Findings from recent research into air purifiers for reducing the incidence of Acute Respiratory Infections(ARIs) in Australian Residential Aged Care Facilities(RACFs)

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Acknowledgement of country

I would like to begin by acknowledging the traditional owners and custodians of the land on which we meet today, the Wurundjeri Woi Wurrung people of the Kulin Nation and pay my respects to their Elders both past and present. I extend that respect to other Aboriginal and Torres Strait Islanders who are present here today

Disclosure of Interest Statement

- Research was supported by Strategic Engagement Scheme (SES) scholarship from the Australian Government's Department of Education, Skills and Employment Research Training Program (RTP) with the University of Newcastle, Australia.
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Study Significance: The effectiveness of in-room air purification for reducing ARIs in RACFs was unknown.

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Research paper

Air purifiers for reducing the incidence of acute respiratory infections in australian residential aged care facilities: A study protocol for a randomised control trial

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Research Question

In residents of aged care facilities, what is the impact of air purification in the residents' room compared to no air purification on the incidence of acute respiratory tract infection (ARI)?

Methodology

Research Design

Multicenter double-blind 2-period

2-treatment crossover RCT

Settings

3 RACFs

Regional NSW, Australia

Participants

Permanent residents of enrolled RACFs

Outcomes

Primary: Number of ARIs

Secondary: Time to infection

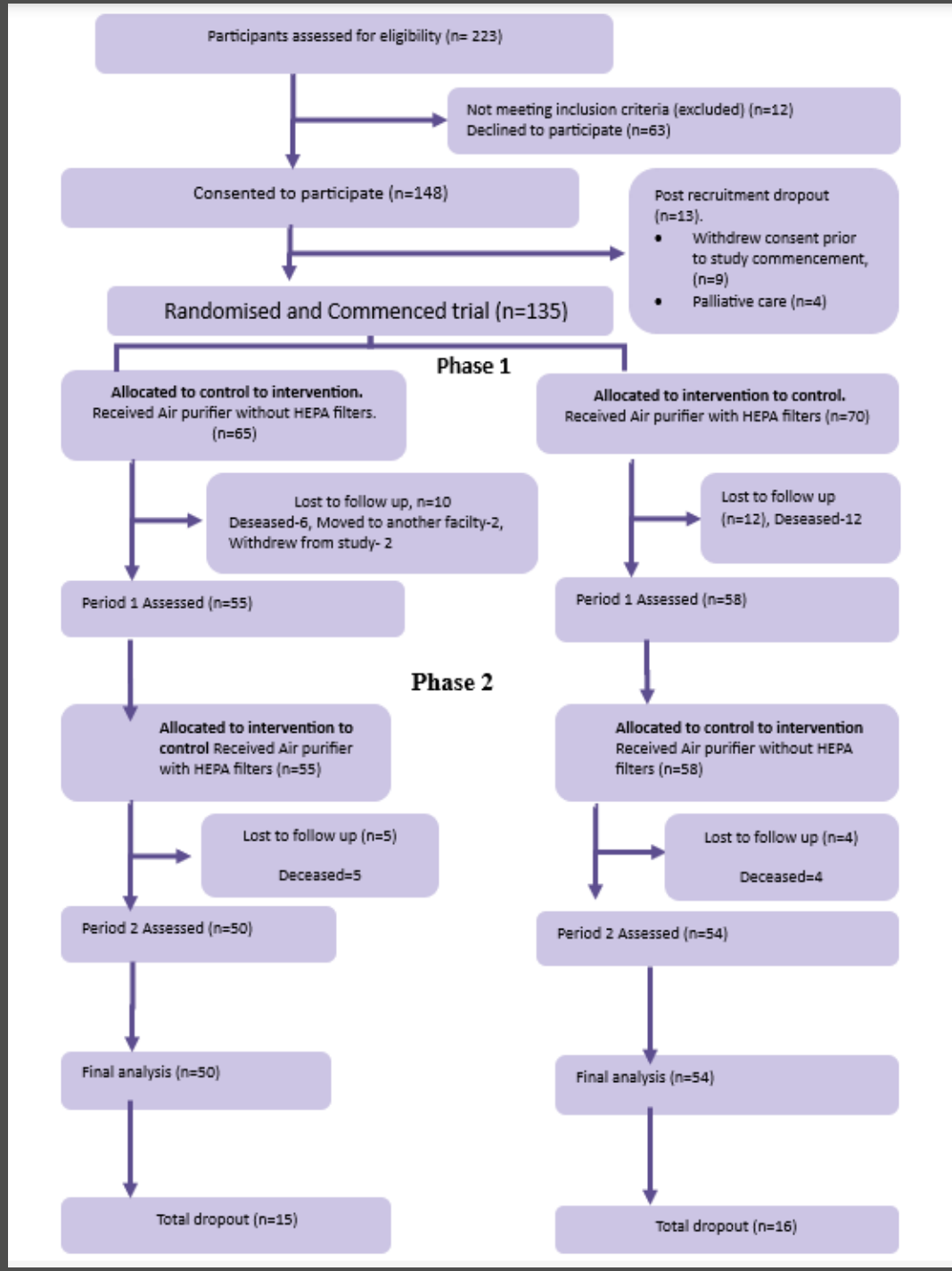
Treatment

Control - Air purifiers without HEPA filters

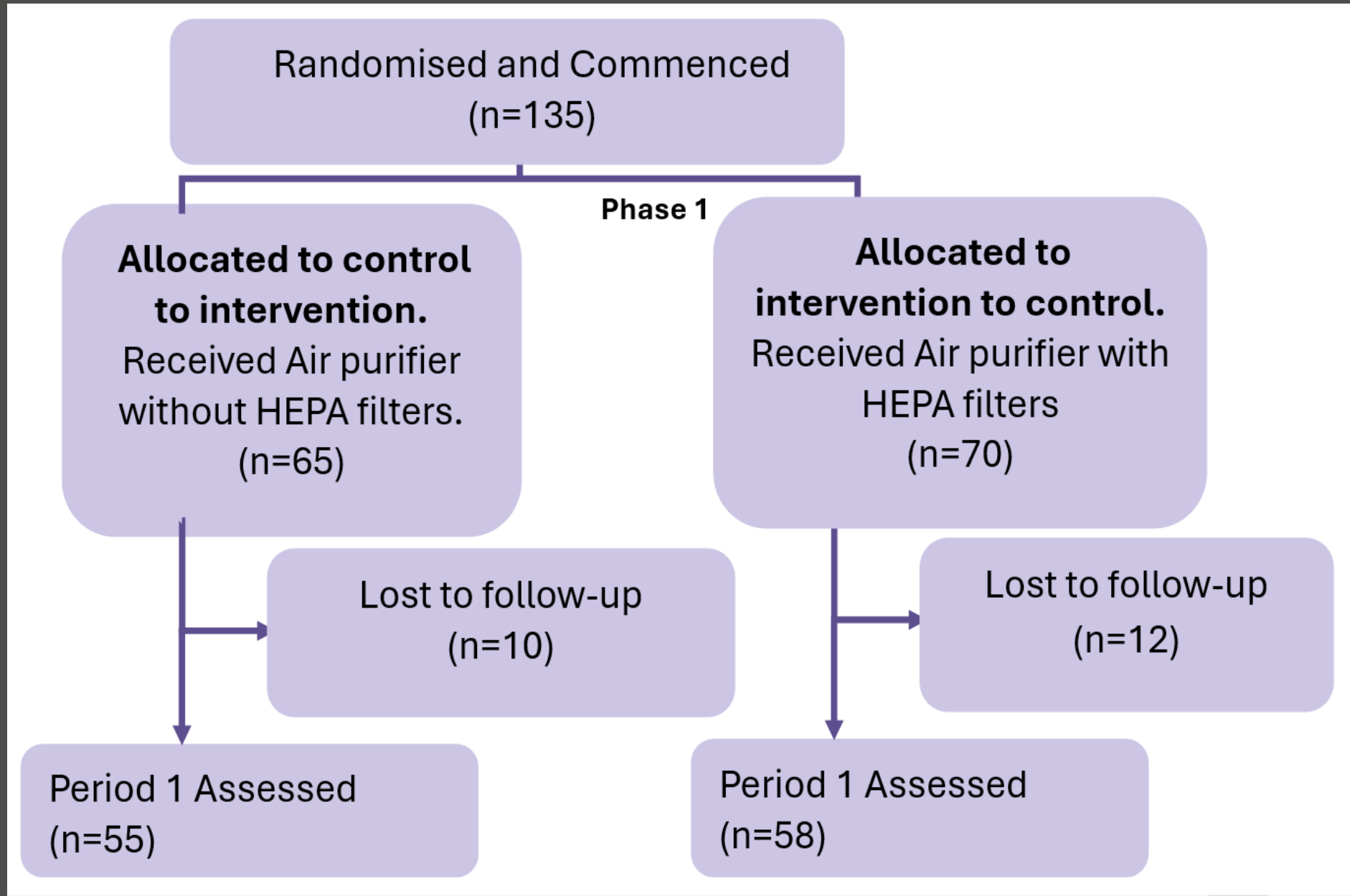
Intervention - Air purifiers with HEPA filters

