**Table 1.** Summary of Characteristics of Studies Included in the Systematic Literature Review in Patients With Cancer (n = 22)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| First Author, Year, Location | Study Duration, Mo | Study Design | Settings | Type of Cancer | EOL Study Period Before Death | No. of Patients With Cancer | Palliative Care, No.  of Patients | | No. of Patients With Infectious Episodes | Cultures Requested  Before ATB Prescribed | No. of Patients Exposed to ATB During EOL, % | ATB  Route | ATB  Duration, D | Outcome  After  ATB Use | D&B  Score |
| Yes | No |
| Al-Shaqi, 2012, Riyadh,Saudi Arabia | 14 | Retrospective cohort | Tertiary palliative care unit | Any type | Last 7 d | 138 | NR | NR | NR | Yes | 46.4% received systemic ATB | O, IV | NR | NR | 15 |
| Azad, 2014, Melbourne, Australia | 10 | Retrospective cohort | Academic medical center | Any type | NR | 270 | NR | NR | NR | NR | 40% received intravenous ATB\* | NR | NR | NR | 16 |
| Baek, 2017, Seoul, South Korea | 36 | Retrospective cohort | Academic medical center | Any type; solid (89.2%), hematologic malignancies (10.8%) | Within 7 d, 3 d and also within 1 d prior to death | 295 | NR | NR | 240 | NR | 81.4% received systemic ATB (within 7 d (81.0%), within 3 d (77.3%), within 1 d (75.3%) | NR | NR | NR | 18 |
| Datta, 2019, New Haven, CT, USA | 28 | Retrospective cohort | Academic medical center | Any type | NR | 461 | 208 | 253 | 382 | Yes | 83% received ATB (94% systemic ATB) | O, IV | Median duration, 12 d  (IQR, 5–23 d) | Survival (patients who received ATB, 61% died) | 20 |
| Fombuena Moreno,  2005, Valencia, Spain | 14 | Prospective cohort | Palliative care unit in an LTCF | Any type | NR | 88  (75 patients with 172 episodes of fever) | 88 | … | 127 | Yes | 79.5% of infectious episodes received ATBa | O, IV, IM | Median duration, 6.5 d | Survival and comfort | 7 |
| Gao, 2013, NR, UK | 8 | Retrospective cohort | General Practice Research Database | 5 major cancers (lung, colorectal, breast, prostate, head and neck) | Last 3 mo of life | 29,810 | NR | NR | NR | NR | 26.8% received ATB, from 23.2% in 2000 to 29.5% in 2008  (*P* < .001) | NR | NR | NR | 10 |
| Girmenia, 1997, Rome, Italy | 30 | Retrospective cohort | Home care | Hematologic malignancies | NR | 151 | 151 | NR | 70 patients developed 109 febrile episodes | Yes | 98.6% received ATB (only 1 ATB) | O, IV | NR | Comfort | 12 |
| Helde-Frankling, 2016, Stockholm, Sweden | NR | Retrospective  cohort | Home care and hospice | Any type | 14 d | 160 | 160 | … | 79 | Yes | 49% received ATB | O, IV | NR | Comfort (37% with improved symptoms after receiving ATB) | 11 |
| Homsi, 2000, Cleveland, OOH, USA | 8 | Retrospective  cohort | Academic medical center | Any type | NR | 393 | 393 | … | 100 | Yes | 82% received ATB | O, IV | Median d of therapy, 11 | NR | 6 |
| Lam, 2005, Kwun Tong, Hong Kong | 7 | Retrospective  cohort | Community hospital | Any type | Last 7 d | 87 | 87 | … | 70 (at least 1 infective episode and accounted for 120 episodes) | Yes | 55.7% received ATB at the time of death (45% received ATB in last week of life) | O, IV | NR | Survival and comfort | 13 |
| Lin, 2012, Liouying, Tainam, Taiwan | 10 | Retrospective  cohort | Academic medical center | Any type | NR | 168 | 168 | … | 115 (at least 1 infective episode and accounted for a total of 123 episodes) | Yes | 99% received ATB | O, IV | NR | Comfort | 13 |
| Mirhosseini, 2006,  Edmonton, Canada | 10 | Prospective cohort | Palliative care unit | Not described (only patients with metastatic disease) | NR | 146 | 146 | … | 26 patients developed 31 infectious episodes | Yes | 100% received ATB (early discontinuation of ATB requested by 1 patient and by the family of 1 patient) | O, IV | Average duration, 9 d (range, 1–61) | Comfort  (48% of physicians felt that the patient improved) | 15 |
| Mohammed, 2014, Holy Capital, Saudia Arabia | 26 | Retrospective  cohort | Specialized cancer center | Any type | NR | 258 | 258 | … | 243 patients (197 with 1 and 46 with 2 infectious episodes) | Yes | 100% received ATB | O, IV | NR | Comfort | 14 |
| Oh, 2006, Seoul, South Korea | 14 | Retrospective  cohort | Academic medical center | Any type | Last 30 d | 141 | NR | NR | 119 patients with infectious episodes | Yes | 84.4% received ATB (85.7% were DNR patients; 90 patients received ATB until death) | NR | Mean duration, 17.8 d | Comfort  (15.1% improved after ATB use) | 12 |
| Oneschuk, 2002, Edmonton, Alberta, Canada | 12 | Retrospective  cohort | Acute care hospital (1); tertiary palliative care unit (1); hospice units (3) | Any type | NR | 50 patients in each of 3 settings | 150 | … | NR | NR | 44% received ATB | O, IV, IM | NR | NR | 9 |
| Pahole, 2016, Ljubljana, Slovenia | 12 | Retrospective  cohort | Academic medical center | Lymphoma | Last 30 d | 53 | 8 | 45 | NR | NR | 84.9% received ATB | NR | NR | NR | 4 |
| Pereira, 1998, Edmonton, Alberta, Canada | NR | Retrospective  cohort | Palliative care unit | Any type | NR | 100 | 100 | … | 55 patients with 74 separated infectious episodes | Yes | 81.8% received ATB  (10 cases with infection did not receive ATB) | O, IV, IM | NR | NR | 11 |
| Porta, 2009, Milan, Italy | 30 | Retrospective  cohort | Hospice | Lung cancer (30%), colorectal cancer (13%), breast cancer (10%) | NR | 286 | 286 | … | NR | NR | 27.4% received ATB | O, IV, IM | NR | Survival | 5 |
| Reinbolt, 2005, Notre Dame, Indiana; Chicago, Illinois; Columbus, OH, USA | 24 | Prospective cohort | Community-based outpatient hospice program (5-county area) | Any type | NR | 1,598 | 1,598 | … | 623 patients  (with 685 infections) | Yes | 92% received ATBa  (20 patients received <72 h ATB due to perceived ATB toxicity or an allergic reaction) | NR | NR | Survivalb | 12 |
| Schur, 2013, Vienna, Austria | 34 | Retrospective  cohort | Palliative care unit | Lung cancer | NR | 86 | 86 | … | NR | NR | 33% received ATB | NR | NR | NR | 10 |
| Thompson, 2012, Ann Arbor, MI, USA | 48 | Retrospective  cohort | Academic medical center | Any type | NR | 145 | 145 | … | 126 patients | Yes | 86.9% received ATB | Systemic | 12.5±12.9 d (median 8; range, 1–81 d) | NR | 18 |
| White, 2003, Notre Dame, IN, USA | 6 | Prospective cohort | Outpatient hospice and palliative care program | Any type | Prognosis of <6 mo | 255 | 255 | … | 117 patients (with 129 infections) | Yes | 65.8% received ATBa | O, IV | NR | Survival and comfort | 11 |

