**Evidence Table E-8. Summary of other outcomes reported in studies comparing N-acetylcysteine and placebo or usual care for the prevention of contrast-induced nephropathy**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Author, year** | **Comparison** |  **Mortality, n/N (%)\*** | **Need for RRT,** **n/N (%)** | **Length of hospital stay, mean days (SD)** | **Cardiac events, n/N (%)** |
| ACT, 2011[3](#_ENREF_3) | Arm 1: Placebo+ NSArm 2: NAC+ NS | At 30 days Arm1: 24/1135 (2.1)Arm2: 23/1171 (2.0)RR 0.97 (95% CI: 0.54-1.73); P=0.92 | At 30 daysArm1: 3/1135 (0.3)Arm2: 3/1171 (0.3)RR 0.87 (95% CI: 0.17-4.35); P=0.86 | NR | NR |
| Alioglu, 2013[6](#_ENREF_6) | Arm 1: 0.45% salineArm 2: NAC + 0.45% saline | NR | NR | NR | NR |
| Allaqaband, 2002[7](#_ENREF_7) | Arm1: 0.45% salineArm2: 0.45% saline + NACArm3: 0.45% saline + fenoldopam | NR | Time point: NR,20 who developed CIN needed hemodialysis, no other details | NR | NR |
| Amini, 2009[8](#_ENREF_8) | Arm 1: Placebo+ NSArm 2: NAC+ NS | NR | NR | NR | NR |
| Aslanger, 2012[9](#_ENREF_9) | Arm 1: Placebo+ NSArm 2: high-dose NAC+ NS | NR | NR | NR | NR |
| Awal, 2011[10](#_ENREF_10) | Arm 1: NSArm 2: NAC+ NS | NR | NR | NR | NR |
| Azmus, 2005[11](#_ENREF_11) | Arm 1: Placebo+ NSArm 2: NAC+ NS | At 48 hours: 6/201 (3.0)Arm2: 5/196 (2.5); P=1.0 | At 48 hoursArm1: 1/201 (0.5)Arm2: 1/196 (0.5); P=1.0 | NR | NR |
| Baker, 2003[12](#_ENREF_12) | Arm 1: NSArm 2: NAC+ NS | NR | At 96 hoursArm1: 0/39 (0)Arm2: 0/41 (0); P=NR | NR | Pulmonary edema at 96 hoursArm1: 2/39Arm2: 2/41; P=NR |
| Baranska-Kosakowska, 2007[14](#_ENREF_14) | Arm1: NSArm2: IV NAC + NS | NR | NR | NR | NR |
|  Baskurt, 2009[13](#_ENREF_13) | Arm1: NSArm2: NS + NAC Arm3: NS + NAC + theophylline | NR | NR | NR | Major adverse cardiac events at 48 hoursArm1: 0/42 (0)Arm2: 0/73 (0)Arm3: 0/72 (0); P=NR |
| Boccalandro, 2003[17](#_ENREF_17) | Arm 1: Placebo + 0.45% salineArm 2: NAC + 0.45% saline | NR | NR | NR | NR |
| Briguori, 2002[21](#_ENREF_21) | Arm 1: 0.45% saline Arm 2: NAC + 0.45% saline | NR | At 48 hoursArm1: 1/91 (1.1)Arm2: 0/92 (0); P=NR | NR | NR |
| Brueck, 2013[23](#_ENREF_23) | Arm1: placebo + NSArm2: IV-NAC+ NSArm3: IA-NAC+ NS | NR | NR | NR | NR |

**Evidence Table E-8. Summary of other outcomes reported in studies comparing N-acetylcysteine and placebo or usual care for the prevention of contrast-induced nephropathy**

