



CADTH Reference List

# Relative Humidity Guidelines for Operating Rooms

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## Key Messages

- We did not identify any relevant evidence-based guidelines about relative humidity levels in operating rooms.
- We identified 7 publications that are not considered to be evidence-based guidelines but do provide relevant guidance and recommendations about relative humidity levels in operating rooms.

## Research Question

What are the evidence-based guidelines regarding relative humidity levels in operating rooms?

## Methods

### Literature Search Methods

An information specialist conducted a literature search on key resources including MEDLINE, Embase, Scopus, the Cochrane Database of Systematic Reviews, the International HTA Database, the websites of Canadian and major international health technology agencies, as well as a focused internet search. The search approach was customized to retrieve a limited set of results, balancing comprehensiveness with relevancy. The search strategy comprised both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. Search concepts were developed based on the elements of the research questions and selection criteria. The main search concepts were operating room and humidity. No filters were applied to limit retrieval by publication type. The search was completed on June 27, 2023, and limited to English-language documents published since January 1, 2018. Internet links were provided, where available.

### Selection Criteria and Summary Methods

One reviewer screened literature search results (titles and abstracts) and selected publications according to the inclusion criteria presented in [Table 1](#). Full texts of study publications were not reviewed. The Overall Summary of Findings was based on information available in the abstracts of selected publications. Open access full-text versions of evidence-based guidelines were reviewed when available, and relevant recommendations were summarized.

**Table 1: Selection Criteria**

Criteria	Description
Population	Individuals receiving care in operating rooms
Intervention	Relative humidity
Comparator	Not applicable
Outcomes	Recommendations regarding relative humidity levels in operating rooms (e.g., acceptable ranges, maximum and minimum levels)
Study designs	Evidence-based guidelines

## Results

No relevant evidence-based guidelines were identified regarding relative humidity levels in operating rooms.

Guidelines and recommendations regarding relative humidity levels in operating rooms that did not meet the inclusion criteria due to unclear methodology are provided in [Appendix 1](#). Additional references of potential interest that did not meet the inclusion criteria are provided in [Appendix 2](#).

## Overall Summary of Findings

No relevant evidence-based guidelines regarding humidity levels in operating rooms were identified; therefore, no summary can be provided.



## References

### Guidelines and Recommendations

No literature identified.

## Appendix 1: Summary of Identified Recommendations and Guidance

The following publications did not meet the methodological criteria to be considered an evidence-based guideline and therefore were not eligible for inclusion in the main body of this report. However, these 7 publications provide relevant guidance or recommendations related to relative humidity levels in operating rooms.

Six publications recommend an acceptable range for relative humidity in operating rooms. Of the reported ranges, the lowest minimum acceptable relative humidity level is 20% and the highest acceptable maximum is 70%. The National Accreditation Board for Hospitals and Healthcare Providers recommends 2 acceptable relative humidity and temperature ranges dependent on the type of operating theatre used. The Centre for Disease Control and Prevention suggests a maximum of 68%. Refer to [Table 2](#) for a detailed summary of the recommended or suggested relative humidity levels in operating rooms.

**Table 2: Summary of Recommendations in Guidelines with Unclear Methodology**

Author, (year)	Suggested relative humidity level in operating rooms
College of Physicians and Surgeons in BC, (2023)	30% to 60%
BC Centre for Disease Control, (2022)	40% to 60%
Bailey et al., (2021)	40% to 70% with a room temperature of at least 21°C
ANSI/ASHRAE/ASHE, (2020)	20% to 60%
Centre for Disease Control and Prevention, (2019)	Maximum of 68%
Aerobotix, (2018) <sup>a</sup>	The Centers of Medicaid and Medicare Services defers to the recommended range of 20% to 60% by the Association of Perioperative Registered Nurses.
National Accreditation Board for Hospitals and Healthcare Providers, (2018)	Type A operating theatre: <sup>b</sup> The relative humidity should be maintained at 20% to 60% at 21°C ± 3°C (except for joint replacement where it should be 18°C ± 2°C). However, the ideal relative humidity level is 55%. Type B operating theatre: <sup>c</sup> 20% to 60% at 21°C ± 3°C

ANSI = American National Standards Institute; ASHE = American Society for Health Care Engineering; ASHRAE = The American Society of Heating, Refrigerating, and Air-conditioning Engineers; BC = British Columbia.

<sup>a</sup>Aerobotix summarized standards, regulations, and guidelines related to hospital OR air quality.

<sup>b</sup>Type A operating theatres are used for neurosciences, orthopedics (joint replacement), and cardiothoracic and transplant surgery (e.g., renal, liver, heart).

<sup>c</sup>Type B operating theatres are used for ophthalmology, daycare surgeries, and all other basic surgical disciplines.

