-1.13) | 0.103 |  |  |
| OR = odds ratio, 95%CI = 95% confidence interval, ICU = intensive care unit, CPB = carbapenemases-producing bacteria, ESBL-PE = extended-spectrum beta-lactamase-producing Enterobacterales |
| a within the past 12 monthsb within 30 days prior to CPB detectionc to be in place for at least 7 days prior to CPB detectiond refers to ESBL-PE and/or CPB in the CPB group and to only ESBL-PE in the ESBL-PE groupe within 3 months prior to CPB detection |

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| **Supplementary table 5:** Subgroup analysis of patients with detection of only CP-Enterobacterales (n=30) versus patients with detection of only ESBL-*E.coli* (n=467) **(A)** and versus patients with detection of only ESBL-*K. pneumoniae* (n=65)**(B)** |
|  | **(A)**  | **(B)**  |
|  | Univariable analyses | Multivariable analyses | Univariable analyses | Multivariable analyses |
|  | OR (95% CI) | p-value | OR (95% CI) | p-value | OR (95% CI) | p-value | OR (95% CI) | p-value |
| Female sex | 1.06 (0.51-2.23) | 0.872 |  |  | 3.23 (1.30-7.98) | **0.011** | 3.60 (1.22-10.65) | **0.020** |
| Age | 0.99 (0.97-1.01) | 0.297 |  |  | 1.00 (0.98-1.03) | 0.692 |  |  |
| Location prior to admissiona | 0.99 (0.93-1.06) | 0.840 |  |  | 1.38 (0.86-2.23) | **0.183** | 1.33 (0.69-2.55) | 0.390 |
| Ward | 0.94 (0.61-1.44) | 0.763 |  |  | 1.39 (0.81-2.37) | 0.233 |  |  |
| History of hospitalizationb | 1.68 (0.71-4.00) | 0.241 |  |  | 0.46 (0.15-1.42) | 0.177 |  |  |
| History of ICU stayb | 1.83 (0.72-4.68) | 0.204 |  |  | 0.49 (0.17-1.37) | 0.174 |  |  |
| Hospitalization abroadb | 16.24 (6.98-37.79) | **<0.001** | 16.54 (6.50-42.10) | **<0.001** | 5.45 (1.94-15.32) | **0.001** | 2.64 (0.70-10.01) | 0.152 |
| Charlson Comorbidity Index | 1.07 (0.91-1.25) | 0.429 |  |  | 1.09 (0.87-1.36) | 0.462 |  |  |
| Active open wounds | 1.28 (0.43-3.83) | 0.655 |  |  | 0.85 (0.24-2.95) | 0.793 |  |  |
| Surgeryb | 2.96 (1.40-6.23) | **0.004** | 1.64 (0.70-3.82) | 0.251 | 1.50 (0.63-3.58) | 0.361 |  |  |
| Urinary catheterizationc | 1.26 (0.57-2.75) | 0.570 |  |  | 0.70 (0.28-1.74) | 0.447 |  |  |
| Vascular hardwared | 2.31 (0.50-10.67) | 0.283 |  |  | 0.70 (0.13-3.70) | 0.677 |  |  |
| Dialysis | 1.58 (0.19-12.74) | 0.670 |  |  | - |  |  |  |
| Allogeneic stem cell transplantation | 1.20 (0.15-9.53) | 0.860 |  |  | 1.09 (0.09-12.47) | 0.947 |  |  |
| History of colonization with CPB/ESBL-PEb,e | 0.50 (0.21-1.19) | 0.115 |  |  | 0.22 (0.08-0.58) | **0.002** | 0.78 (0.19-3.19) | 0.735 |
| History of infection with CPB/ESBL-PEb,e | 0.37 (0.09-1.60) | 0.185 |  |  | 0.19 (0.04-0.86) | **0.032** | 0.32 (0.05-2.00) | 0.222 |
| History of antibiotic therapyf | 2.73 (1.23-6.10) | **0.014** | 3.46 (1.42-8.44) | **0.006** | 1.46 (0.58-3.69) | 0.425 |  |  |
| - Duration (days) | 1.01 (1.00-1.02) | 0.119 |  |  | 1.00 (1.00-1.01) | 0.372 |  |  |
| Immunosuppressive therapyb | 0.97 (0.42-2.24) | 0.950 |  |  | 0.88 (0.33-2.32) | 0.797 |  |  |
| Proton pump inhibitorf | 0.61 (0.29-1.29) | 0.197 |  |  | 0.28 (0.11-0.68) | **0.005** | 0.32 (0.10-0.96) | **0.041** |