**(continued)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Author, year** | **Comparison** |  **Mortality, n/N (%)\*** | **Need for RRT,** **n/N (%)** | **Length of hospital stay, mean days (SD)** | **Cardiac events, n/N (%)** |
| Burns, 2010[24](#_ENREF_24) | Arm 1: Placebo+ NSArm 2: NAC+ NS | At 5 daysArm1: 9/21 (42.9)Arm2: 6/21 (28.6); P=0.52 | At 5 daysArm1: 0/21 (0)Arm2: 0/21 (0); P=NR | All patients (ICU)Arm1: 13.1 (7.9)Arm2: 24.4 (23.5); P=0.47Survivors (ICU)Arm1: 13.7 (7.3)Arm2: 25.0 (24.9); P=0.65All patients (hospital stay)Arm1: 41.5 (42.6)Arm2: 50.7 (23.6); P=0.71Survivors (hospital stay)Arm1: 45.8 (27.8)Arm2: 57.2 (60.6); P=0.68 | NR |
| Buyukhatipoglu, 2010[25](#_ENREF_25) | Arm1: NSArm2: IV NAC + NS | NR | NR | NR | NR |
| Carbonell, 2007[26](#_ENREF_26) | Arm 1: Placebo + 0.45% saline Arm 2: NAC + 0.45% saline | Time point: NRArm1: 5/109 (4.6)Arm2: 3/107 (2.8); P=NR | NR | Coronary unit stayArm1: median 4 (2-37)Arm2: median 4.5 (2-24); P=NR | NR |
| Carbonell, 2010[27](#_ENREF_27) | Arm 1: Placebo + 0.45% saline Arm 2: NAC + 0.45% saline | Coronary unit Time point: short-termArm1: 2/42 (4.2)Arm2: 3/39 (7.7)OR 0.20 (95% CI: 0.04-0.97)P=0.18In-hospital Time point: short-termArm1: 7/42 (16.7)Arm2: 4/39 (10.3); P=0.65Long-termArm1: 9/42 (21.4)Arm2: 6/39 (15.4); P=0.67 | At 12 monthsArm1: 1/42 (2.0)Arm2: 0/39 (0); P=0.15 | Coronary unit stayArm1: median 4 (2-27)Arm2: median 5 (1-20); P=0.70HospitalArm1: median 10 (2-76)Arm2: median 10 (1-42); P=0.20 | NR |

**Evidence Table E-8. Summary of other outcomes reported in studies comparing N-acetylcysteine and placebo or usual care for the prevention of contrast-induced nephropathy**

**(continued)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Author, year** | **Comparison** |  **Mortality, n/N (%)\*** | **Need for RRT,** **n/N (%)** | **Length of hospital stay, mean days (SD)** | **Cardiac events, n/N (%)** |
| Castini, 2010[28](#_ENREF_28) | Arm1: NSArm2: NS + NACArm3: NaHCO3 | NR | NR | NR | NR |
| Chousterman, 2011[29](#_ENREF_29) | Arm 1: NSArm 2: NAC + NS | NR | NR | NR | NR |
|  Chousterman, 2013[30](#_ENREF_30) | Arm 1: NSArm 2: NAC + NS | NR | Time point: NRArm1: 5/54 (9)Arm2: 7/62 (11); P=NR | NR | NR |
| Demir, 2008[31](#_ENREF_31) | Arm1:NSArm2: NAC + NSArm3: misopriatol + NSArm4: theophylline + NSArm5: nifedipine + NS | NR | NR | NR | NR |
|  Durham, 2002[32](#_ENREF_32) | Arm 1: 0.45% SalineArm 2: high-dose NAC + 0.45% saline | NR | Whole population: 2/79 (2.4%)P=NR | NR | NR |
| Erturk, 2014[34](#_ENREF_34) | Arm1: IV Normal SalineArm2: Oral NAC + IV Normal SalineArm3: IV NAC + IV Normal Saline | 30 daysArm1: 3/103 (2.9)Arm2: 0/102 (0)Arm3: 1/102 (1)p=0.1731 yearArm1: 7/103 (6.8)Arm2: 8/102 (7.8)Arm3: 12/102 (11.8)p=0.417 | Dialysis at 30 daysArm1: 2/103 (1.9)Arm2: 0/102 (0)Arm3: 0/102 (0)p=0.136Dialysis at 1 yearArm1: 3/103 (2.9)Arm2: 1/102 (1)Arm3: 0/102 (0)p=0.173 | NR | NR |
| Ferrario, 2009[35](#_ENREF_35) | Arm 1: Placebo+ NSArm 2: NAC+ NS | At 72 hoursArm1: 0/101 (0)Arm2: 0/99 (0); P=NR | At 72 hoursArm1: 0/101 (0)Arm2: 0/99 (0); P=NR | NR | NR |
| Fung, 2004[37](#_ENREF_37) | Arm 1: NSArm 2: NAC+ NS | NR | Temporary dialysis therapy for acute renal failureTime point: NRArm1: 0/45 (0)Arm2: 0/46 (0); P=NR | NR | NR |

**Evidence Table E-8. Summary of other outcomes reported in studies comparing N-acetylcysteine and placebo or usual care for the prevention of contrast-induced nephropathy**