3-month crossover (with 1 week washout period).

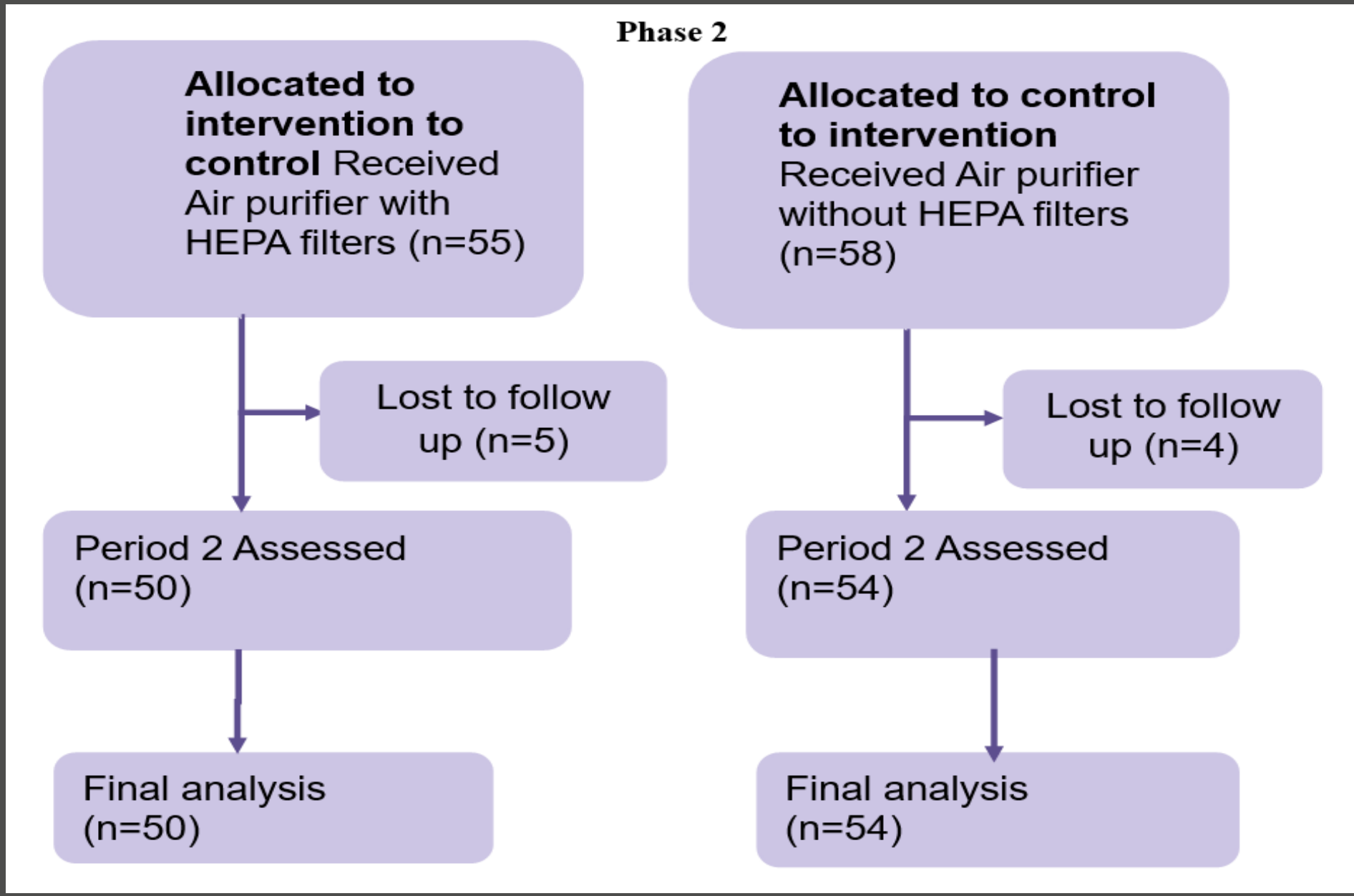
RCT - CONSORT Flow diagram



