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| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Source** | **Article/study type** | **Category** | **LOE** | **No. Subjects** | **Summary** |
| 1964 | Seeler50 | Review | Equipment | V | ~ | Emergency life-sustaining system for spacecraft |
| 1971 | Hinton51 | Review | Transport | V | ~ | Space rescue operations |
| 1972 | Perchonok52 | Review | Transport | V | ~ | Space rescue considerations |
| 1979 | LeJeune53 | Review | Airway | V | ~ | Laryngoscopy in space |
| 1980 | Frey et al.54 | Review | Critical Care | V | ~ | Emergency care in space |
| 1981 | Griswold & Trusch55 | Review | Transport | V | ~ | Emergency and rescue considerations from space |
| 1981 | Stazhadze et al.56 | Review | Anesthesia | V | ~ | Anesthesia, surgery, and resuscitation in space |
| 1984 | Houtchens57 | Review | Critical Care | V | ~ | Trauma and emergency surgery in space |
| 1986 | Kelly58 | Review | Transport | V | ~ | Analysis of escape/recovery systems for the US Space Station |
| 1988 | Halsell et al.59 | Review | Transport | V | ~ | Assessment of Space Station rescue vehicle |
| 1989 | Naftel et al.60 | Review | Transport | V | ~ | Space rescue vehicle design |
| 1990 | Billica et al.6 | Prospective Cohort | Equipment | II | 4 | Fluid handling in microgravity |
| 1990 | Billica et al.7 | Prospective Cohort | Equipment | II | 3 | CPR in microgravity |
| 1990 | Gosbee et al.8 | Prospective Cohort | Equipment | II | 3 | ATLS procedures in microgravity |
| 1990 | Maidlow et al.9 | Prospective Cohort | Equipment | II | 4 | Intravenous catheter and fluid |
| 1990 | NASA/USRA61 | Review | Transport | V | ~ | Assured crew return vehicle subsystem design |
| 1991 | Cerimele et al.62 | Patent | Transport | V | ~ | Assured crew return vehicle Patent No. 5,064,151 |
| 1991 | Nicogossian et al.63 | Review | Critical Care | V | ~ | Medical countermeasures |
| 1992 | Campbell & Billica64 | Review | Critical Care | V | ~ | Microgravity surgical investigations |
| 1992 | Chandler65 | Review | Transport | V | ~ | Assured crew return vehicle medical issues |
| 1992 | Dons & Folmeister66 | Review | Critical Care | V | ~ | Combined injury syndrome |
| 1992 | McCuaig & Houtchens10 | Prospective | Critical Care | II | 3 | Microgravity simulation of trauma and surgical care |
| 1993 | Campbell et al.11 | Prospective Cohort | Critical Care | II | 3 flights | Surgical bleeding in microgravity |
| 1994 | Siegel67 | Review | Critical Care | V | ~ | Medical/surgical evaluation |
| 1994 | Guy et al.12 | Prospective Cohort | Critical Care | II | 7 | Pulmonary ventilation in microgravity |
| 1994 | McCuaig68 | Review | Critical Care | V | ~ | Surgical problems in space |
| 1995 | Prisk et al.13 | Prospective Cohort | Critical Care | II | 4 | Pulmonary ventilation in microgravity |
| 1996 | Leach et al.14 | Prospective Cohort | Critical Care | II | 7 | Body fluid regulation during short-term spaceflight |
| 1997 | Harris et al.15 | Prospective Cohort | Critical Care | II | 7 | Physical examination |
| 1997 | Mazanek et al.69 | Review | Transport | V | ~ | Assured crew return vehicle for the International Space Station |
| 1997 | Smith et al.70 | Review | Critical Care | V | ~ | Fluid and electrolyte regulation |
| 1997 | Wilson71 | Review | Transport | V | ~ | Crew return vehicle based on the X-38 prototype |
| 1998 | NASA72 | Review | Equipment | V | ~ | Space Shuttle extravehicular mobility unit (EMU) |
| 1999 | Cuttino16 | Prospective Cohort | Critical Care | II | ? | Medical crisis management |
| 2000 | Keller et al.17 | Prospective Cohort | Airway | II | 4 | Spaceflight airway management |
| 2000 | Norfleet73 | Review | Anesthesia | V | ~ | Anesthesia concerns in microgravity |
| 2001 | Stepaniak et al.74 | Review | Transport | V | ~ | Assured crew return vehicle medical considerations |