**(continued)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Author, year** | **Comparison** |  **Mortality, n/N (%)\*** | **Need for RRT,** **n/N (%)** | **Length of hospital stay, mean days (SD)** | **Cardiac events, n/N (%)** |
| Goldenberg, 2004[38](#_ENREF_38) | Arm 1: Placebo + 0.45% SalineArm 2: NAC + 0.45% saline | NR | NR | NR | Overt congestive heart failure Time point: NRArm1: 1/39 (3)Arm2: 1/41 (2); P=74 |
| Gomes, 2005[39](#_ENREF_39) | Arm 1: Placebo+ NSArm 2: NAC+ NS | Time point: NRArm1: 2/79 (2.5)Arm2: 5/77 (6.5); P=0.42 | Time point: NRArm1: 0/79 (0)Arm2: 2/77 (2.6); P=0.24 | NR | NR |
| Gulel, 2005[41](#_ENREF_41) | Arm 1: NSArm 2: NAC+ NS | NR | NR | NR | NR |
| Gunebakmaz, 2012[42](#_ENREF_42) | Arm1: NSArm2: NS + nebivololArm3: NAC + NS | NR | NR | NR | NR |
| Holscher, 2008[46](#_ENREF_46) | Arm1: NS + glucoseArm2: NS + dialysis + glucose Arm3: NS + NAC + glucose | NR | NR | NR | NR |
| Hsu, 2007[47](#_ENREF_47) | Arm 1: NSArm 2: NAC+ NS | NR | Time point: NRArm1: 0/9 (0)Arm2: 0/11 (0); P=NR | Arm1: 8.1 (4.1)Arm2: 5.2 (1.5); P=0.04 | Acute coronary syndrome or acute congestive heart failureTime point: NRArm1: 0/9 (0)Arm2: 0/11 (0); P=NR |
|  Hsu, 2012[48](#_ENREF_48) | Arm 1: NSArm 2: NAC+ NS | Time point: NRArm1: 13/103 (12.6)Arm2: 8/106 (7.5)OR 0.57 (95% CI: 0.224-1.427)P=NR | Time point: NRArm1: 0/103 (0)Arm2: 0/106 (0); P=NR | NR | NR |
| Izani Wan Mohamed, 2008[49](#_ENREF_49) | Arm 1: 0.45% SalineArm 2: NAC + 0.45% saline | NR | Patients who developed CIN at 48 hoursArm1: 0/6 (0)Arm2: 0/2 (0); P=NR | NR | NR |
| Jaffery, 2012[50](#_ENREF_50) | Arm 1: NSArm 2: high-dose NAC+ NS | Time point: short-termArm1: 1/192 (0.5)Arm2: 1/206 (0.5); P=1.0At 30 daysArm1: 3/192 (1.6)Arm2: 3/206 (1.3); P=1.0 | NR | Arm1: 3.6 (3.3)Arm2: 3.2 (2.6); P=0.13 | NR |

**Evidence Table E-8. Summary of other outcomes reported in studies comparing N-acetylcysteine and placebo or usual care for the prevention of contrast-induced nephropathy**

**(continued)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Author, year** | **Comparison** |  **Mortality, n/N (%)\*** | **Need for RRT,** **n/N (%)** | **Length of hospital stay, mean days (SD)** | **Cardiac events, n/N (%)** |
| Kama, 2014[54](#_ENREF_54) | Arm1: IV Normal SalineArm2: IV NAC in Normal SalineArm3: IV NaHCO3 in Normal Saline | NR | Need for RRT1 monthArm1: 0 (0)Arm2: 3 (803)Arm3: 2 (5.6)p=NR | NR | NR |
| Kay, 2003[57](#_ENREF_57) | Arm 1: Placebo + NSArm 2: NAC+ NS | NR | NR | Arm1: 3.9 (2.0)Arm2: 3.4 (0.9)RR 0.52 (95% CI: 0.08-0.96)P=0.02 | NR |
| Kefer, 2003[58](#_ENREF_58) | Arm 1: Placebo + dextroseArm 2: high-dose NAC + dextrose | NR | NR | NR | NR |
| Khalili, 2006[59](#_ENREF_59) | Arm 1: NSArm 2: NAC+ NS | NR | NR | NR | NR |
| Kim, 2010[60](#_ENREF_60) | Arm 1: NSArm 2: high-dose NAC+ NS | NR | NR | NR | NR |
| Kimmel, 2008[61](#_ENREF_61) | Arm 1: Placebo + 0.45% SalineArm 2: NAC + 0.45% saline | NR | NR | NR | NR |
| Kinbara, 2010[62](#_ENREF_62) | Arm1: NSArm2: NS + aminophylline Arm3: NS + high-dose NAC | NR | NR | NR | NR |
| Koc, 2012[63](#_ENREF_63) | Arm1: Standard NS Arm2: IV NAC + High dose NSArm3: High dose NS | NR | NR | NR | NR |
|  Kotlyar, 2005[66](#_ENREF_66) | Arm1: NSArm2: NAC 300mg + NSArm3: NAC 600mg + NS | NR | Chronic reductions in renal function at 30 daysArm1: 2/19 (11)Arm2: 4/20 (20)Arm3: 2/21 (10); P=0.66 | NR | NR |
| Kumar, 2014[67](#_ENREF_67) | Arm 1: IV NSArm 2: Oral NAC + IV NS | NR | NR | NR | NR |