Participant Flow Phase 1

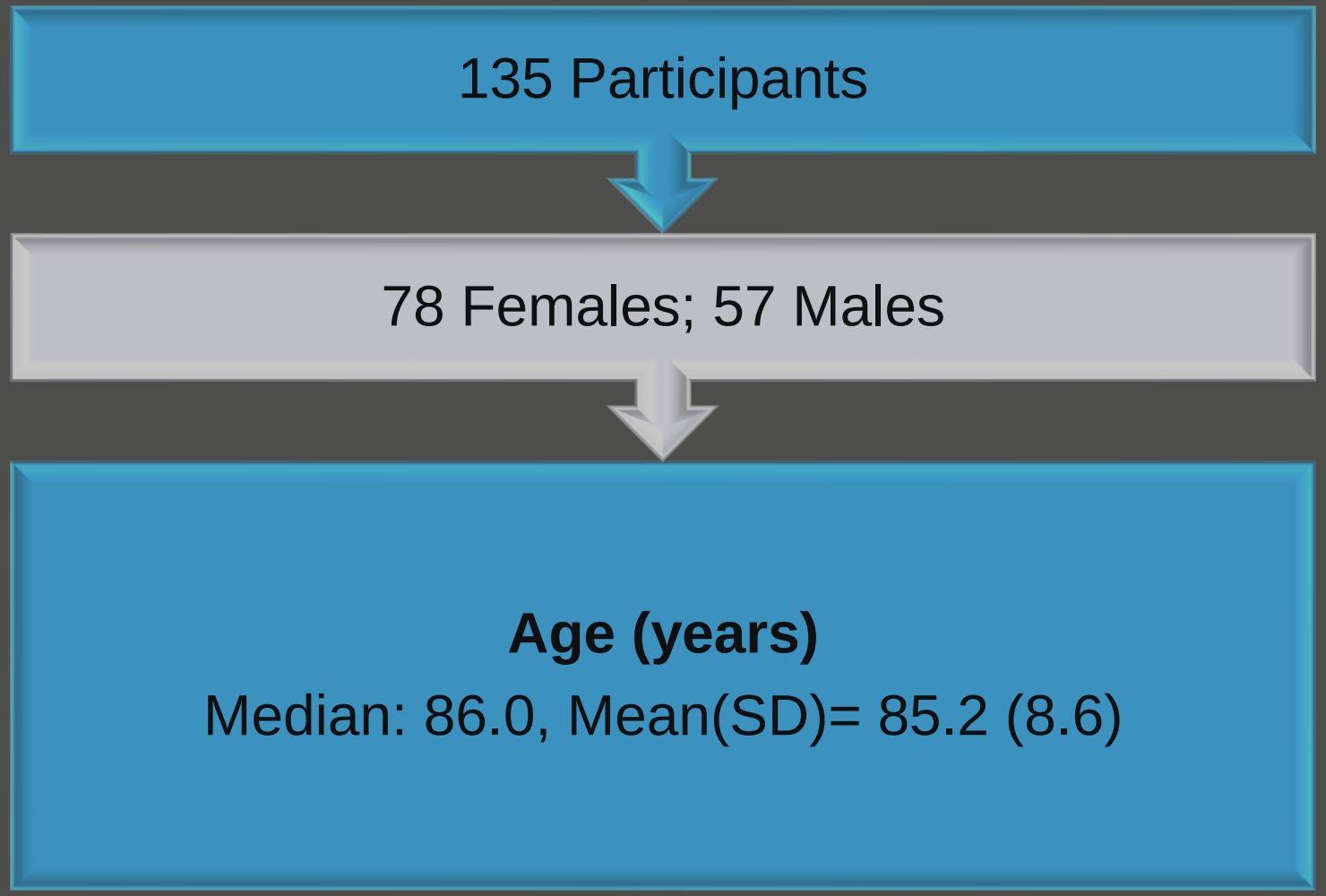


Participant Flow Phase 2



Results

Baseline Characteristics



