**Table 1.** Study Design, Setting, and Intervention Characteristics (with HICPAC Recommendation Categorya)

| 1. Central Line-Associated Bloodstream Infection (CLABSI) Prevention Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Stage 0  Avoidb |  | Stage 1  Insertionb | | | | | | | | | | |  | Stage 2  Maintenanceb | | | | | |  | Stage 3  Removalb | |  | Multiple Stages | |  | Interventions to Improve Implementation & Sustainability | | |
| Author /Year |  | Study Design |  | ICU Type Studied | Insertion Appropriateness List (1A) |  | Provide a Checklist (1B) | Avoid Femoral Site (1A) | Provide Insertion Kit/Cart (Not Graded) | Improve Hand Hygiene (1B) | Ensure Maximum Sterile Barriers (1B) | Chlorhexidine Skin Preparation (1A) | Cover Site with Sterile Dressing (1A) | Education on Insertion/Aseptic Technique (1A) | Empower Staff to Stop Procedure (Not Graded) | Process Surveillance (Not Graded) | Dedicated Staff for Catheter Insertion (1A) |  | Scrub the Hub Prior to Use (1A) | Access Catheter with Sterile Device (1A) | Ensure Best Dressing Change Practices (1B) | Maintenance Checklist or Kit (1B) | Antimicrobial Hubs/Chlorhexidine-impregnated (1B) | Chlorhexidine Bathing (II) |  | CLABSI Rounds or Daily Audit for Line Removal (1A) | Replacement of Emergent Lines (1B) |  | Antimicrobial CVC (1A) (Stages 2 & 3) | Electronic Checklist for Documentation (Not Graded) |  | Outcomes Surveillance: Feedback on CLABSI (Not Graded) | Promote Culture of Quality and Safety (Not Graded) | CUSP Implementation (1B) |
| Allen 201438 |  | B-A |  | M, S | - |  | S | S | S | - | X | X | X | X1R | - | - | - |  | - | - | - | X | - | - |  | - | - |  | - | X |  | - | - | - |
| Arora 201439 |  | B-A |  | MS | - |  | - | S | - | S | S | S | S | S | - | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | - | - | - |
| Barsuk 200940 |  | B-A |  | M, S | - |  | X | S | - | S | S | S | - | S | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Barsuk 201441 |  | B-A |  | M | - |  | X | S | - | S | S | S | - | S | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Berenholtz 200442 |  | B-A |  | C, S | - |  | X | X | X | X | X | X | - | X | X | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | - | - | - |
| Berenholtz 201424 |  | B-A |  | - | - |  | X | X | X | X | X | X | - | X | - | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | X | X | X |
| Bion 201399 |  | B-A |  | - | - |  | - | X | - | X | X | X | X | X | - | - | - |  | - | X | X | - | - | - |  | X | - |  | - | - |  | - | - | - |
| Bonne 201543 |  | B-A |  | S | - |  | - | - | - | - | - | - | - | S1R | - | S | - |  | - | - | S | - | - | - |  | - | - |  | X | - |  | - | S | - |
| Borschel 200644 |  | B-A |  | MS | - |  | - | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Brun-Buisson 200490 |  | RCT |  | - | - |  | - | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Burden 201245 |  | B-A |  | MS | - |  | S | - | S | - | S | - | - | X1 | S | - | - |  | - | - | - | - | - | - |  | S | - |  | - | - |  | - | - | - |
| Carrasco 200491 |  | RCT |  | MS | - |  | S | - | - | - | - | S | S | S1 | - | - | - |  | - | - | - | S | - | - |  | - | - |  | X | - |  | - | S | - |
| Cherifi 2013100 |  | B-A |  | MS | - |  | - | S | S | S | S | S | - | X | - | X | - |  | S | - | S | - | - | - |  | - | - |  | - | - |  | X | - | - |
