



## **Supporting Information**

### **Supplementary results**

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

Appendix to: Cini C, Neto AS, Burrell A, Udy A. Inter-hospital transfer and clinical outcomes for people with COVID-19 admitted to intensive care units in Australia: an observational cohort study. *Med J Aust* 2023; doi: 10.5694/mja2.51917.

**Table 1. Missing data: summary**

Characteristic	Total	Transferred	Not transferred
<b>Total number of people</b>	<b>5207</b>	<b>328</b>	<b>4879</b>
Age	0	0	0
Gender	4 (0.1%)	0	4 (0.1%)
APACHE II score	946 (18.2%)	34 (10%)	912 (18.7%)
Symptoms to hospital admission	1010 (19.4%)	31 (9.5%)	979 (20.1%)
Symptoms to ICU admission	1018 (19.6%)	35 (11%)	983 (20.1%)
Time between hospital and ICU admission	26 (0.5%)	6 (1.8%)	20 (0.4%)
Time between consecutive admissions (in the same ICU)	87 (1.7%)	7 (2%)	80 (1.6%)
ICU admission to intubation	3111 (59.7%)	20 (6.1%)	3091 (63.4%)
Body mass index	1404 (27.0%)	42 (12.8%)	1362 (27.9%)
Health care worker*	3947 (75.8%)	223 (68.0%)	3724 (76.3%)
Pregnant	3524 (67.7%)	238 (72.6%)	3286 (72.2%)
<b>COVID-19 vaccination history</b>	<b>550 (10.6%)</b>	<b>26 (7.9%)</b>	<b>524 (10.7%)</b>
<b>Number of doses</b>			
One	3195 (61.4%)	260 (79.3%)	2935 (60.2%)
Two	3195 (61.4%)	260 (79.3%)	2935 (60.2%)
Three	3195 (61.4%)	260 (79.3%)	2935 (60.2%)
Four	3195 (61.4%)	260 (79.3%)	2935 (60.2%)
<b>Time from the most recent dose</b>			
Less than 7 days	1770 (40%)	266 (81.1%)	3171 (65%)
7-14 days	1770 (40%)	266 (81.1%)	3171 (65%)
More than 14 days	1770 (40%)	266 (81.1%)	3171 (65%)
<b>Vaccine type</b>			
Pfizer/BioNTech	3338 (64.1%)	260 (79.3%)	3078 (63.1%)
Oxford/AstraZeneca	3338 (64.1%)	260 (79.3%)	3078 (63.1%)
Novavax	3338 (64.1%)	260 (79.3%)	3078 (63.1%)
Moderna	3338 (64.1%)	260 (79.3%)	3078 (63.1%)
Other	3338 (64.1%)	260 (79.3%)	3078 (63.1%)
<b>Number of co-existing diseases</b>			
0			
1	0	0	0
2	0	0	0
≥ 3	0	0	0
<b>Co-existing disorders</b>			
Diabetes	637 (12.2%)	32 (9.8%)	605 (12.4%)
Obesity	727 (14.0%)	35 (11%)	692 (14.2%)
Use of ACEi or ARB	687 (13.2%)	36 (11%)	651 (13.3%)
Chronic cardiac failure	652 (12.5%)	34 (10%)	618 (12.7%)
Smoker*	791 (15.2%)	45 (14%)	746 (15.3%)
Chronic pulmonary disease	662 (12.7%)	34 (10%)	628 (12.9%)
Asthma	670 (12.9%)	34 (10%)	636 (13.0%)
Immunosuppression	701 (13.5%)	34 (10%)	667 (13.7%)
Chronic kidney disease	666 (12.8%)	35 (11%)	631 (12.9%)
Chronic haematological disease	659 (12.7%)	34 (10%)	625 (12.8%)
Cancer	666 (12.8%)	34 (10%)	632 (13.0%)
<b>Drugs</b>			
Steroids	825 (15.8%)	33 (10%)	792 (16.2%)
Remdesivir	0	0	0