| OR = odds ratio, 95%CI = 95% confidence interval, ICU = intensive care unit, CPB = carbapenemase-producing bacteria, ESBL-PE = extended-spectrum beta-lactamase-producing Enterobacteralesa home, other acute-care facility or nursing-home b within the past 12 monthsc within 30 days prior to CPB detectiond to be in place for at least 7 days prior to CPB detectione refers to ESBL-PE and/or CPB in the CPB group and to only ESBL-PE in the ESBL-PE groupf within 3 months prior to CPB detection |

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| **Supplementary table 6:** Comparison of risk-factors between patients with detection of only carbapenemases-producing Enterobacterales with detection of CPB between 01/2016-12/2018 (n=20) versus patients with detection of ESBL-PE (n=572) |
|  | Univariable analysis | Multivariable analysis |
|  | OR (95% CI) | p-value | OR (95% CI) | p-value |
| Demographics and clinical data |
| Female sex | 1.60 (0.64-4.00) | 0.313 |  |  |
| Age | 1.00 (0.98-1.02) | 0.917 |  |  |
| Ward | 0.93 (0.54-1.61) | 0.791 |  |  |
| History of hospitalizationa | 1.33 (0.48-3.73) | 0.583 |  |  |
| History of ICU staya | 1.86 (0.66-5.24) | 0.242 |  |  |
| Hospitalisation abroada | 12.55 (4.88-32.30) | **<0.001** | 12.29 (4.55-33.21) | **<0.001** |
| Charlson Comorbidity Index | 1.08 (0.89-1.31) | 0.427 |  |  |
| Open wounds | 1.92 (0.62-5.91) | 0.257 |  |  |
| Surgerya | 2.58 (1.05-6.30) | **0.038** | 1.60 (0.61-4.17) | 0.338 |
| Urinary catheterizationb | 0.99 (0.37-2.61) | 0.981 |  |  |
| Vascular hardwarec | 2.78 (0.61-12.72) | 0.188 |  |  |
| Dialysis | 2.96 (0.36-24.30) | 0.313 |  |  |
| Allogeneic stem cell transplantation | 1.83 (0.23-14.51) | 0.568 |  |  |
| History of colonization with ESBL-PE/CPBa,d | 0.47 (0.17-1.31) | 0.150 |  |  |
| History of infection with ESBL-PE/CPBa,d | 0.25 (0.03-1.90) | 0.181 |  |  |
| History of antibiotic therapye | 2.45 (0.93-6.47) | **0.070** | 2.84 (1.02-7.86) | **0.045** |
| Duration of antibiotic therapy (days) | 1.01 (1.00-1.02) | 0.127 |  |  |
| Immunosuppressive therapya | 1.16 (0.44-3.08) | 0.761 |  |  |
| Proton pump inhibitore | 0.54 (0.22-1.33) | 0.179 |  |  |
| OR = odds ratio, 95%CI = 95% confidence interval, ICU = intensive care unit, CPB = carbapenemases-producing bacteria, ESBL-PE = extended-spectrum beta-lactamase-producing Enterobacterales |
| a within the past 12 monthsb within 30 days prior to CPB detectionc to be in place for at least 7 days prior to CPB detectiond refers to ESBL-PE and/or CPB in the CPB group and to only ESBL-PE in the ESBL-PE groupe within 3 months prior to CPB detection |

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| **Supplementary table 7:** Subgroup analysis of patients with detection of only CP-Enterobacterales with CPB-detection between 01/2016-12/2018 (n=20) versus patients with detection of only ESBL-*E.coli* (n=467) **(A)** and versus patients with detection of only ESBL-*K. pneumoniae* (n=65)**(B)** |
|  | **(A)**  | **(B)**  |
|  | Univariable analyses | Multivariable analyses | Univariable analyses | Multivariable analyses |