**Evidence Table E-8. Summary of other outcomes reported in studies comparing N-acetylcysteine and placebo or usual care for the prevention of contrast-induced nephropathy**

**(continued)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Author, year** | **Comparison** |  **Mortality, n/N (%)\*** | **Need for RRT,** **n/N (%)** | **Length of hospital stay, mean days (SD)** | **Cardiac events, n/N (%)** |
| Lawlor, 2007[68](#_ENREF_68) | Arm1: Placebo + IV NS Arm2: IV hydration + oral NAC Arm3: Oral hydration + oral NAC | NR | Need for DialysisAt 48 hoursArm1: 0 (0)Arm2: 0 (0)Arm3: 0 (0)p=NR | NR | NR |
| MacNeill, 2003[75](#_ENREF_75) | Arm 1: Placebo + NSArm 2: NAC+ NS | NR | NR | NR | NR |
| Marenzi, 2006[78](#_ENREF_78) | Arm1: Placebo + NSArm2: NAC + NSArm3: High-dose NAC + NS | Time point: NRArm1: 13/119 (11)Arm2: 5/115 (4)Arm3: 3/118 (3); P=0.007 | Time point: NRArm1: 6/119 (5)Arm2: 2/115 (2)Arm3: 1/118 (1); P=0.14 | NR | NR |
| Miner, 2004[83](#_ENREF_83) | Arm 1: Placebo + 0.45% SalineArm 2: High-dose NAC + 0.45% saline | In-hospitalTime point: NRArm1: 2Arm2: 0; P=NRLong-term Time point: NRArm1: 3 (3.5)Arm2: 4 (4); P=NR | In-hospitalTime point: NRArm1: 0Arm2: 1; P=NRTime point: NRArm1: 1Arm2: 1; P=NR | NR | Non-fatal MI, in-hospitalTime point: NRArm1: 1Arm2: 6; P=0.14Non-fatal MI, long-termTime point: NRArm1: 4Arm2: 6; P=NR |
| Ochoa, 2004 [85](#_ENREF_85) | Arm 1: Placebo + NSArm 2: NAC+ NS | NR | NR | NR | NR |
| Oldemeyer, 2003[86](#_ENREF_86) | Arm 1: Placebo + 0.45% SalineArm 2: High-dose NAC + 0.45% saline | NR | At 48 hoursArm1: 0/47 (0)Arm2: 0/48 (0); P=NR | Arm1: 4.9 (4.0)Arm2: 4.8 (3.8); P=NR | NR |
| Ozcan, 2007[87](#_ENREF_87) | Arm1: NSArm2: NS + NACArm3: bicarbonate | NR | At 48 hoursArm1: 1/88 (1.14)Arm2: 0/88 (0)Arm3: 1/88 (1.14); P=NR | NR | Incidence of congestive heart failure at 48 hoursArm1: 0/88 (0)Arm2: 0/88 (0)Arm3: 0/88 (0); P=NR |
| Poletti, 2007[90](#_ENREF_90) | Arm 1: NS + 0.45% SalineArm 2: High-dose NAC + 0.45% saline | NR | NR | NR | NR |

**Evidence Table E-8. Summary of other outcomes reported in studies comparing N-acetylcysteine and placebo or usual care for the prevention of contrast-induced nephropathy**