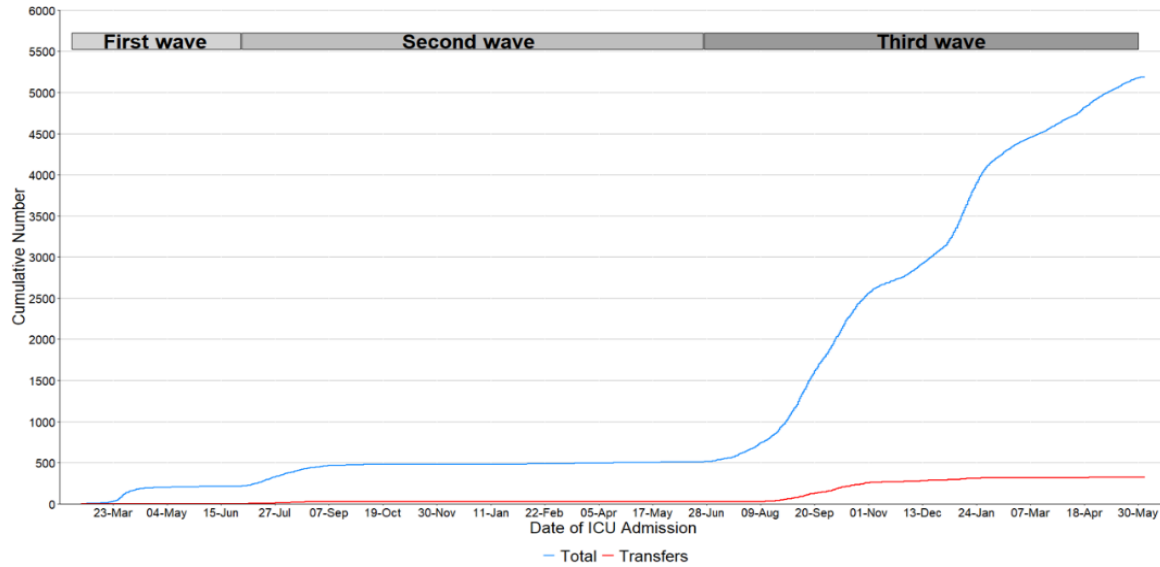
Characteristic	Total	Transferred	Not transferred
<b>Total number of people</b>	<b>5207</b>	<b>328</b>	<b>4879</b>
Tocilizumab	0	0	0
Baricitinib	1205 (23.1%)	43 (13%)	1162 (23.8%)
Neutralising antibodies	4062 (78.0%)	265 (80.8%)	3797 (77.8%)
<b>Organ support*</b>			
High-flow nasal cannula	751 (14.4%)	8 (2%)	743 (15.2%)
Non-invasive ventilation	783 (15.0%)	7 (2%)	776 (15.9%)
Invasive ventilation	681 (13.1%)	4 (1%)	677 (13.9%)
Inotropic or vasopressor	813 (15.6%)	9 (3%)	804 (16.5%)
Neuromuscular blocking agent**	4092 (78.6%)	223 (68.0%)	3869 (79.3%)
<b>Prone positioning</b>	807 (15.5%)	9 (3%)	798 (16.4%)
Awake prone	687 (13.2%)	4 (1%)	683 (14.0%)
Invasive prone	754 (14.4%)	7 (2%)	747 (15.3%)
<b>Renal replacement therapy</b>	819 (15.7%)	9 (3%)	810 (16.6%)
<b>Tracheostomy</b>	359 (6.9%)	24 (7.3%)	335 (6.9%)
<b>Extracorporeal membrane oxygenation</b>	340 (6.5%)	25 (7.6%)	315 (6.5%)
<b>Highest level of respiratory support</b>			
No	804 (15.4%)	26 (7.9%)	778 (15.9%)
High-flow nasal cannula or non-invasive ventilation	804 (15.4%)	26 (7.9%)	778 (15.9%)
Invasive ventilation	804 (15.4%)	26 (7.9%)	778 (15.9%)
<b>Development of complications</b>			
Bacterial pneumonia	1009 (19.4%)	36 (11%)	973 (19.9%)
Bacteraemia	1001 (19.2%)	35 (11%)	966 (19.8%)
Stroke	989 (19.0%)	34 (10%)	955 (19.6%)
Arrhythmia	976 (18.7%)	35 (11%)	941 (19.3%)
Barotrauma	987 (19.0%)	35 (11%)	952 (19.5%)
Cardiac arrest	990 (19.0%)	35 (11%)	955 (19.6%)
Pulmonary embolism	1020 (19.6%)	35 (11%)	985 (20.2%)
Deep vein thrombosis	1035 (19.9%)	36 (11%)	999 (20.5%)
Myocarditis	1035 (19.9%)	36 (11%)	999 (20.5%)
<b>Clinical outcomes</b>			
ICU length of stay	241 (4.6%)	24 (7.3%)	217 (4.4%)
Hospital length of stay	423 (8.1%)	22 (6.7%)	401 (8.2%)
ICU mortality	227 (4.4%)	18 (5.5%)	209 (4.3%)
Hospital mortality	411 (7.9%)	19 (5.8%)	392 (8.0%)

APACHE = Acute Physiology and Chronic Health Evaluation; ACEi = angiotensin-converting enzyme inhibitor; ARB = angiotensin II receptor blocker; ICU = Intensive care unit; COVID-19 = coronavirus disease 2019.