|  | OR (95% CI) | p-value | OR (95% CI) | p-value | OR (95% CI) | p-value | OR (95% CI) | p-value |
| Female sex | 1.39 (0.56-3.47) | 0.475 |  |  | 4.24 (1.48-12.12) | **0.007** | 5.47 (1.54-19.42) | **0.009** |
| Age | 1.00 (0.97-1.02) | 0.727 |  |  | 1.01 (0.98-1.04) | 0.435 |  |  |
| Location prior to admissiona | 1.00 (0.91-1.08) | 0.848 |  |  | 1.30 (0.75-2.27) | 0.345 |  |  |
| Ward | 0.89 (0.51-1.54) | 0.676 |  |  | 1.49 (0.72-3.08) | 0.286 |  |  |
| History of hospitalizationb | 1.53 (0.55-4.30) | 0.416 |  |  | 0.42 (0.12-1.48) | 0.176 |  |  |
| History of ICU stayb | 2.45 (0.86-7.00) | 0.095 |  |  | 0.65 (0.21-2.03) | 0.459 |  |  |
| Hospitalization abroadb | 17.38 (6.50-46.47) | **<0.001** | 18.54 (6.29-54.63) | **<0.001** | 5.83 (1.84-18.42) | **0.003** | 4.40 (1.04-18.62) | **0.044** |
| Charlson Comorbidity Index | 1.07 (0.89-1.30) | 0.453 |  |  | 1.10 (0.85-1.42) | 0.464 |  |  |
| Active open wounds | 2.09 (0.67-6.48) | 0.204 |  |  | 1.38 (0.38-4.98) | 0.627 |  |  |
| Surgeryb | 2.96 (1.20-7.28) | **0.018** | 1.73 (0.63-4.70) | 0.285 | 1.50 (0.55-4.11) | 0.430 |  |  |
| Urinary catheterizationc | 1.08 (0.41-2.86) | 0.883 |  |  | 0.60 (0.21-1.77) | 0.357 |  |  |
| Vascular hardwared | 3.60 (0.76-17.02) | 0.107 |  |  | 1.09 (0.20-5.89) | 0.918 |  |  |
| Dialysis | 2.41 (0.29-19.76) | 0.414 |  |  | - |  |  |  |
| Allogeneic stem cell transplantation | 1.84 (0.23-14.79) | 0.567 |  |  | 1.66 (0.14-19.30) | 0.686 |  |  |
| History of colonization with CPB/ESBL-PEb,e | 0.55 (0.20-1.53) | 0.249 |  |  | 0.24 (0.08-0.73) | **0.012** | 0.70 (0.17-2.88) | 0.626 |
| History of infection with CPB/ESBL-PEb,e | 0.28 (0.04-2.09) | 0.212 |  |  | 0.14 (0.02-1.10) | 0.062 |  |  |
| History of antibiotic therapyf | 2.73 (1.03-7.24) | **0.043** | 3.78 (1.28-11.11) | **<0.001** | 1.46 (0.50-4.29) | 0.493 |  |  |
| - Duration (days) | 1.01 (1.00-1.03) | 0.099 |  |  | 1.00 (1.00-1.01) | 0.278 |  |  |
| Immunosuppressive therapyb | 1.15 (0.43-3.05) | 0.783 |  |  | 1.04 (0.35-3.10) | 0.947 |  |  |
| Proton pump inhibitorf | 0.61 (0.24-1.52) | 0.287 |  |  | 0.28 (0.10-0.78) | **0.015** | 0.21 (0.06-0.76) | **0.018** |
| OR = odds ratio, 95%CI = 95% confidence interval, ICU = intensive care unit, CPB = carbapenemase-producing bacteria, ESBL-PE = extended-spectrum beta-lactamase-producing Enterobacteralesa home, other acute-care facility or nursing-home b within the past 12 monthsc within 30 days prior to CPB detectiond to be in place for at least 7 days prior to CPB detectione refers to ESBL-PE and/or CPB in the CPB group and to only ESBL-PE in the ESBL-PE groupf within 3 months prior to CPB detection |

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| **Supplementary table 8:** International travel destinations of the CPB travel subgroup |
| **N** | **Country** |
| 7 | Serbia |
| 3 | Italy |
| 3 | Turkey |
| 2 | Dominican Republic |
| 2 | Spain (incl. Canary islands) |
| 2 | Thailand |
| 1 | Brazil |
| 1 | Colombia |
| 1 | Egypt |
| 1 | Estonia |
| 1 | Greece |
| 1 | Hungary |
| 1 | India |
| 1 | Lebanon |
| 1 | Marocco |
| 1 | North Macedonia |
| 1 | Russia |
| 1 | Sri Lanka |