### Guidelines and Recommendations

#### *Unclear Methodology*

Heating, ventilation and air conditioning (HVAC). Vancouver (BC): Non-Hospital Medical and Surgical Facilities Accreditation Program and the College of Physicians and Surgeons of British Columbia; 2023: <https://www.cpsbc.ca/files/pdf/NHMSFAP-AS-HVAC.pdf> Accessed 2023 Jun 29.

Refer to HVAC1.1.4

Options for operating room configuration and use when a patient with suspected or confirmed COVID-19 requires emergent surgery. Victoria (BC): BC Centre for Disease Control, BC Ministry of Health; 2022: <http://www.bccdc.ca/Health-Professionals-Site/>

- [Documents/COVID19\\_ORConfigUseEmergentSurgery.pdf](#) Accessed 2023 Jun 29.  
Refer to “Requirements” under “Key Assumptions & Requirements Used to Develop OR Configuration Options”
- Bailey CR, Radhakrishna S, Asanati K, et al. Ergonomics in the anaesthetic workplace: guideline from the Association of Anaesthetists. *Anaesthesia*. 2021; 76(12):1635-1647. [PubMed](#)  
Refer to Recommendation #5 and the Humidity section
- Addendum a to ANSI/AHSHRAE/ASHE Standard 170-2017. Atlanta (GA): ASHRAE; 2020: [https://www.ashrae.org/file%20library/technical%20resources/standards%20and%20guidelines/standards%20errata/standards/170\\_2017\\_a\\_20200901.pdf](https://www.ashrae.org/file%20library/technical%20resources/standards%20and%20guidelines/standards%20errata/standards/170_2017_a_20200901.pdf). Accessed 2023 Jun 29.  
Refer to Table 7.1 Design Parameters – Inpatient Spaces
- Environmental infection-control measures for special health-care settings. In: Environmental infection control guidelines. Washington (DC): US Department of Health & Human Services Centers for Disease Control and Prevention (CDC); 2019: <https://www.cdc.gov/infectioncontrol/guidelines/environmental/background/air.html#c5> Accessed 2023 Jun 29.  
Refer to c. Operating Rooms
- Summary of standards, regulations and guidelines related to hospital OR air quality. Miamisburg (OH): Aerobiotix; 2018: <https://aerobiotix.com/wp-content/uploads/2018/05/Summary-of-Standards-Regulations-and-Guidelines-related-to-hospital-OR-air-quality.pdf>. Accessed 2023 Jun 29.
- Revised guidelines for air conditioning in operation theatres. New Dehli (IN): National Accreditation Board for Hospitals & Healthcare Providers (NABH); 2018: [https://www.nabh.co/images/pdf/RevisedGuidelines\\_AirConditioning\\_OT2018-final.pdf](https://www.nabh.co/images/pdf/RevisedGuidelines_AirConditioning_OT2018-final.pdf). Accessed 2023 Jun 29.  
Refer to 6. Temperature and Relative Humidity under Requirements – Type A and 6. Temperature and Humidity under Requirements – Type B

## Appendix 2: References of Potential Interest

### Systematic Review

Sadrizadeh S, Aganovic A, Bogdan A, et al. A systematic review of operating room ventilation. *J Build Eng.* 2021; 40:102693. <https://eprints.whiterose.ac.uk/175581/1/1-s2.0-S2352710221005519-main.pdf>. Accessed 2023 Jun 29.

### Nonrandomized Study

Armit D, Vickers M, Parr A, et al. Humidity a potential risk factor for prosthetic joint infection in a tropical Australian hospital. *ANZ J Surg.* 2018; 88(12):1298-1301. [PubMed](#)

### Guidelines and Recommendations

#### *Guidelines for Humidity Control Events (Above or Below the Established Facility Relative Humidity Range)*

Humidity control events in perioperative care areas. Atlanta (GA): ASHRAE; 2019: [https://www.ashrae.org/file%20library/technical%20resources/bookstore/whitepaper\\_tc0906-humidcontroleventsinperiopcareareas.pdf](https://www.ashrae.org/file%20library/technical%20resources/bookstore/whitepaper_tc0906-humidcontroleventsinperiopcareareas.pdf) Accessed 2023 Jun 29.

### Review

Joseph A, Bayramzadeh S, Zamani Z, Rostenberg B. Safety, performance, and satisfaction outcomes in the operating room: a literature review. *HERD.* 2018; 11(2):137-150. [PubMed](#)

### Additional References

#### *Newsletter*

Humidity levels in ORs. *ASPF Newsl.* 2019; 34, No. 1. <https://www.apsf.org/article/humidity-levels-in-ors/>. Accessed 2023 Jun 29.

#### *Article*

Curless MS, Bow L, Lentz T, Trexler P, Maragakis LL. Management and mitigation of temperature and humidity events in the perioperative setting. *AORN J.* 2021; 114(6):563-571. [PubMed](#)