| Cherry 201146 |  | B-A |  | MS | - |  | - | X | - | - | - | - | - | XPNSV | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Chua 201047 |  | B-A |  | T | - |  | X | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Collin 199948 |  | RCT |  | MS, T, NS | - |  | - | - | - | S | S | - | S | S | - | - | - |  | - | - | - | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Coopersmith 200249 |  | B-A |  | B, S, T | - |  | X | - | - | - | - | - | - | X1 | - | - | - |  | - | - | X | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Coopersmith 200450 |  | B-A |  | S | - |  | - | - | - | S | S | - | S | S | - | - | - |  | - | - | - | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Corral 200392 |  | RCT |  | B, S, T | - |  | - | - | - | - | S | - | S | S | - | - | SD |  | - | - | S | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Depalo 201027 |  | B-A |  | S | - |  | - | - | - | - | - | - | - | X1 | X | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | X |
| Dixon 201051 |  | B-A |  | S | - |  | - | - | - | S | S | S | S | S | - | - | - |  | - | - | - | - | - | X |  | S | - |  | - | - |  | S | - | - |
| Entesari-Tatafi 2015101 |  | B-A |  | MS | - |  | - | X | - | X | X | X | X | X | X | X | XD |  | - | - | - | - | - | X |  | X | - |  | - | - |  | - | - | - |
| Exline 201352 |  | B-A |  | M | - |  | X | X | X | - | - | X | X | X1 | X | X | - |  | - | - | - | - | X | X |  | X | X |  | X | - |  | X | - | - |
| Fox 201553 |  | B-A |  | C | - |  | - | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | XH |  | - | - |  | - | - |  | - | - | - |
| Frankel 200554 |  | B-A |  | S | X |  | - | - | X | - | S | - | X | X1 | - | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | X | X | - |
| Galpern 200855 |  | B-A |  | M, S | - |  | - | X | X | X | X | X | - | - | - | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | - | - | - |
| Gozu 201156 |  | B-A |  | MS | X |  | X | - | - | X | X | X | - | - | - | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | - | - | - |
| Hagau 200993 |  | RCT |  | MS | - |  | - | - | - | - | S | - | S | - | - | - | - |  | - | - | S | - | - | - |  | - | X |  | X | - |  | X | - | - |
| Hakko 2015102 |  | B-A |  | MS | - |  | - | X | - | X | X | - | - | X | - | - | - |  | - | - | X | - | - | - |  | X | X |  | - | - |  | X | - | - |
| Hanna 200357 |  | B-A |  | M, S | - |  | - | - | - | - | S | - | - | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Hansen 2014103 |  | B-A |  | M, S, MS | - |  | - | - | - | - | - | - | - | XPN^ | - | - | - |  | - | - | XPN | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Hatler 200658 |  | B-A |  | M | - |  | - | - | - | - | - | - | - | XN | - | - | - |  | - | - | XN | - | - | - |  | - | - |  | - | - |  | X | - | - |
| Hermon 2015104 |  | B-A |  | MS | - |  | - | X | X | X | X | X | - | X PN | - | - | - |  | X | - | XPN | - | - | - |  | X | - |  | - | X |  | - | - | - |
| Hong 201314 |  | B-A |  | M, S, MS, T, C | - |  | X | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | X |
| Jaggi 2013105 |  | B-A |  | - | - |  | - | X | X | X | X | X | - | XPN | - | X | - |  | X | - | XPN | - | - | - |  | - | - |  | - | - |  | X | - | - |
| Jeong 2013107 |  | B-A |  | M, S, CT, NS | - |  | - | X | - | S | X | X | - | XPN^ | - | - | - |  | - | - | XPN | - | - | - |  | X | - |  | - | - |  | X | X | - |
| Kalfon 200794 |  | RCT |  | M, S, MS | - |  | - | - | - | S | S | - | S | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Kamboj 201559 |  | B-A |  | MS | - |  | - | - | - | S | - | - | - | - | - | - | - |  | S | - | S | - | X | - |  | - | - |  | - | - |  | - | - | - |
| Khalid 2013106 |  | B-A |  | MS | - |  | X | - | - | - | X | - | - | XN^ | - | - | - |  | - | - | XN | - |  | - |  | X | - |  | X | - |  | X | X | - |
| Khouli 201160 |  | B-A |  | M | - |  | - | - | - | - | - | - | - | XVS1 | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Klintworth 2014108 |  | B-A |  | - | - |  | - | S | - | S | X | S | - | XPNR | - | - | X |  | - | - | - | - | - | X |  | - | - |  | S | - |  | X | - | - |