Note. EOL, end-of-life; ATB, antibiotics; NR, not reported; DNR, do not resuscitate; UTI, urinary tract infection; GI, gastrointestinal; SD, standard deviation; LTCF, long term care facility; DNR, do not resuscitate; DNH, do not hospitalize; VA, Veterans’ Affairs; LRI, lower respiratory infection; HR, hazard ratio; CI, confidence interval; O, oral; IV, intravenous; IM, intramuscular; D&B score, Downs and Black score.

aAntimicrobials in general (ATB or antifungal or antiviral therapy).

bNo significant difference in survival in the patients with infection (623 patients) vs without infection (975 patients), and no significant difference in survival in patients who received antimicrobials (573) vs patients who did not received antimicrobials (1,025 patients).

**Table 2.** Summary of Characteristics of Studies Included in the Systematic Literature Review in Patients With Advanced Dementia (n=17)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| First Author, Year, Location | Study Duration | Study Design | Settings | Type of Dementia | Severity of Dementia Classification | EOL Study  Period Before Death | No. of Patients With AD | Palliative Care  No. of Patients | | No. of Infectious Episodes | Requested  Cultures Before ATB Prescribed | No. of Patients Exposed to ATB During EOL, % | ATB  Route | ATB Duration, D | Outcome  After  ATB  Use | D&B  Score |
| Yes | No |
| Ahronheim, 2000, New York, NY, US | 3 mo | RCT | Community hospital | Alzheimer’s disease | FAST  (stage 6d-7f | NR | 99 | 48  (92 admissions) | 51  (98 admissions) | NR | NR | 75% received systemic ATB | Systemic | NR | NR | 22 |
| Catic, 2013, Boston, MA, US | 6 mo | Retrospective cohort | Academic medical center | Any type | BANS; GDS (score of 7) | NR | 29 | 5 | 24 | NR | NR | 86.2% received intravenous ATB (100% intervention group) | IV | NR | NR | 15 |
| Chen, 2006, Boston, MA, US | 36 mo | Retrospective cohort | LTCF (675 beds) | Any type | CPS score ≥5 on the last MDS assessment before death were eligible | 6 mo prior to death | 240 | NR | NR | >1 infectious episode (229 suspected pneumonia episodes) | NR | 154 (64%) had advanced dementia; 229 had suspected pneumonia; 91% received ATB | O, IV, IM | NR | NR | 21 |
| D’Agata, 2008, Boston, MA, US | 44 mo | Prospective cohort | Nursing home residences  (21 facilities) | Any type | Test for severe impairment (range of 24, with lower scores indicating greater cognitive impairment; GDS score of 7 | 14–56 d | 99 | NR | NR | >1 infectious episode (pneumonia; UTI; GI and skin infection) | NR | 126 ATB courses for all 99 decedents during 8 wks before death  (DOT per 1,000 resident days = 171.9 at 0–14 d before death) | NR | NR | NR | 22 |
| D’Agata, 2013, Boston, MA, US | 12  mo | Prospective cohort | Nursing home residence  (25 facilities) | Any type | GDS score of 7 | NR | 266 | NR | NR | >1 infectious episode (UTI) | NR | 102 (77.9%) suspected UTIs were treated with ATB in 131 UTI episodes (72 patients) | NR | NR | NR | 19 |
| Di Giulio, 2008, Cremona, Lombardy, Italy | 12 mo | Retrospective cohort | LTCF (7 with more than 200 beds) | Any type | FAST stage≥7c | 30 d | 141 | NR | NR | NR (but mentioning pneumonia and UTI) | NR | >70% received systemic ATB | NR | NR | NR | 14 |
| Evers, 2002, New York, NY, US | 15 y | Retrospective cohort | Chronic care facilities (30 different chronic care facilities | Alzheimer’s disease | CDR score (all stages included, 0–5) during the last 6 mo of life | NR | 279 | NR | NR | NR the no. of infectious episodes but reported 128 patients with pneumonia (42%) and 90 patients with UTI (30%) | NR | 53% received ATB | NR | NR | NR | 13 |