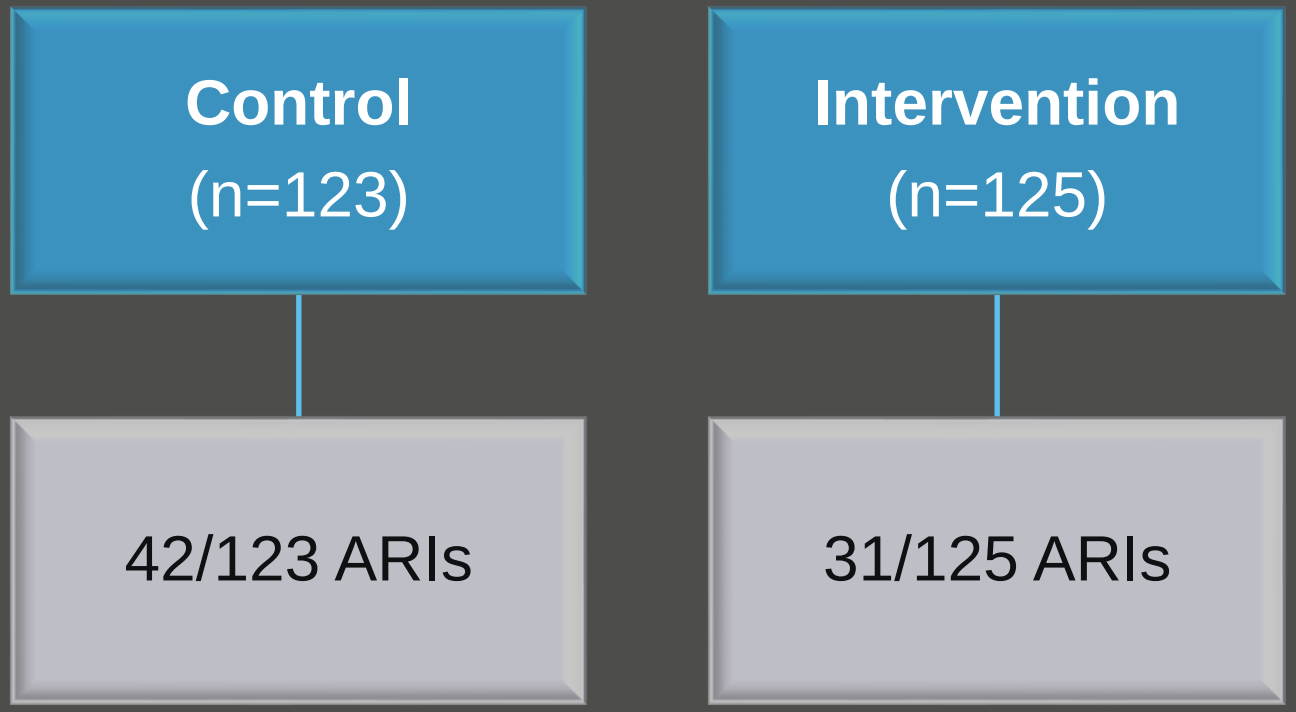
Results

Primary outcome - Incidence of ARIs (All participants, N=135)

- Total number of ARIs: 73
- Unknown causative agents: 37
- SARS CoV-2:19; RSV:16; Rhinovirus:1
- 1st Phase: 5 participants with multiple ARIs
- 2nd phase: 9 participants with multiple ARIs

Results

Primary outcome- The incidence of ARIs [All participants]



Statistically non-significant group difference in ARI incidence

(OR, 0.57; 95% CI, 0.32-1.04; *P=0.07*)

Results

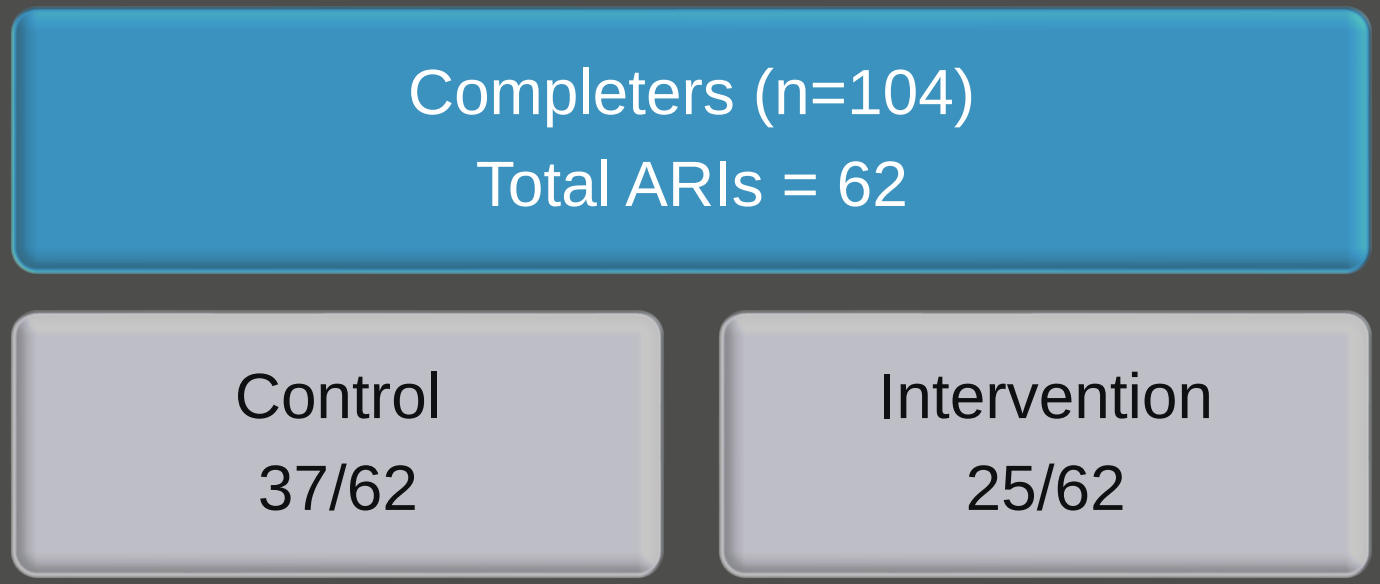
Primary outcome - The incidence of ARIs [Per phase]

Intervention (n=125) and Control (n=123)

Phase 1 Intervention (n=70) 21/70 ARIs	Phase 1 Control (n=65) 29/65 ARIs
Phase 2 Intervention (n=55) 10/55 ARIs	Phase 2 Control (n=58) 13/ 58 ARIs

Results

Subgroup analysis - Participants completed the entire study (n=104)



Statistically significant reduction in the intervention group
(OR = 0.53; 95% CI 0.28-1.00; p = 0.48)