| 2002 | Campbell et al.18 | Prospective Cohort | Critical Care | II | 12 (swine) | ATLS procedures in microgravity |
| 2003 | Bacal et al.39 | Retrospective Review | Critical Care | III | 237 | Neurovestibular symptoms after spaceflight |
| 2003 | Jay et al.19 | Prospective Cohort | Critical Care | II | 8 | CPR in microgravity |
| 2004 | Agnew et al.75 | Review | Anesthesia | V | ~ | Anesthesia and microgravity exposure |
| 2004 | Bacal et al.76 | Review | Critical Care | V | ~ | Contingency medical care |
| 2004 | Beck77 | Review | Airway | V | ~ | Emergency airway management in orbit |
| 2004 | Johnston20 | Prospective Cohort | Critical Care | II | 11 (swine) | CPR in microgravity |
| 2004 | Kaczka & Beck78 | Review | Critical Care | V | ~ | Mechanical ventilation in orbit |
| 2004 | Spaulding et al.21 | Prospective Cohort | Equipment | II | 6 | Intravenous fluids in microgravity |
| 2005 | Cooke & Convertino79 | Review | Critical Care | V | ~ | Cardiovascular responses to microgravity |
| 2005 | Evetts et al.22 | Prospective Cohort | Critical Care | II | 2 | CPR in microgravity |
| 2005 | Groemer et al.23 | Prospective Cohort | Airway | II | 3 | Intubation in microgravity |
| 2005 | Summers et al.80 | Review | Critical Care | V | ~ | Emergencies in space |
| 2006 | Rabitsch et al.24 | Prospective Cohort | Airway | II | 4 | Intubation in microgravity |
| 2007 | Convertino & Ryan81 | Review | Critical Care | V | ~ | Physiological monitoring in space |
| 2007 | Gontcharov et al.40 | Retrospective Review | Critical Care | III | 19 | In-flight medical incidents NASA-Mir |
| 2007 | Miller et al.82 | Review | Equipment | V | ~ | Intravenous fluids in microgravity |
| 2007 | Muratore83 | Review | Transport | V | ~ | Space rescue overview |
| 2007 | Roan & Boyd84 | Letter to the Editor | Airway | V | ~ | Comment on Rabitsch et al. study |
| 2007 | Stepaniak et al.25 | Prospective Cohort | Critical Care | II | 32 | Reentry physiologic effects |
| 2007 | Stewart et al.85 | Review | Critical Care | V | ~ | Emergency medicine in space |
| 2008 | Barnes et al.26 | Prospective Cohort | Critical Care | II | 22 | Mechanical ventilation at high altitude |
| 2008 | Hamilton et al.86 | Review | Critical Care | V | ~ | Autonomous medical care |
| 2008 | Hatfield87 | Review | Equipment | V | ~ | Lightweight trauma module for aeromedical evacuation |
| 2008 | Smith et al.88 | Review | Transport | V | ~ | Medical evacuation and transport vehicles |
| 2009 | Kirkpatrick et al.89 | Review | Critical Care | V | ~ | Injury care in space |
| 2009 | Mathers27 | Prospective Cohort | Critical Care | II | 20 | Acceleration injuries in astronauts |
| 2010 | Minard et al.90 | Review | Equipment | V | ~ | Medical kit optimization for evacuation |
| 2011 | Haidegger et al.91 | Review | Equipment | V | ~ | Telemedicine and surgery in space |
| 2011 | Hurst et al.28 | Prospective Cohort | Critical Care | II | 40 | CPR timing during spaceflight |
| 2011 | Kordi et al.29 | Prospective Cohort | Critical Care | II | 10 | CPR in microgravity |
| 2011 | Rehnberg et al.30 | Prospective Cohort | Critical Care | II | 21 | CPR in microgravity |
| 2011 | McQuillen et al.31 | Prospective Cohort | Equipment | II | 6 | Intravenous fluid generation in space (IVGEN) |
| 2011 | NASA92 | Review | Equipment | V | ~ | Crew health care systems (CHeCS) |
| 2011 | Stewart & Drudi93 | Review | Critical Care | V | ~ | Review of Aerospace Medicine Elective |
| 2012 | Blue et al.32 | Prospective Cohort | Transport | II | 77 | Suborbital G-force tolerance |
| 2012 | Drudi et al.94 | Review | Critical Care | V | ~ | Surgical care in space |
| 2012 | Hinkelbein et al.95 | Review | Critical Care | V | ~ | Anesthesia and emergency medicine |