\* Data collection stopped on 30 September 2021.

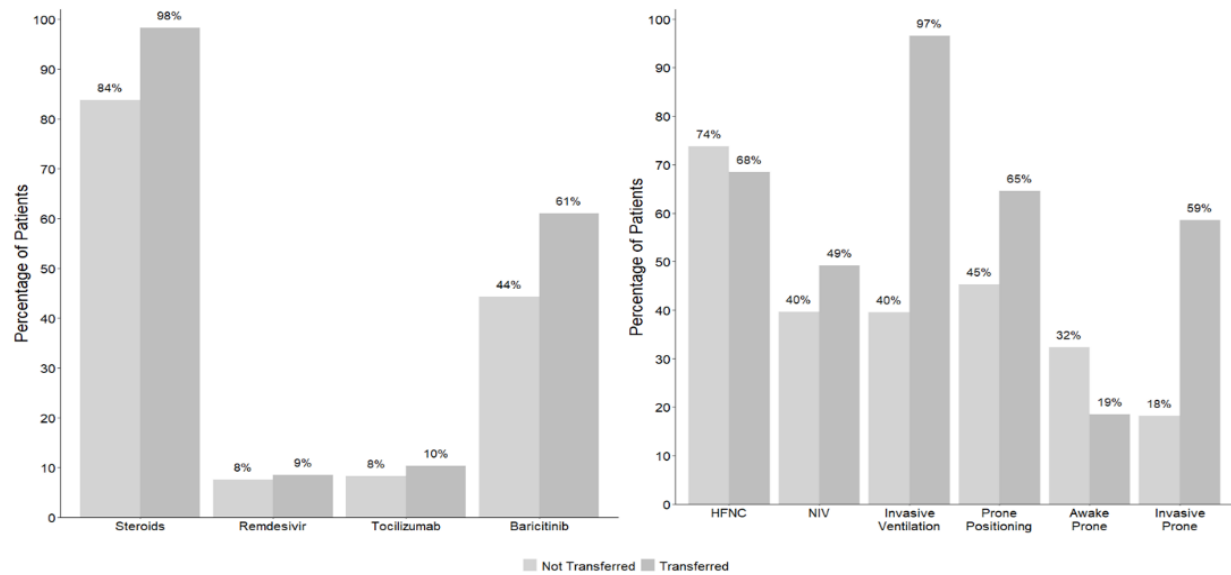
\*\* Data collection stopped on 31 March 2021.

**Figure 1. Cumulative number of ICU admissions of people with COVID-19, and of inter-hospital transfers, March 2020 – May 2022**