Secondary outcome: Time to first infection

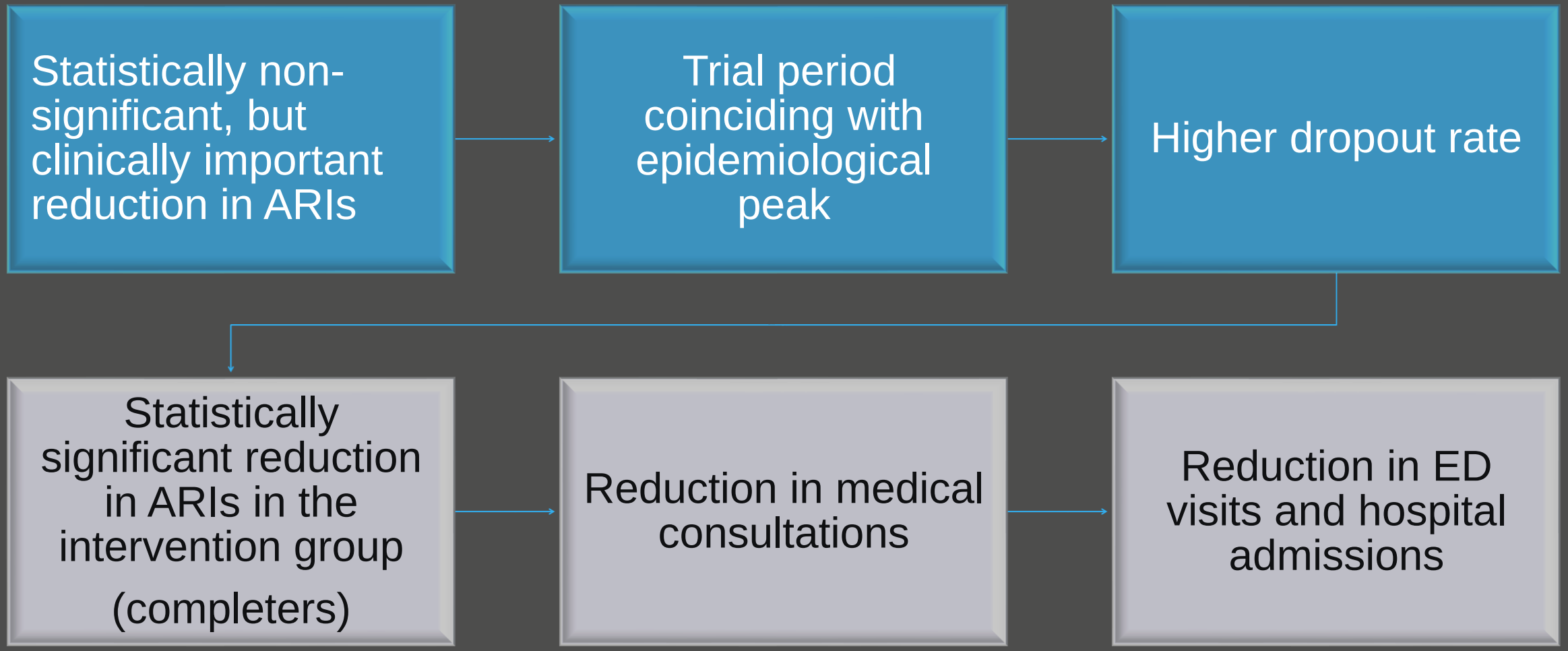
Characteristic	Restricted mean (days)	
	Mean (90days)	**SE**
Overall		
Control	74.20	2.27
Intervention	78.14	2.13
Phase 1		
Control	72.87	2.63
Intervention	78.78	2.37
Phase 2		
Control	75.85	3.75
Intervention	77.27	3.77

Note: SE= Standard Error

Statistically non-significant reduction in time to the first ARI among groups (HR=0.67; 95%CI, 0.42-1.07; *P=.09*)

Results: Other outcomes related to ARI

Discussion


Statistically non-significant, but clinically important reduction in ARIs
Trial period coinciding with epidemiological peak
Higher dropout rate
Statistically significant reduction in ARIs in the intervention group
(completers)
Reduction in medical consultations
Reduction in ED visits and hospital admissions

Strengths and limitations

Strengths

- 1st and double-blinded RCT used air purification in RACFs
- Cross-over trial
- Pragmatic approach

Limitations

- Dropout rate
- Study limited to in-room air purification
- Study time coinciding with epidemiological peak of ARIs

Air purifier acceptability survey

Purpose

- To assess the acceptability of air purifiers in residential aged care facilities