| Koll 200861 |  | B-A |  | - | - |  | - | X | X | X | X | X | - | - | - | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | - | - | - |
| Kurtz 200895 |  | RCT |  | MS | - |  | - | - | - | - | S | S | S | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Latif 2015110 |  | B-A |  | - | - |  | - | - | - | - | - | - | - | XPR | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | X | - | X |
| Leblebicioglu 2013109 |  | B-A |  | M, S, MS, CT | - |  | - | X | - | X | X | - | - | XPNR | - | X | - |  | X | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Leon 200397 |  | RCT |  | M, S | - |  | - | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | X | - |  | - | - |  | - | - |  | - | - | - |
| Leon 200498 |  | RCT |  | - | - |  | - | - | - | S | S | - | - | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Lin 201225 |  | B-A |  | - | - |  | - | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | X |
| Lin 201316 |  | B-A |  | - | - |  | - | - | - | X | X | - | - | XV1 | - | - | - |  | X | X | XV1 | X | - | - |  | - | - |  | - | - |  | - | X | X |
| Lobo 2010112 |  | B-A |  | M | - |  | - | - | - | - | - | - | - | XPR | - | X | - |  | - | - | XPR | - | - | - |  | - | - |  | - | - |  | X | X | - |
| Longmate 2011111 |  | B-A |  | MS | - |  | X | X | - | X | X | X | - | - | - | - | - |  | - | - | X | X | - | - |  | X | - |  | - | - |  | X | - | - |
| Lopez 201162 |  | B-A |  | MS | - |  | - | S | - | S | S | S | - | - | - | - | - |  | - | - | - | - | - | X |  | S | - |  | - | - |  | X | - | - |
| Lorente 2014113 |  | B-A |  | - | - |  | - | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Maki 199763 |  | B-A |  | MS | - |  | - | - | - | - | - | S | S | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Marra 2010114 |  | B-A |  | MS | - |  | - | X | X | X | X | X | - | - | - | X | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | X | X | - |
| Marsteller 201264 |  | RCT |  | - | - |  | X | - | X | X | X | X | - | XNR | - | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | - | - | X |
| Martinez-Resendez 2014115 |  | B-A |  | M, S | - |  | - | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | X |  | - | - |  | - | - |  | - | - | - |
| Mathur 2015116 |  | B-A |  | T | - |  | - | X | X | X | X | X | - | - | - | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | - | - | - |
| Mazi 2014117 |  | B-A |  | T | X |  | - | - | X | S | S | S | - | X1 | - | - | - |  | - | - | - | - | - | - |  | S | - |  | - | - |  | - | - | - |
| McMullan 201365 |  | B-A |  | S | - |  | X | - | X | - | X | X | - | XM | - | X | - |  | - | X | X | - | - | X |  | X | - |  | - | - |  | X | - | - |
| Menegueti 2015118 |  | B-A |  | - | - |  | X | - | X | X | X | - | - | XPN | - | - | - |  | - | - | X | - | - | - |  | X | - |  | - | - |  | - | - | - |
| Miller 201066 |  | B-A |  | T | - |  | - | - | X | S | S | S | - | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | X |  | - | - | - |
| Montecalvo 201267 |  | B-A |  | M, MS | - |  | - | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | X |  | - | - |  | - | - |  | - | - | - |
| Mueller 201487 |  | B-A |  | - | - |  | - | - | - | - | - | - | - | XNV | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | X | - |
| Muto 200510 |  | B-A |  | M, MS, T, C, B, CT | - |  | X | X | - | - | X | X | - | XM | - | - | - |  | - | - | - | X | - | - |  | - | - |  | - | - |  | - | - | - |
| Noto 201568 |  | RCT\* |  | M, S, T, C, N | - |  | - | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | X |  | - | - |  | - | - |  | - | - | - |
| Osma 200696 |  | RCT |  | MS | - |  | - | S | - | - | S | - | S | S | - | - | - |  | - | - | - | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Palomar 2013121 |  | B-A |  | - | - |  | - | X | - | X | X | X | - | XR | - | - | - |  | X | - | - | - | - | - |  | X | - |  | - | - |  | - | - | X |
| Paula 2012119 |  | B-A |  | S | - |  | - | X | - | X | X | X | - | XR | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Peredo 2010122 |  | B-A |  | MS | - |  | X | X | - | - | - | X | - | XRPN | - | - | - |  | - | - | - | - | - | - |  | S | - |  | - | - |  | - | - | - |
| Perez Parra 2010123 |  | B-A |  | M, S | - |  | - | X | - | - | - | - | - | X1 | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Popovich 200969 |  | B-A |  | M | - |  | - | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | X |  | - | - |  | - | - |  | - | - | - |
| Popovich 201070 |  | B-A |  | S | - |  | S | S | - | - | S | S | S | - | - | - | - |  | - | - | S | - | - | X |  | - | - |  | - | - |  | - | - | - |
| Pronovost 200626 |  | B-A |  | - | - |  | X | X | X | X | X | X | - | XP | X | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | - | X | X |
| Pronovost 201671 |  | B-A |  | - | - |  | S | S | S | S | S | S | S | S | S | - | - |  | - | - | - | - | - | - |  | S | - |  | - | - |  | - | X | X |
| Rangachari 201572 |  | B-A |  | M | - |  | - | - | - | - | - | - | - | XR | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | X | X | - |
| Reddy 2014120 |  | B-A |  | MS | - |  | X | X | X | X | X | X | - | X1V | X | - | - |  | X | - | - | - | - | - |  | X | - |  | - | X |  | X | X | X |
| Render 201173 |  | B-A |  | M, S, MS, C | - |  | X | X | - | - | X | X | - | X1M | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | X | X | - |
| Rosenthal 2003124 |  | B-A |  | MS, C | - |  | - | - | - | X | - | - | - | XR | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | X | - | - |
| Rosenthal 2010125 |  | B-A |  | S, MS, T, NS | - |  | - | - | - | - | - | - | - | - | - | X | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | X | - | - |
| Rupp 200574 |  | RCT |  | - | - |  | - | - | - | - | S | - | - | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | X | - |  | - | - | - |
| Sacks 201475 |  | B-A |  | M, S | - |  | X | X | X | X | X | X | - | XM | - | - | - |  | - | - | - | X | - | - |  | X | - |  | - | - |  | - | - | - |
| Salama 2016126 |  | B-A |  | MS | - |  | - | X | X | X | X | X | - | X | X | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | - | - | - |
| Salemi 200276 |  | B-A |  | MS, C | - |  | - | - | - | X | - | - | - | XR | - | X | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Santana 2008127 |  | B-A |  | MS | - |  | - | - | S | - | - | - | - | XR | - | X | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | X | - | - |
| Scheithauer 2014128 |  | B-A |  | M, C | - |  | S | S | S | S | S | - | - | - | - | - | - |  | - | - | - | - | X | - |  | - | - |  | - | - |  | - | - | - |
| Seguin 201033 |  | B-A |  | S | - |  | - | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | - | - | - |
| Shannon 200677 |  | B-A |  | M | - |  | - | - | X | - | - | - | - | - | - | X | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Singh 2012129 |  | B-A |  | CT | - |  | - | - | X | - | - | - | - | X1 | - | X | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Sopirala 201378 |  | B-A |  | MS | - |  | X | - | - | - | - | - | - | - | X | - | - |  | - | - | - | - | - | - |  | X | X |  | - | - |  | X | - | - |
| Speroff 201179 |  | RCT |  | - | - |  | - | - | S | S | S | S | - | X1 | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Thom 201480 |  | B-A |  | S | - |  | - | - | S | - | - | - | - | X1V | - | X | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | X | X | X |
| Venkatram 201081 |  | B-A |  | M | - |  | X | X | S | X | X | X | - | - | X | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | - | - | - |
| Vigorito 201188 |  | B-A |  | MS, T, C, N | - |  | - | - | - | - | - | - | - | - | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | X | - |