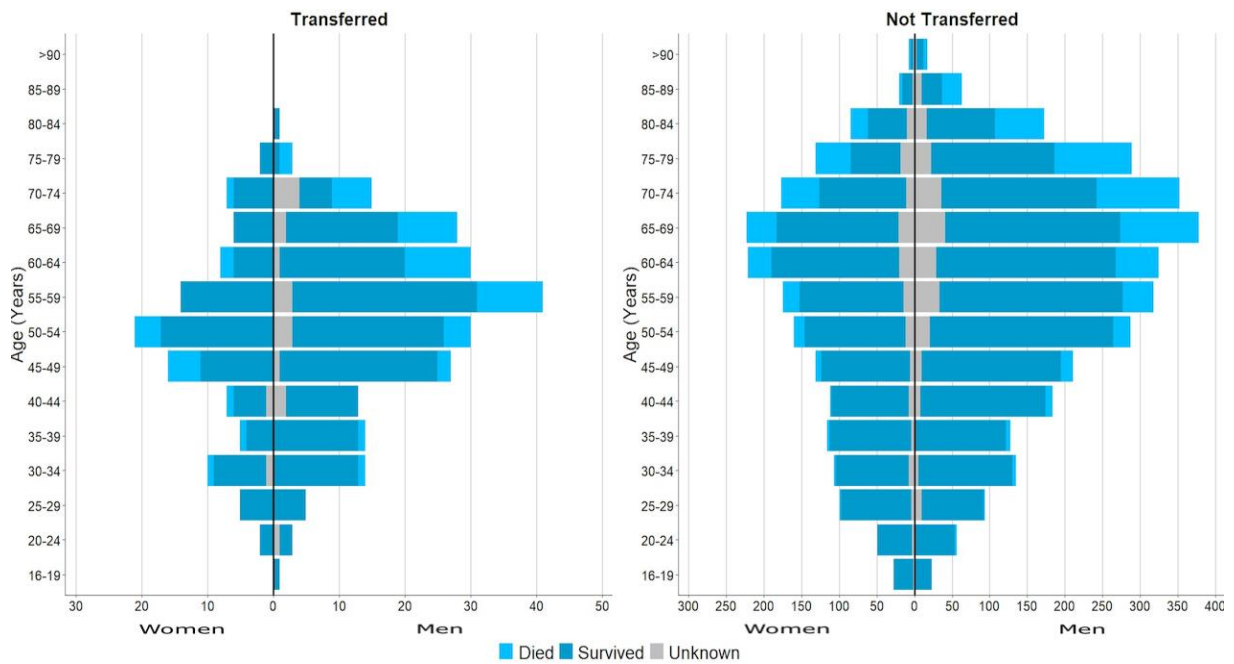
ICU = intensive care unit; COVID-19 = coronavirus disease 2019.

**Figure 2. Comparison of the interventions provided in the transferred and non-transferred COVID-19 ICU patient groups (proportions)**



ICU = Intensive care unit; COVID-19 = coronavirus disease 2019; HFNC = High flow nasal cannula; NIV = Non-invasive ventilation.

**Figure 3. Population pyramid showing crude in-hospital mortality in transferred and non-transferred patients by gender and age category**



**Table 2. Full multivariable model for hospital mortality**

	Risk difference (95% CI)
Transferred	-5.03 (-10.0 to -0.03)
Age	8.35 (6.89 to 9.81)
Body mass index	-0.86 (-2.14 to 0.43)
APACHE II	7.58 (6.05 to 9.11)
Number of other conditions	
1	0.69 (-2.81 to 4.23)
2	3.74 (-0.13 to 7.64)
≥ 3	8.82 (4.91 to 12.75)
Time between hospital and ICU admission	0.78 (-0.44 to 2.02)
Invasive ventilation	16.1 (13.3 to 18.9)
Number of admissions per month	0.78 (-1.11 to 2.69)
Time between consecutive admissions	-0.17 (-1.35 to 1.01)

All models including hospitals and week of admission as random effects. Continuous variables were standardised and the effect estimate corresponds to the change in one standard deviation of the variable.

APACHE II = Acute Physiology and Chronic Health Evaluation II; ICU = Intensive Care Unit

### **The participating SPRINT-SARI Australia Hospitals and the SPRINT-SARI Australia investigators**

Alice Springs Hospital (Paul Secombe, Shan Cairnes, Elizabeth Matthews), Angliss Hospital (Peter Chan, Kym Gellie, Nicole Robertson), Austin Hospital (Rinaldo Bellomo, Glenn Eastwood, Leah Peck, Helen Young), Grampians Health previously Ballarat Base Hospital (Khaled El-Khawas, Dianne Hill), Bankstown-Lidcombe Hospital (Manoj Saxena, Magda Luciuk, Diane Redmond, Megan Ford), Barwon Health (Matthew Maiden, Michelle Horton, Jemma Trickey), Bendigo Hospital (Cameron Knott, Angus Carter, Julie Smith), Box Hill Hospital (Peter Chan, Cheelim Liew, Kym Gellie, Nicole Robertson), Bunbury Hospital (Ravi Krishnamurthy, Marie Draper), Bundaberg Hospital (Anthony Eidan, Angela Ratsch), Caboolture Hospital (Mahesh Ramanan, Julia Afleck, Ramsy D'souza), Cabrini Hospital Malvern (David Brewster, Shannon Simpson, Lisa Dougherty), Cairns Hospital (Catherine Tacon,, Janine Cullen, Ben Nash), Calvary Mater Newcastle (Alan Rashid, Toni McKenna), Campbelltown Hospital (Ritesh Sanghavi,, Kelsey Dobell-Brown), