



Supporting Information

Supplementary methods and results

**This appendix was part of the submitted manuscript and has been peer reviewed.
It is posted as supplied by the authors.**

Appendix to: Freeman CR, Scott IA, Hemming K, et al. Reducing Medical Admissions and Presentations Into Hospital through Optimising Medicines (REMAIN HOME): a stepped wedge, cluster randomised controlled trial. *Med J Aust* 2021; doi: 10.5694/mja2.50942.

Table 1. Patient recruitment into the stepped wedge design*

| General practice | Month 1 | Month 2 | Month 3 | Month 4 | Month 5 | Month 6 | Month 7 | Month 8 | Month 9 |
|------------------|------------------------------|------------------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|------------------------------|-----------------------------|-----------------------------|
| 1 | Eligible: 2 Consented: 2 | Eligible: 3 Consented: 2 | Eligible: 2 Consented: 1 | Eligible: 1 Consented: 1 | Eligible: 1 Consented: 0 | Eligible: 2 Consented: 1 | Eligible: 3 Consented: 2 | Eligible: 2 Consented: 1 | Eligible: 3 Consented: 2 |
| 2 | Eligible: 1 Consented: 0 | Eligible: 2 Consented: 0 | Eligible: 1 Consented: 1 | Eligible: 0 Consented: 0 | Eligible: 4 Consented: 4 | Eligible: 0 Consented: 0 | Eligible: 1 Consented: 1 | Eligible: 2 Consented: 2 | Eligible: 2 Consented: 2 |
| 3 | Eligible: 3 Consented: 2 | Eligible: 1 Consented: 1 | Eligible: 6 Consented: 4 | Eligible: 1 Consented: 0 | Eligible: 5 Consented: 5 | Eligible: 3 Consented: 3 | Eligible: 3 Consented: 2 | Eligible: 1 Consented: 1 | Eligible: 3 Consented: 1 |
| 4 | Eligible: 2 Consented: 1 | Eligible: 4 Consented: 3 | Eligible: 3 Consented: 3 | Eligible: 3 Consented: 1 | Eligible: 4 Consented: 4 | Eligible: 8 Consented: 6 | Eligible: 1 Consented: 0 | Eligible: 5 Consented: 4 | Eligible: 5 Consented: 5 |
| 5 | Eligible: 5 Consented: 3 | Eligible: 2 Consented: 2 | Eligible: 3 Consented: 1 | Eligible: 3 Consented: 2 | Eligible: 3 Consented: 3 | Eligible: 2 Consented: 2 | Eligible: 2 Consented: 2 | Eligible: 3 Consented: 1 | Eligible: 5 Consented: 1 |
| 6 | Eligible: 6 Consented: 3 | Eligible: 3 Consented: 3 | Eligible: 7 Consented: 6 | Eligible: 4 Consented: 4 | Eligible: 4 Consented: 3 | Eligible: 1 Consented: 1 | Eligible: 6 Consented: 5 | Eligible: 3 Consented: 2 | Eligible: 3 Consented: 2 |
| 7 | Eligible: 10 Consented: 9 | Eligible: 6 Consented: 4 | Eligible: 2 Consented: 2 | Eligible: 7 Consented: 6 | Eligible: 5 Consented: 4 | Eligible: 5 Consented: 3 | Eligible: 4 Consented: 3 | Eligible: 6 Consented: 5 | Eligible: 6 Consented: 5 |
| 8 | Eligible: 7 Consented: 5 | Eligible: 11 Consented: 7 | Eligible: 10 Consented: 8 | Eligible: 16 Consented: 15 | Eligible: 11 Consented: 9 | Eligible: 6 Consented: 5 | Eligible: 5 Consented: 4 | Eligible: 5 Consented: 4 | Eligible: 4 Consented: 3 |
| 9 | Eligible: 6 Consented: 6 | Eligible: 6 Consented: 5 | Eligible: 6 Consented: 5 | Eligible: 4 Consented: 4 | Eligible: 2 Consented: 1 | Eligible: 6 Consented: 5 | Eligible: 2 Consented: 2 | Eligible: 4 Consented: 3 | Eligible: 5 Consented: 4 |
| 10 | Eligible: 3 Consented: 0 | Eligible: 4 Consented: 3 | Eligible: 4 Consented: 4 | Eligible: 1 Consented: 1 | Eligible: 5 Consented: 4 | Eligible: 4 Consented: 2 | Eligible: 2 Consented: 1 | Eligible: 1 Consented: 1 | Eligible: 2 Consented: 2 |
| 11 | Eligible: 10 Consented: 7 | Eligible: 7 Consented: 6 | Eligible: 4 Consented: 4 | Eligible: 10 Consented: 7 | Eligible: 8 Consented: 5 | Eligible: 13 Consented: 10 | Eligible: 10 Consented: 8 | Eligible: 6 Consented: 4 | Eligible: 8 Consented: 2 |
| 12 | Eligible: 4 Consented: 1 | Eligible: 0 Consented: 0 | Eligible: 5 Consented: 3 | Eligible: 3 Consented: 1 | Eligible: 1 Consented: 1 | Eligible: 1 Consented: 0 | Eligible: 2 Consented: 2 | Eligible: 1 Consented: 0 | Eligible: 1 Consented: 1 |
| 13 | Eligible: 2 Consented: 2 | Eligible: 1 Consented: 1 | Eligible: 1 Consented: 1 | Eligible: 5 Consented: 3 | Eligible: 1 Consented: 0 | Eligible: 2 Consented: 0 | Eligible: 1 Consented: 1 | Eligible: 1 Consented: 1 | Eligible: 3 Consented: 2 |
| 14 | Eligible: 1 Consented: 1 | Eligible: 0 Consented: 0 | Eligible: 2 Consented: 2 | Eligible: 3 Consented: 2 | Eligible: 1 Consented: 0 | Eligible: 3 Consented: 2 | Eligible: 1 Consented: 1 | Eligible: 1 Consented: 1 | Eligible: 3 Consented: 3 |