| Wall 200582 |  | B-A |  | M | - |  | X | - | X | X | X | X | - | X1 | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | X |  | X | - | - |
| Walz 201583 |  | B-A |  | - | - |  | - | X | X | X | X | X | - | X1 | X | - | - |  | - | - | - | - | X | - |  | - | - |  | X | - |  | X | X$ | - |
| Warren 200485 |  | B-A |  | M | - |  | - | X | - | X | X | - | - | X1M | - | - | - |  | - | - | X | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Warren 200684 |  | B-A |  | M, S, MS, C, NS, CT | - |  | - | X | - | - | X | - | - | X1M | - | - | - |  | - | - | X | - | - | - |  | - | - |  | - | - |  | - | X | - |
| Watson 200986 |  | B-A |  | - | - |  | X | X | X | X | X | X | X | X | - | - | - |  | - | - | - | - | - | - |  | X | - |  | - | - |  | - | - | X |
| Zack 200889 |  | B-A |  | B, T, S | - |  | - | - | - | - | - | - | - | XM | - | - | - |  | X | X | X | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Zingg 2009131 |  | B-A |  | M, S, N | - |  | - | - | - | X | S | - | - | XNR | - | X | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |
| Zingg 2014130 |  | B-A |  | - | - |  | X | - | S | - | - | S | - | XPRS | - | - | - |  | - | - | - | - | - | - |  | - | - |  | - | - |  | - | - | - |

| 1. Catheter-Associated Urinary Tract Infection (CAUTI) Prevention Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | Stage 0  Avoidb | | |  | Stage 1  Insertionb | | | |  | Stage 2  Maintenanceb | | |  | Stage 3  Removalb | | |  | Multiple Stages | | | |  | Interventions to Improve Implementation & Sustainability | | | | | |
| Author /Year |  | Study Design |  | ICU Type Studied |  | UC Placement Restrictions (1B) | Promoting UC Alternatives (II) | Require UC Order by Physicians (1B) |  | Standardized UC Kit (1B) | Commercial Securement Device (1B) | UC Insertion Cart (1B) | UC Aseptic Insertion Training (1B) |  | UC Maintenance Care Training (1B) | UTI Bundle Checklist in Rounds (1B) | Bowel Management Program (Not Graded) |  | Foley Catheter Rounds (1B) | UC Removal Reminder (1B) | UC Removal Stop Order (1B) |  | Antimicrobial UCs (1B) (Stages 1 & 2) | Interventions also in ED or OR (Not Graded) (Stages 0 & 3) | Chlorhexidine Intervention (No Recommendation) (Stages 1 & 2) | Healthcare Worker Hand Hygiene (1B) (Stages 1-3) |  | Multi-disciplinary Prep Meeting (Not Graded) | Data Feedback to ICUs (II) | CAUTI Root Cause Analysis (Not Graded) | Measure Intervention Compliance (II) | Patient Education about UCs (Not Graded) | Adaptable Interventions, Reboot (Not Graded) |
| Alexaitis 2014133 |  | B-A |  | NS |  | - | X | - |  | - | - | - | - |  | X | - | - |  | X | - | X |  | - | - | - | - |  | X | X | - | X | X | X |
| Amine 2014143 |  | B-A |  | M |  | X | - | - |  | - | - | - | X |  | X | - | - |  | - | - | - |  | - | - | - | X |  | - | - | - | X | - | - |
| Apisarnthanarak 2007149 |  | B-A |  | - |  | - | - | - |  | - | - | - | - |  | - | - | - |  | - | X | - |  | - | - | - | - |  | - | - | - | - | - | - |
| Chen 2013142 |  | RCT |  | M |  | X | - | - |  | S | - | - | S |  | S | - | - |  | - | X | - |  | - | - | - | - |  | - | - | - | - | - | - |
| Dumigan 199828 |  | B-A |  | M, S, C |  | - | X | - |  | X | - | - | X |  | X | - | - |  | - | - | X |  | - | - | - | - |  | X | - | - | - | - | X |
| Elpern 2009134 |  | B-A |  | M |  | - | - | - |  | - | - | - | - |  | - | - | - |  | X | X | - |  | - | - | - | - |  | X | - | - | - | - | - |
| Fox 201553 |  | B-A |  | C |  | - | - | - |  | - | - | - | - |  | - | - | - |  | - | - | - |  | - | - | XH | - |  | - | - | - | - | - | - |
| Fuchs 2011135 |  | B-A |  | M, S, C, N, CT |  | - | X | - |  | - | - | - | - |  | X | - | - |  | - | X | - |  | - | - | - | - |  | X | - | - | - | - | - |