| 2012 | Law & Vanderploeg96 | Review | Critical Care | V | ~ | Emergency planning guide |
| 2012 | NASA97 | Review | Equipment | V | ~ | Ventilator technologies for injured patients in space |
| 2013 | Komorowski et al.98 | Review | Anesthesia | V | ~ | Anesthesia protocols in space |
| 2013 | Kuypers99 | Review | Critical Care | V | ~ | Medical training |
| 2013 | Russomano et al.33 | Prospective Cohort | Critical Care | II | 30 | CPR in microgravity |
| 2013 | McQuillen100 | Review | Equipment | V | ~ | Fluid constraints for emergency medical systems for spaceflight |
| 2014 | Blue et al.34 | Prospective Cohort | Transport | II | 86 | Suborbital spaceflight tolerance |
| 2014 | Keenan et al.101 | Review | Equipment | V | ~ | Medical kit optimization for evacuation |
| 2014 | Rehnberg et al.35 | Prospective Cohort | Critical Care | II | 23 | CPR in microgravity |
| 2015 | Blue et al.46 | Case Series | Transport | IV | 2 | Suborbital spaceflight and implanted cardiac devices |
| 2015 | Blue et al.48 | Case | Transport | V | 1 | Suborbital spaceflight simulation in cardiac malformation subject |
| 2015 | Braunecker et al.4 | Systematic Review | Critical Care | I | 69 | CPR in microgravity |
| 2015 | Johannigman et al.41 | Retrospective Review | Critical Care | III | 61 | Aeromedical evacuation and hypoxemia |
| 2015 | Keenan et al.42 | Retrospective Observational | Critical Care | III | 6 | An integrated medical model (IMM) to predict in-flight risk |
| 2015 | Kirkpatrick et al.102 | Review | Equipment | V | ~ | Telemonitoring of surgery in weightlessness |
| 2015 | Komorowski & Fleming36 | Prospective Cohort | Anesthesia | II | 5 | Rapid sequence induction intubation during space exploration |
| 2015 | Levin et al.47 | Case Series | Transport | IV | 2 | Suborbital spaceflight and insulin pumps |
| 2016 | Alexander103 | Review | Critical Care | V | ~ | Trauma and surgery in space |
| 2016 | Garbino et al.104 | Review | Critical Care | V | ~ | Space-suited patient considerations |
| 2016 | Komorowski et al.105 | Review | Anesthesia | V | ~ | Anesthesia in space |
| 2016 | Komorowski et al.106 | Review | Anesthesia | V | ~ | Anesthesia in space |
| 2016 | Menon et al.43 | Retrospective Review | Critical Care | III | 22 | Manned stratospheric balloon crew recovery |
| 2016 | NASA107 | Manual | Critical Care | V | ~ | Emergency medical procedures manual |
| 2017 | Halberg et al.108 | Review | Transport | V | ~ | Space ambulance design based on the X-37B |
| 2017 | Hodkinson et al.109 | Review | Critical Care | V | ~ | Space medicine overview |
| 2017 | Kirkpatrick et al.110 | Review | Critical Care | V | ~ | Damage control surgery in weightlessness |
| 2017 | Maddry et al.44 | Retrospective Review | Critical Care | III | 1,086 | Aeromedical evacuation ventilator management and mortality |
| 2017 | Myers et al.45 | Retrospective Observational | Critical Care | III | 24 | An integrated medical model (IMM) to predict in-flight risk |
| 2017 | Reschke et al.37 | Prospective Cohort | Critical Care | II | 32 | Neurovestibular symptoms after landing |
| 2017 | Suresh et al.38 | Prospective Cohort | Transport | II | 148 | Suborbital spaceflight and cardiac dysrhythmias |
| 2017 | Suresh et al.49 | Case Report | Transport | V | 1 | Suborbital spaceflight-induced tachydysrhythmia |
| 2018 | Cheatham111 | Review | Critical Care | V | ~ | ATLS for the injured astronaut |
| 2018 | Hinkelbein et al.112 | Review | Critical Care | V | ~ | Cardiac arrest in space |
| 2018 | Komorowski et al.5 | Systematic Review | Anesthesia | I | ~ | Anesthesia for future space missions |

**Table 1.** Summary of Relevant Articles

Abbreviations: ATLS = Advanced Trauma Life Support; CPR = cardiopulmonary resuscitation; IMM = integrated medical model; LOE = Level of Evidence; NASA = National Aeronautics and Space Administration.