* Blue, white and orange cells represent months that the general practice was in the control phase, lead-in phase and intervention phase, respectively.

Table 2. General practice characteristics

| General practice | Dominant billing type | Full-time equivalent GPs | GP registrars | Active patients* | Standardised whole patient equivalents | Practice nurses | Medical specialist and allied health professionals | Pharmacies within 5 km | IRSAD percentile† |
|------------------|-----------------------|--------------------------|---------------|------------------|--|-----------------|--|------------------------|-------------------|
| 1 | Mixed billing | 12 | 6 | 8452 | 5587 | 5 | 9 | 12 | 95 |
| 2 | Private billing | 5.2 | 1 | 15 593 | 4773 | 4 | 2 | 4 | 59 |
| 3 | Private billing | 7 | 0 | 11 297 | 5073 | 6 | 14 | 8 | 61 |
| 4 | Mixed billing | 10 | 4 | 9893 | 6752 | 5 | 2 | 4 | 80 |
| 5 | Bulk billing | 7 | 0 | 9400 | 5431 | 4 | 9 | 8 | 15 |
| 6 | Bulk billing | 8 | 2 | 3500 | 2405 | 4 | 8 | 8 | 4 |
| 7 | Bulk billing | 9 | 2 | 8693 | 5290 | 3 | 5 | 6 | 75 |
| 8 | Mixed billing | 16 | 2 | 100 868 | 14 512 | 5 | 1 | 18 | 68 |
| 9 | Mixed billing | 8 | 2 | 10 902 | 7506 | 4 | 6 | 6 | 74 |
| 10 | Bulk billing | 10 | 6 | 18 762 | 4588 | 4 | 12 | 4 | 33 |
| 11 | Mixed billing | 9 | 3 | 11 103 | 8182 | 4 | 7 | 14 | 71 |
| 12 | Bulk billing | 8 | 0 | 26 512 | 9248 | 5 | 3 | 10 | 4 |
| 13 | Bulk billing | 2.3 | 1 | NA | 2000 | 1 | 1 | 2 | 80 |
| 14 | Mixed billing | 6 | 1 | 6134 | 4586 | 2 | 0 | 4 | 75 |

IRSAD = Index of Relative Socio-Economic Advantage and Disadvantage (<https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2033.0.55.001~2016~Main%20Features~IRSAD~20>).

* At least three visits during the preceding two years.

† Higher percentiles indicate more advantage and less disadvantage in general.

NA = not available.