Survey design

- Cross-sectional
- Theoretical Framework of Acceptability (TFA) Questionnaire (Sekhon et al., 2022)

Participants

- Residents(participants of RCT) (n=38)
- Employees involved in direct care of participants of RCT(n=48) (RN, EN, and HCW)

Sekhon, M., Cartwright, M., & Francis, J. J. (2022). Development of a theory-informed questionnaire to assess the acceptability of healthcare interventions. *BMC health services research*, *22*(1), 279

Survey Results: Baseline characteristics

Residents (n=38)

Males:16(42.1%)
Females: 22 (57.9%)

Age[Mean (SD)]
88.7(6.4) years

Employees (n=48)

Males: 6 (12.5%)
Females: 42 (87.5%)

Age[Mean: (SD)]
43.5(12.2) years

Occupation
RN=30 (62.5%)
EN=5 (10.4%)
Carer=13 (27.1%)

Air purifier Acceptance - Residents

n(%)= 37(97.4**)**

Median=5,
mean (SD)= 4.6 (0.75)

Air purifier Acceptance - Employees

n(%)= 44(91.7)

Median=4,
mean (SD)= 4.2 (0.76)

Participant feedback on air purifier experience

Positive attitude

“I totally like it. The lights are good to indicate the purity of air”

(Resident no.29)

Confidence

“It made me feel safer when entering the room first thing in the morning knowing that the air had been purified overnight”

(Employee no. 8)

Conclusion

Air purifier RCT results reveal statistically non-significant but clinically important findings.

Air purifier acceptability survey, TFA analysis, identifies acceptance by participants, with the participants of RCT expressing more acceptability.

Air Purifier RCT in RACFs - Published

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Air Purifiers and Acute Respiratory Infections in Residential Aged Care
A Randomized Clinical Trial

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Abstract

IMPORTANCE The effectiveness of in-room air purification for the reduction of acute respiratory infections (ARIs) in residential aged-care facilities (RACFs) is unknown.

OBJECTIVE To investigate the effectiveness of in-room air purifiers with high-efficiency particulate air (HEPA)–14 filters in reducing the incidence of ARIs among residents of RACFs.

DESIGN, SETTING, AND PARTICIPANTS This randomized clinical trial used a multicenter, double-blind, 2-period, 2-treatment crossover design for 6 months from April 7 to October 26, 2023, in 3 RACFs with a bed capacity of 50 to 100 in New South Wales, Australia. The purposive sampling approach included permanent residents in private rooms in the enrolled RACFs. Data collection was performed every 2 weeks and required no additional follow-up beyond the final data collection on October 31, 2023.

INTERVENTION An air purifier containing a HEPA-14 filter was placed in rooms of participants in the intervention group, and an air purifier without a HEPA-14 filter was placed in rooms of the control participants. The groups crossed over after 3 months.

MAIN OUTCOMES AND MEASURES The primary outcome was the incidence of ARIs, assessed with logistic mixed-model regression.

RESULTS Among 135 participants randomized (70 to the intervention-first group and 65 to the control-first group), 78 (57.8%) were female; mean (SD) age was 85.2 (8.6) years. In the intention-to-treat analysis, the use of air purifiers with HEPA-14 filters did not reduce ARIs compared with the control (OR, 0.57; 95% CI, 0.32-1.04; $P = .07$). Among the 104 participants who completed the entire study, the intervention reduced ARI incidence from 35.6% (37 participants) in the control group to 24.0% (25 participants) in the intervention group (OR, 0.53; 95% CI, 0.28-1.00; $P = .048$).

Key Points

Question In residential aged-care facilities (RACFs), what is the effect of air purification compared with no air purification in the residents' rooms on the incidence of acute respiratory infections?

Findings In this randomized clinical trial using a crossover design and including 135 RACF residents, there was no significant difference in the incidence of acute respiratory infections with (25%) vs without (34%) use of air purifiers with high-efficiency particulate air (HEPA)–14 filters.

Meaning The findings suggest that air purifiers with HEPA-14 filters placed in residents' rooms do not reduce the incidence of acute respiratory infections among RACF residents.

+ Supplemental content

Author affiliations and article information are listed at the end of this article.