| Fabiszewski,  1990, Boston, MA, US | 34 mo | Prospective cohort | Intermediate medical care unit  (25 beds) | Alzheimer’s disease | Mini-mental state test; BANS; the MACC behavioral adjustment scale, the language assessment scale | NR | 104  (75 patients with 172 episodes of fever) | 80 episodes of fever | 92 episodes of fever | NR (episodes of fever) | Yes | 69.6% of patients with episodes of fever received ATB | O, IV, IM | NR | Survival | 18 |
| Givens, 2010, Boston, MA, US | 6 y | Prospective cohort | Nursing home residences  (22 facilities) | Any type | GDS score of 7; cognitive performance score of 5 or 6 (indicating severe or very severe cognitive impairment) | NR | 323 | NR | NR | >1 infection episode (pneumonia) | NR | 91% received ATB (133 residents with 225 suspected pneumonia episodes) | O, IV, IM | NR | Survival | 21 |
| Hirakawa, 2006, Nagoya, Aichi, Japan | 24 mo | Retrospective  cohort  (multicenter study) | Hospice and home care | Any type | ADL criteria; severity of dementia (level 5 = severe dementia) | Last 48 h of life | 98  (compared with 112 decedents without demented) | NR | NR | NR | NR | 23.5% received ATB (compared to 9.8% nondementia patients who received ATB) | NR | NR | NR | 20 |
| Klapwijk, 2013, Leiden, The Netherlands | 13 mo | Prospective cohort | LTCF (2) | Any type | PAINAD (range, 0–10); DS-DAT (range, 0–27); EOLD-CAD (range, 14–42); MSSE  (range, 0–9) | 7 d | 24 | NR | NR | NR | NR | 25% received ATB | NR | NR | NR | 15 |
| Marttini Abarca, 2017, Madrid, Spain | 24 mo | Retrospective  cohort | Acute geriatric unit | Any type | NR | NR | 50 | NR | NR | NR | NR | 24% received ATB | NR | NR | NR | 7 |
| Mitchell, 2014, Boston, MA, US | 38 mo | Retrospective  cohort | Nursing home residence  (35 facilities) | Any type | GDS score of 7 | 14 d | 362 | 88.1% DNR; 44.5% DNH; 16.9% no IV atb; 7.5% no atb (any route) | … | Once for 66.3% of residents (pneumonia, UTI, skin infection) | Yes | 72.4% received ATBa | O, IV, IM | 30 d before death | Comfort | 20 |
| Nourhashemi, 2012,  Toulouse, France | 31 mo | Prospective cohort | After hospitalization in geriatric wards (home, nursing home; LTCF; or other) from 2 hospitals | Alzheimer’s disease | ADL score; MMSE<10 with minimal verbal communication and inability to recognize family members | 30 d | 112 | NR | NR | NR | NR | 31.7% received ATB (52% had been treated with ATB during the 3 mo before inclusion) | NR | NR | NR | 15 |
| van der Steen, 2012, Bedford,MA, US | 60 mo | Prospective cohort | U.S. VA nursing home | Any type | CPS score of 5 or 6 | 14 d | 94 (109 episodes) | NR | NR | Yes |  | 77% received ATB (109 episodes of LRI) | O, IM | 10 d before death (95%) | Survivalb | 19 |
| van der Steen, 2018, Leiden, Netherlands | 24 mo | Prospective cohort | Nursing home residence (28 facilities) | Any type | FAST stage of 7 (substages a–f) | ≥14 d | 77 (109 episodes) | NR | NR | >1 infectious episode (pneumonia) | NR | 90% received ATB (109 pneumonia episodes) | NR | NR | Comfort | 17 |
| Volicer, 1993, Boston, MA, US | 34 mo | Prospective cohort | Intermediate medical care unit (three 25-bed facilities) | Alzheimer’s disease | Mini-mental state exam and BANS at 3-mo intervals | 6-mo survival following a fever episode | 104 | 44% received palliative care | … | NR | NR | 56% received ATB | NR | NR | Comfort | 16 |