Table 3. Practice pharmacist characteristics (n = 11*)

| Characteristic | |
|---|-------------|
| Sex (women) | 10 (91%) |
| Years with registrable pharmacy degree, mean (SD) | 25.6 (11.1) |
| Postgraduate qualifications | 9 (82%) |
| Previous field of employment | |
| Independent consultant | 9 (82%) |
| Community | 6 (55%) |
| Academia | 2 (18%) |
| Hospital | 1 (9%) |
| Accreditation with the Australian Association of Consultant Pharmacy (AACP) | 11 (100%) |
| Years accredited with AACP, mean (SD) | 10.5 (4.4) |

SD = standard deviation.

* Two pharmacists did not complete the questionnaire; one pharmacist worked in two practices.

Table 4. Analysis of major outcome (12-month hospital re-admissions), by software package and analysis type

| Software/random effect analysis | Incidence rate ratio (95% CI) |
|--------------------------------------|--------------------------------------|
| Stata 14.1 | |
| Random effects | |
| Random cluster and cluster by period | DNC |
| Random cluster | 0.74 (0.50–1.08) [<i>P</i> = 0.12] |
| No random effects | 0.69 (0.49–0.96) [<i>P</i> = 0.030] |
| SAS 9.4 | |
| Random cluster and cluster by period | DNC |
| Random cluster | DNC |
| No random effects | 0.69 (0.49–0.97) [<i>P</i> = 0.034] |

DNC = did not converge or fitted model was unstable

Stata commands used are: *mepoisson* for IRR with random effects and *poisson* for IRR without random effects; in SAS, a Poisson distribution was specified for IRRs. All models were adjusted for time period.

Table 5. Analysis of major outcome (12-month hospital re-admissions), by random effects model

| Model/random effect | Incidence rate ratio (95% CI) |
|---------------------------------------|-------------------------------|
| Poisson | |
| Cluster and cluster by time | DNC |
| Cluster | 0.74 (0.50–1.08) |
| None | 0.69 (0.49–0.96) |
| Negative binomial | |
| Cluster and cluster by time | DNC |
| Cluster | DNC |
| None | 0.65 (0.33–1.26) |
| Poisson with zero inflation | |
| None | 0.66 (0.45–0.96) |
| Negative binomial with zero inflation | |
| None | 0.61 (0.32–1.17) |

CI = confidence interval; DNC = Did not converge or fitted model was unstable..

Table 6. Model convergence and random effect components for all outcomes and time points, by software package

| Outcome | | Time-adjusted | | | | Fully adjusted* | | | |
|------------------|-------|----------------------|---------------|-------------|-----------------|----------------------|---------------|--------------|-----------------|
| | | Apparent convergence | Random effect | | Stable model | Apparent convergence | Random effect | | Stable model |
| | | | Coefficient | 95% CI | | | Coefficient | 95% CI | |
| 30 days | | | | | | | | | |
| Re-admission | Stata | Yes | 0.000 | — | No ¹ | Yes | 0.000 | — | No ¹ |
| | SAS | Yes | 0.000 | — | No ² | Yes | 0.000 | — | No ² |
| ED presentation | Stata | Yes | 0.000 | — | No ¹ | Yes | 0.000 | — | No ¹ |
| | SAS | No | — | — | — | No | — | — | — |
| Composite | Stata | Yes | 0.000 | — | No ¹ | Yes | 0.000 | — | No ¹ |
| | SAS | Yes | 0.000 | — | No ² | Yes | 0.000 | — | No ² |
| 90 days | | | | | | | | | |
| Re-admission | Stata | Yes | 0.033 | 0.001–0.807 | Yes | Yes | 0.000 | — | No ¹ |
| | SAS | Yes | 0.001 | 0.001–0.001 | No ² | No | — | — | — |
| ED presentation | Stata | Yes | 0.000 | — | No ¹ | Yes | 0.000 | — | No ¹ |
| | SAS | No | — | — | — | No | — | — | — |
| Composite | Stata | Yes | 0.061 | 0.007–0.538 | Yes | Yes | 0.012 | 0.0005–0.729 | No |
| | SAS | Yes | 0.002 | 0.002–0.002 | No ² | Yes | 0.001 | 0.001–0.001 | No ² |
| 180 days | | | | | | | | | |
| Re-admission | Stata | Yes | 0.015 | 0.000–1.191 | Yes | Yes | 0.000 | — | No ¹ |
| | SAS | No | — | — | — | Yes | 0.000 | — | No ¹ |
| ED presentation | Stata | Yes | 0.000 | — | No ¹ | Yes | 0.000 | — | No ¹ |
| | SAS | No | — | — | — | Yes | 0.000 | — | No ¹ |
| Composite | Stata | Yes | 0.022 | 0.001–0.399 | Yes | Yes | 0.000 | — | No ¹ |
| | SAS | Yes | 0.000 | 0.000–0.000 | No ² | Yes | 0.000 | — | No ¹ |
| 12 months | | | | | | | | | |
| Re-admission | Stata | Yes | 0.038 | 0.007–0.198 | Yes | Yes | 0.064 | 0.014–0.282 | Yes |
| | SAS | Yes | 0.000 | — | No ¹ | No | — | — | — |
| ED presentation | Stata | Yes | 0.120 | 0.015–0.946 | Yes | Yes | 0.171 | 0.026–1.101 | Yes |
| | SAS | Yes | 0.001 | 0.001–0.001 | No ² | Yes | 0.000 | — | No ¹ |
| Composite | Stata | Yes | 0.066 | 0.020–0.218 | Yes | Yes | 0.080 | 0.025–0.262 | Yes |
| | SAS | No | — | — | — | No | — | — | — |