**(continued)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Author, year** | **Comparison** |  **Mortality, n/N (%)\*** | **Need for RRT,** **n/N (%)** | **Length of hospital stay, mean days (SD)** | **Cardiac events, n/N (%)** |
| Rashid, 2004[94](#_ENREF_94) | Arm1: IV Normal Saline Arm2: IV Normal Saline + Oral NAC | At 7 daysArm1: 0/48 (0)Arm2: 1/46 (2.2)p=NR | At 7 daysArm1: 1/48 (2.1)Arm2: 0/46 (0)p=NR | NR | NR |
| Ratcliffe, 2009[93](#_ENREF_93) | Arm1: NSArm2: NS + high-dose NACArm3: NaHCO3Arm4: NaHCO3 + NAC | NR | NR | NR | NR |
| Reinecke, 2007 [95](#_ENREF_95) | Arm1: NS + glucoseArm2: NS+ dialysis + glucoseArm3: NS+ NAC + glucose | In hospitalArm1: 1/NR (0.7)Arm2: 3/NR (2.2)Arm3: 1/NR (0.7); P=0.42730-dayArm1: 3/NR (2.2)Arm2: 3/NR (2.2)Arm3: 1/NR (0.7); P=0.540Months NRArm1: 9.7Arm2: 13.1Arm3: 9.9; P=0.582 | In-hospital Time point: NRArm1: 1/NR (0.7)Arm2: 22/133 (1.5)Arm3: 1/NR (0.7); P=0.762 | NR | NR |
| Sadat, 2011[96](#_ENREF_96) | Arm1: NSArm2: NS + NAC | NR | NR | NR | NR |
| Sandhu, 2006[97](#_ENREF_97) | Arm 1: No treatmentArm 2: NAC | NR | NR | NR | NR |
| Sar, 2010[99](#_ENREF_99) | Arm1: NSArm2: Oral NAC + IV NS | NR | NR | NR | NR |
| Seyon, 2007[100](#_ENREF_100) | Arm 1: Placebo + 0.45% SalineArm 2: NAC + 0.45% saline | NR | NR | NR | NR |
| Shyu, 2002[104](#_ENREF_104) | Arm 1: 0.45% SalineArm 2: NAC + 0.45% saline | NR | Time point: NRArm1: 1Arm2: 0; P=NR | NR | NR |
| Tanaka, 2011[105](#_ENREF_105) | Arm 1: Placebo + Ringer's LactateArm 2: High-dose NAC + Ringer's Lactate | NR | NR | Arm1: 20.8 (8.9)Arm2: 18.7 (5.6); P=0.22 | NR |
| Tepel, 2000 [106](#_ENREF_106) | Arm 1: 0.45% SalineArm 2: NAC + 0.45% saline | NR | NR | NR | NR |

**Evidence Table E-8. Summary of other outcomes reported in studies comparing N-acetylcysteine and placebo or usual care for the prevention of contrast-induced nephropathy**

**(continued)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Author, year** | **Comparison** |  **Mortality, n/N (%)\*** | **Need for RRT,** **n/N (%)** | **Length of hospital stay, mean days (SD)** | **Cardiac events, n/N (%)** |
| Thayssen, 2014[107](#_ENREF_107) | Arm1: IV Normal Saline Arm2: IV Normal Saline + oral NAC Arm3: IV Normal Saline + IV NaHCO3 Arm4: IV Normal Saline + oral NAC + IV NaHCO3 | NR | 30 DaysArm1: 0/181 (0)Arm2: 0/176 (0)Arm3: 0/181 (0)Arm3: 0/177 (0)p=NR | NR | Cardiac major events, composite (cardiac death, myocardial infarction, target vessel revascularization)Arm1: 4/181 (2.2)Arm2: 0/176 (0)Arm3: 6/181 (3.6)Arm3: 3/177 (1.7)p=0.13 |
| Thiele, 2010[108](#_ENREF_108) | Arm 1: Placebo + NSArm 2: NAC+ NS | At 6 monthsArm1: 12/125Arm2: 12/126; P=NR | NR | NR | Non-fatal reinfarctionsAt 6 monthsArm1: 4/125 (3.2)Arm2: 3/126 (2.4); P=NRNew congestive heart failure at 6 monthsArm1: 7 (5.6)Arm2: 11 (8.7); P=NR |
| Traub, 2013[110](#_ENREF_110) | Arm1: IV Normal Saline Arm2: IV NAC | NR | NR | NR | NR |
| Wang, 2008[114](#_ENREF_114) | Arm1: NS Arm2: IV NAC + NS | NR | NR | NR | NR |
| Webb, 2004[115](#_ENREF_115) | Arm 1: Placebo + NSArm 2: NAC+ NS | At 8 daysArm1: 5/227Arm2: 7/220; P=NRAt >8 daysArm1: 4/227Arm2: 3/220; P=NR | At 2-8 daysArm1: 0/227Arm2: 0/220; P=NR | NR | NR |
| Yeganehkhah, 2014[117](#_ENREF_117) | Arm 1: IV NSArm 2: Oral NAC + IV NS | NR | NR | NR | NR |

%=percent; ACT=Acetylcysteine for Contrast-Induced Nephropathy Trial; CI=confidence interval; CIN=contrast induced nephropathy; MI=myocardial infarction; N=sample size; NAC=N-acetylcysteine; NaHCO3=sodium bicarbonate; NR=not reported; OR=odds ratio; P=p-value; RR=risk ratio; RRT=renal replacement therapy

\* n/N refers to number of events divided by number at risk.