Note. EOL, end-of-life; AD, advanced dementia; ATB, antibiotics; NR, not reported; RCT, randomized controlled trial; GDS score, Global Deterioration Scale; FAST, Functional Assessment Staging Tool; CDR score, clinical dementia rating; BANS: Bedford Alzheimer Nursing Severity scale; UTI, urinary tract infection; GI, gastrointestinal; SD, standard deviation; ADL, activities of daily living scale of disable elderly; LTCF, long-term care facility; MDS, computerized minimum data set; PAINAD, Pain Assessment in Advanced Dementia; DS-DAT, Discomfort Scale-Dementia of Alzheimer Type; EOLD-CAD, end-of-life in dementia-comfort assessment in dying; MSSE, Mini-Suffering State Examination; DNR, do not resuscitate; DNH, do not hospitalize; VA, Veterans’ Affairs; CPS, cognitive performance scale; LRI, lower respiratory infection; HR, hazard ratio; CI, confidence interval; O, oral; IV, intravenous; IM, intramuscular; D&B score, Downs and Black score.

a359 of 496 suspected infections; mean DOT per 1,000 resident days = 34.6 (SD, 67.9); median DOT per 1,000 resident days = 13.8 (IQR, 0–39.1).

b10-day mortality: 39% residents treated with ATB vs 76% in untreated residents; after adjustment for covariates, overall ATB were not significantly associated with mortality (HR, 0.70; 95% CI, 0.38–1.3).