CI = confidence interval; ED = emergency department.

All models have included cluster as a random effect.

* Adjusted model contains adjustment for: age, sex, days to general practitioner visit, length of stay, planned or unplanned, number of medications, and number of comorbid conditions.

¹ Deemed unstable as confidence interval for random effect not reported.

² Deemed unstable as confidence interval is the same as the point estimate.

Table 7. Per protocol evaluation of primary and secondary outcomes, by study group and time period

| Exposure and outcomes | No. of events (incidence rate) | | Incidence ratio ratio (95% CI) | |
|--|--------------------------------|--------------|--------------------------------|------------------|
| | Control | Intervention | Time-adjusted | Fully adjusted* |
| 30 days | | | | |
| Exposure time (person-months) | 176.1 | 101.0 | | |
| Hospital re-admissions | 59 (0.33) | 14 (0.14) | 0.35 (0.14–0.86) | 0.38 (0.15–0.98) |
| Non-admitted ED presentations | 15 (0.09) | 4 (0.04) | 0.60 (0.06–5.63) | 0.52 (0.03–8.26) |
| Hospital re-admission or ED presentation | 74 (0.42) | 18 (0.16) | 0.38 (0.17–0.86) | 0.41 (0.17–0.98) |
| 90 days | | | | |
| Exposure time (person-years) | 43.0 | 24.7 | | |
| Hospital re-admissions | 105 (2.4) | 31 (1.26) | 0.55 (0.30–1.00) | 0.59 (0.32–1.11) |
| Non-admitted ED presentations | 27 (0.63) | 11 (0.45) | 0.49 (0.18–1.32) | 0.59 (0.20–1.74) |
| Hospital re-admission or ED presentation | 132 (3.07) | 42 (1.70) | 0.53 (0.31–0.89) | 0.60 (0.35–1.03) |
| 180 days | | | | |
| Exposure time (person-years) | 85.4 | 48.9 | | |
| Hospital re-admissions | 156 (1.83) | 57 (1.17) | 0.71 (0.44–1.15) | 0.75 (0.46–1.22) |
| Non-admitted ED presentations | 52 (0.56) | 16 (0.33) | 0.29 (0.12–0.69) | 0.31 (0.12–0.80) |
| Hospital re-admission or ED presentation | 208 (2.44) | 73 (1.49) | 0.57 (0.38–0.87) | 0.62 (0.41–0.96) |
| 12 months | | | | |
| Exposure time (person-years) | 170.6 | 97.9 | | |
| Hospital re-admissions | 282 (1.65) | 109 (1.11) | 0.70 (0.49–1.00) | 0.71 (0.50–1.01) |
| Non-admitted ED presentations | 88 (0.52) | 37 (0.38) | 0.40 (0.22–0.74) | 0.45 (0.23–0.87) |
| Hospital re-admission or ED presentation | 370 (2.17) | 146 (1.49) | 0.61 (0.45–0.83) | 0.64 (0.47–0.87) |

CI = confidence interval; ED = emergency department.

All models were adjusted for time period.

* Adjusted for age, sex, days to GP visit, length of stay, planned or unplanned admission, number of medications, and number of comorbid conditions.