| Huang 200430 |  | B-A |  | M, S, C, NS, CT |  | - | - | - |  | - | - | - | - |  | - | - | - |  | - | X | - |  | - | - | - | - |  | - | - | - | - | - | - |
| Jain 2006136 |  | B-A |  | MS |  | - | - | - |  | - | - | - | X |  | X | X | - |  | - | - | - |  | XK | - | - | X |  | X | - | - | - | - | X |
| Kanj 2013144 |  | B-A |  | MS |  | X | X | - |  | - | - | - | X |  | X | - | - |  | - | - | - |  | - | - | - | X |  | - | X | - | X | - | - |
| Leblebicioglu 2013109 |  | B-A |  | M, S, MS, CT |  | X | X | - |  | - | - | - | X |  | X | - | - |  | - | - | - |  | - | - | - | X |  | - | X | - | X | - | - |
| Marra 2011150 |  | B-A |  | MS |  | S | - | - |  | - | - | X | S |  | S | X | - |  | X | - | - |  | XZ | - | S | X |  | - | X | - | - | - | - |
| Martinez-Resendez 2014115 |  | B-A |  | M, S |  | - | - | - |  | - | - | - | - |  | - | - | - |  | - | - | - |  | - | - | X | X |  | - | - | - | X | - | - |
| Mathur 2015116 |  | B-A |  | T |  | X | X | - |  | - | - | - | X |  | X | - | - |  | - | X | X |  | - | - | - | X |  | - | X | - | - | - | - |
| Miller 201066 |  | B-A |  | T |  | - | - | - |  | - | - | - | X |  | X | X | - |  | - | - | X |  | - | - | - | X |  | - | - | - | X | - | - |
| Navoa-Ng 2013145 |  | B-A |  | M, S, MS, C |  | XB | XB | - |  | - | - | - | XB |  | X | - | - |  | - | - | - |  | - | - | - | X |  | - | X | - | X | - | - |
| Noto 201568 |  | RCT\* |  | M, S, T, C, N |  | - | - | - |  | - | - | - | - |  | - | - | - |  | - | - | - |  | - | - | X | - |  | - | - | - | - | - | - |
| Popp 2014137 |  | B-A |  | B |  | - | - | - |  | - | - | - | - |  | - | - | - |  | - | - | - |  | - | - | X | - |  | - | - | - | - | - | - |
| Reilly 2006138 |  | B-A |  | MS |  | X | - | X |  | - | - | - | - |  | - | - | - |  | - | X | - |  | - | - | - | - |  | - | - | - | - | - | - |
| Rosenthal 2012146 |  | B-A |  | M, S, MS, C, CT, N, NS, T, R |  | X | X | - |  | - | - | - | X |  | X | - | - |  | - | - | - |  | - | - | - | X |  | - | X | - | X | - | - |
| Saint 2015139 |  | B-A |  | - |  | X | X | - |  | X | - | - | X |  | X | - | - |  | - | X | - |  | XZ | - | - | - |  | - | X | - | - | X | X |
| Salama 2013147 |  | B-A |  | MS, C |  | - | - | - |  | - | - | - | - |  | - | - | - |  | - | - | - |  | - | - | - | X |  | - | X | - | X | - | - |
| Schelling 2015140 |  | B-A |  | NS |  | X | X | - |  | - | X | - | - |  | X | - | X |  | X | X | - |  | - | - | - | X |  | X | X | - | - | - | X |
| Seguin 201033 |  | B-A |  | S |  | - | - | - |  | - | - | - | - |  | - | - | - |  | - | X | - |  | - | - | - | - |  | - | - | - | - | - | - |
| Seyman 2014148 |  | B-A |  | M, S |  | - | - | - |  | - | - | - | - |  | - | - | - |  | - | - | - |  | - | - | X | - |  | - | - | - | - | - | - |
| Sutherland 2015141 |  | B-A |  | M, S, C, NS, CT |  | X | - | X |  | - | - | - | X |  | X | - | - |  | - | X | - |  | - | X | - | - |  | X | X | - | - | - | X |
| Titsworth 201234 |  | B-A |  | N |  | X | X | - |  | X | X | - | X |  | X | - | X |  | X | X | - |  | X | X | - | X |  | - | X | X | X | X | X |

aHealthcare Infection Control Practices Advisory Committee (HICPAC) Recommendation Category from the Guidelines for Prevention of Intravascular Catheter-Related Infections, 2011, and Guideline for Prevention of Catheter-Associated Urinary Tract Infections, 2009: Category 1A = strong recommendation supported by high to moderate quality evidence; Category 1B = strong recommendation supported by low quality evidence; Category 1C = required by state or federal regulations; Category II = weak recommendation; No recommendation = unresolved issue; Not graded = not addressed in guidelines.

bStages as defined in Figure 2 “Disrupting the Life Cycle of a Catheter.”