**Table 3.** Summary of Characteristics of Studies Included in the Systematic Literature Review in End-Of-Life Patients With “Mixed Population” (n = 33)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| First Author, Year, Location | Study Duration,  mo | Study Design | Settings | Type of EOL Patient | EOL Study Period Before Death | No. EOL of Patients | Paliative Care  No. of Patients | | No. of Patients With Infectious Episodes | Culture  Requested  Before ATB | No. of Patients Exposed to ATB during EOL, % | ATB  Route | Duration of ATB | Outcome  Measured After  ATB | D&B  Score |
| Yes | No |
| Ahronheim, 1996, New York City, NY, USA | 13 | Retrospective cohort | Academic medical center | Cancer; advanced dementia | NR | 164 (84 with cancer; 80 with advanced dementia) | NR | NR | NR | NR | 88% received systemic ATB | Systemic | NR | NR | 18 |
| Albrecht, 2013, Baltimore, Maryland, and Portland, Oregon, USA | 3 | Retrospective cohort | Data from 2007 National Home and Hospice Care Survey | Cancer; advanced dementia; elderly; heart failure; COPD; cerebrovascular disease; renal and liver disease; other | 7 d | 3,884 | NR | NR | 380 | NR | 27% received ATB | NR | NR | NR | 13 |
| Alonso, 2016, Mannheim, Germany | 36 | Retrospective cohort | Academic medical center | Stroke | NR | 101 | 101 (40 patients with decision to withdraw/withhold further life supportive therapy) | NR | NR | NR | 86% withdraw ATB | NR | NR | NR | 13 |
| Arribas, 2006, Madrid, Spain | 2 | Prospective cohort | Academic medical center | Cancer; advanced dementia | NR | 63 | NR | NR | NR | NR | 89% received ATB; 11% (7 cases) without ATB | NR | Median duration of therapy, 4 d; mean±SD, 7.7±9 d | NR | 9 |
| Bauduer, 2000, Bayonne, France | 16 | Retrospective cohort | Community hospital | Cancera | NR | 81 | NR | NR | NR | NR | 47% received ATBb | NR | NR | NR | 9 |
| Brabin, 2008, Liverpool, UK | 5 | Retrospective cohort | Hospice | Cancer; end-stage respiratory disease | NR | 209 | 209 | NR | 18 patientsc | Yes | 18 patients received 20 courses of parenteral ATB | O, IV | NR | Survival and comfortd | 10 |
| Burnham, 2019, St Louis, Missouri, USA | 10 | Cluster RTC | Academic medical center (2 ICUs) | NR | NR | 132 | 132 | … | NR | NR | 100% received ATB | NR | Patients discharged on hospice (n=23) had significantly (*P* = .018) shorter duration of inpatient ATB therapye | NR | 17 |
| Choi, 2016, Seoul, Republic of Korea | 12 | Retrospective  Cohort | Academic medical center | NR | NR | 76 | 76 | … | NR | NR | 100% received ATB | NR | NR | NR | 6 |
| Chun, 2010, Ann Arbor, Michigan, USA | 5 | Retrospective  Cohort | Academic medical center | Cancer; advanced dementia; stroke; COPD; heart failure; chronic renal failure; end-stage liver disease | NR | 131 | 131 | … | 70 (at least 1 infective episode and accounted for 92 episodes) | Yes | 100% received ATB | NR | NR | NR | 19 |
| Clayton, 2003, Sidney, Australia | 13 | Prospective cohort | Palliative care unit | Cancer; HIV | NR | 41 | 41 | … | 41 patients received 43 courses of parenteral ATB, symptoms of underlying infection in 34 patients | Yes | 100% received ATB | O, IV, IM | NR | Comfort | 9 |
| Dagli, 2019, Bursa, Turkey | 12 | Retrospective  cohort | Academic medical center | Cancer; advanced dementia; cerebrovascular disease; COPD; heart failure; chronic renal failure | NR | 113 | 113 | … | 74.3% of patients with nosocomial infections | Yes | 92% received ATB | NR | Mean duration of therapy, 23.13±18.06 d | NR | 16 |
| Fins, 1999, New York City, NY, USA | 4 | Retrospective  cohort | Academic medical center | cancer; HIV; cardiovascular disease | Median 9 d | 200 | 200 | … | NR | NR | 41% of patients at comfort care plans received ATB | NR | Mean duration of therapy, 17.8 d | Comfort | 9 |
| Fong, 2017, Akron, Ohio, USA | 12 | Retrospective  cohort | Hospice | NR | 30 d | 824 | 824 | … | NR | NR | 16.4% received ATB; at death, 64 (47.4%) patients had continued ATB | O | NR | NR | 8 |
| Furuno, 2014, Portland, Oregon, USA | 24 | Cross-sectional study | Academic medical center | Cancer; advanced dementia; cerebro vascular disease; COPD; heart failure; chronic renal failure; end-stage liver disease | NR | 845 | 845 | … | NR | Yes | 21.1% received ATB upon discharge to hospicef | NR | NR | NR | 15 |
| Furuno, 2017, Portland, Oregon, USA | 9 | Retrospective  cohort | Hospice | NR | NR | 520 | 520 | … | 19 documented UTI | NR | 25.4% received ATB | NR | NR | NR | 11 |
| Hirakawa, 2006, Nagoya, Japan | 24 | Retrospective  cohort | Hospice and Home care | Cancer (lung, pancreas, stomach, liver, colon, kidney, brain); advanced dementia | 48 h | 152 (116 patients with advanced cancer; and 36 patients with advanced dementia) | 152 | … | NR | NR | 15.1% received ATB | NR | NR | NR | 8 |
| Kadoyama, 2019, Portand, Oregon, USA | 84 | Retrospective  cohort | Academic medical center | Cancer; COPD; heart failure; chronic renal failure; end-stage liver disease | NR | 348 | 348 | … | NR | NR | 32.8% received ATBg | NR | NR | NR | 16 |
| Koon, 2016, Singapore | 6 | Retrospective  cohort | Hospice | Cancer and noncancer (NR) | 14 d | 1,008 | 1,008 | … | NR | NR | 6% received ATB 2 wks before death | NR | Mean duration of therapy, 5 d (range, 1–14) | Comfort | 15 |
| Low, 1998, Singapore | 6 | Retrospective  cohort | Community hospital | Elderly patients | Mean, 9.9 d (47.2% died within first 5 d of admission) | 72 (DNR status) | NR | NR | NR | NR | 63.9% received ATB at death (DNR patients); 56.6% received ATB 5 d before death (non-DNR patients) | NR | NR | NR | 9 |
| Merel, 2016, Seattle, Washington, USA | 26 | Retrospective  cohort | Academic medical center | Cancer; cerebro- vascular disease; COPD; cardiovascular disease; chronic renal failure | NR | 1,881 | 1,881 | … | NR | NR | 77% received ATB (transitioned to comfort care) | O, IV | NR | Comfort | 19 |
| Niederman, 2011, Mineola, NY, USA | 12 | Retrospective  cohort | Academic medical center | Cancer; COPD; heart failure | NR | 158 | 43 (DNR status) | 115 (non-DNR status) | NR | NR | 75.9% received ATB (84% DNR patients vs 73% non-DNR patients,  *P* = .12) | NR | NR | NR | 14 |
| Niederman, 2012, Mineola, NY, USA | 12 | Retrospective  cohort | Academic medical center | Cancer; COPD; heart failure | NR | 70 | 70 (DNR status) | … | NR | NR | 92% received ATB (64% with documented infection) | NR | NR | NR | 14 |
| Philip, 2008, Melbourne, Victoria, Australia | 5 | Retrospective  cohort | Academic medical center | Cystic fibrosis | Last 24 h | 20 | 20 | … | NR | NR | 85% received ATB in the last 24 h of life | NR | NR | NR | 12 |
| Phua, 2011, Singapore | 12 | Retrospective  cohort | Academic medical center | Cancer; advanced dementia; stroke; COPD; heart failure; chronic renal failure; end-stage liver disease | NR | 683 | NR | NR | NR | NR | 44.9% received ATB | NR | NR | NR | 19 |
| Rajala, 2016, Helsinki, Finland | 26 | Retrospective  cohort | National Clinical Registry | Idiopathic pulmonary fibrosis (+cancer) | Last 6 mo | 59 | NR | NR | NR | NR | 66% received ATB during last week of life | NR | NR | NR | 10 |
| Reinhardt, 2017, New York City, NY, USA | 12 | Cross-sectional study | Nursing home residence | Cancer; advanced dementia; heart failure | Last 6 mo | 300 | NR | NR | NR | NR | 68% received ATB in the 6 mo prior to death | NR | NR | NR | 15 |
| Robinson, 1997, Boston, MA, USA | 109 | Retrospective  cohort | Academic medical center | Cystic fibrosis | 12 h before death | 44 | 44 | … | NR | NR | 75% received ATB 12 h before death | IV | NR | NR | 12 |
| Smallwood,  2016, Melbourne, Australia | 10 | Retrospective cohort | Academic medical center | COPD | NR | 139 | 113 | … | 127 | NR | 62% had antibotics discontinued prior to death (n=62) | NR | NR | NR | 10 |
| Soh, 2012, Dublin, Ireland | 12 | Prospective cohort | Nursing home residence | Advanced dementia (91%), elderly patients | Last 48 h | 60 | 60 | … | NR | NR | 50% receiving oral ATB | O, IV | NR | NR | 6 |
| Tagashira, 2018, Tokyo, Japan | 12 | Retrospective  cohort | Community hospital | Cancer (73.8%); advanced dementia; stroke; COPD; chronic renal failure; end-stage liver disease | 14 d | 260 | 260 | … | 27 of 48 cultures were positive (56.3%) for sputum, 27 of 91 (29.7%) for blood, 25 of 47 (53.2%) for urine, and 3 of 13 (23.1%) for other specimens | Yes | 52.3% received ATBg  (DOT per 1,000 patient days, 421.9 in the last 14 d of life | IV | Median duration of therapy, 8 d  (IQR, 5–14) | Comfort  (31 patients (22.8%) had improvement of symptoms after using antimicrobial therapy) | 17 |
| Taverner, 2019, Melborne, Victoria, Australia | 12 | Retrospective  cohort | Academic medical center | COPD | NR | 221 | 221 | … | NR | Yes | 90.5% received ATB\* (63.3 withdrawn prior to death) | O, IV, IM | Median duration d of therapy=4 (IQR=2-8 d) | NR | 18 |
| Tiirola, 2017, Tampere, Finland | 108 | Retrospective  cohort | Hospice | Amyotrophic lateral sclerosis (ALS) (48%); other nervous systems diseases; COPD; idiopathic pulmonary fibrosis; myelofibrosis; cardiovascular diseases; chronic renal failure; end-stage liver disease | Last 24 h | 67 | 67 | … | NR | NR | 17.9% received ATB (31.3% were patients with ALS and 5.7% patients with other nonmalignant disease) | NR | NR | NR | 13 |
| Vitetta, 2000, Melbourne, Victoria, Australia | 18 | Retrospective  cohort | Academic medical center | Cancer (genitourinary, brain, skin, unknown primary site, mesothelioma pleura) and nonmalignant illness (7.8%) | NR | 102 | 102 | … | 37 patients with 42 separate infections | Yes | 94.6% received ATB | O, IV | NR | Comfort | 16 |