NOTE: X = studied as an intervention; S = employed as standard of care for intervention and comparison group (not studied as intervention); “-“ = not mentioned in published study as standard of care or intervention. Study Designs: B-A = before-after; RCT = randomized controlled trial; “\*” = cluster-randomized, crossover, controlled study. ICU Types: M = Medical ICU; MS = Medical-Surgical ICU; S = Surgical ICU; C = Cardiac ICU; CT = Cardiothoracic Surgery; N = Neurologic; NS = Neurosurgical; T = Trauma; B = Burn; R = Respiratory. Abbreviations: CUSP, Comprehensive Unit-Based Safety Program; CVC, central vascular catheter; ED, emergency department; HICPAC, Healthcare Infection Control Practices Advisory Committee; ICU, intensive care unit; Int., intervention; OR, operating room; UC, urinary catheter, indwelling; UTI, urinary tract infection. Superscript abbreviations: 1, 1-time educational effort; “^”, posters/fliers used; $, interventions included pay for performance through bonus and reimbursement structure; B, noted to be discussed but not fully applied or measured due to budget limitations; D, dedicated staff follow-up all CVCs on discharge; ED, emergency department; H, Chlorhexidine bathing was only of patient hands; K, optional, not required intervention; M, module-based education; N, nursing-focused education; P, physician-focused education; R, recurrent educational effort; S, simulation-based education; V, video-based education; Z, intervention explicitly recommended against.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. Catheter-Associated Urinary Tract Infection (CAUTI) Outcomes | | | | |
| Study | CAUTIs per  1000 Catheter Days | | Urinary Catheter  Utilization Rates | |
|  | Pre-Int./Control Rate | Post-Int. Rate | Pre-Int./Control Rate | Post-Int. Rate |
| Alexaitis 2014133 | 3.85 | 3.06 | 0.74 | 0.76 |
| Amine 2014143 | 90.12 | 65.69 | 0.66 | 0.71 |
| Apisarnthanarak 2007149 | 23.4 | 3.5\* | -- | -- |
| Chen 2013142 | 17.2 | 10.3 | 0.88 | 0.68+ |
| Dumigan 199828 | 10.3 (M)  15.8 (S)  15.1 (C) | 8.6 (M)  11.2 (S)  8.3\* (C) | -- | -- |
| Elpern 2009134 | 4.7 | 0\* | -- | -- |
| Fox 201553 | 9.1 | 5.6 | -- | -- |
| Fuchs 2011135 | 2.88 | 1.46 | -- | -- |
| Huang 200430 | 11.5 | 8.3\* | -- | -- |
| Jain 2006136 | 3.8 | 2.4 | -- | -- |
| Kanj 2013144 | 13.07 | 2.21\* | 0.96 | 0.96 |
| Leblebicioglu 2013109 | 10.63 | 5.65\* | 0.9 | 0.84+ |
| Marra, 2011150 | 7.6 | 5\* | 0.62 | 0.53 |
| Martinez-Resendez 2014115 | 16.68 | 12.62\* | -- | -- |
| Mathur 2015116 | 37.13 | 15.5 | -- | -- |
| Miller 201066 | 7.48 | 1.74\* | -- | -- |
| Navoa-Ng 2013145 | 11 | 2.66\* | 0.67 | 0.6+ |
| Noto 201568 | 1.54 | 1.09 | -- | -- |
| Popp, 2014137 | 2.7 | 0 | -- | -- |
| Reilly 2006138 | -- | “33% Reduction” | 0.96 | 0.86 |
| Rosenthal 2012146 | 7.86 | 4.95 | 0.72 | 0.7 |
| Saint, 2015139 | 1.4 | 2.1 | -- | -- |
| Salama 2013147 | 5.5 | 5.9 | -- | -- |
| Schelling 2015140 | 8.18 | 0.93 | -- | -- |
| Seguin 201033 | 5.0 | 4.9 | -- | -- |
| Seyman 2014148 | 0.87 | 1.88 | -- | -- |
| Sutherland 2015141 | 5.4 | 2.2 | .47 | .76 |
| Titsworth 201234 | 13.3 | 4\* | 1 | 0.73+ |

NOTE: **Abbreviations:** CLABSI=Central Line-Associated Bloodstream Infection; CRBSI=Catheter-Related Bloodstream Infection; CAUTI=Catheter-Associated Urinary Tract Infection; Int.=Intervention; -- = not reported in study; ICU Types: M=Medical ICU, S=Surgical ICU, C=Cardiac ICU

Superscript numbers denote multiple ICUs of the same type included in one study.

Statistically significant outcomes (when p<0.05 or confidence interval did not contain a null hypothesis value) are noted with \* for CLABSIs, CRBSIs, and CAUTIs and + for Central Line Device and Urinary Catheter Utilization Rates.