Note. EOL, end-of-life; ATB, antibiotics; ICU, intensive care unit; NR, not reported; DNR, do-not-resuscitate; LRTI, lower respiratory tract infection; UTI, urinary tract infection; GI, gastrointestinal; SD, standard deviation; COPD, chronic obstructive pulmonary disease; LTCF, long term care facility; DNR, do not resuscitate; DNH, do not hospitalize; VA, Veterans’ Affairs; LRI, lower respiratory infection; HR, hazard ratio; CI, confidence interval; O, oral; IV, intravenous; IM, intramuscular; D&B score, Downs and Black score.

aLung, lymphoma, leukemia, multiple myeloma; colon, melanoma, prostate, larynx, tonsil, unknown); anaemias of various causes; amyloidosis; immune thrombocytopenia purpura; warfarin-induced cerebral hemorrhage.

bAntimicrobials in general (ATB or antifungal or antiviral therapy).

cReceived 20 courses of parenteral ATB: LRTI, 11 episodes; UTI, 3 episodes; soft-tissue infection, 2 episodes; LRTI+UTI, 1 episode; unknown source, 3 episodes.

d16 (89%) of the 18 patients who received parenteral ATB died during their hospice stay, within 2 weeks of starting ATB treatment in 16 treated infective episodes. One patient who survived for 9 weeks was treated with ATB therapy for cellulitis.

eMedian, 5 d (IQR, 3–7) than patients who not discharged to hospice (n = 109; median, 7 d; IQR, 4–12).

f52 patients who received a prescription for ATB on discharge did not have a documented infection on the index admission.

gAntimicrobials in general (antibiotic or antifungal or antiviral therapy).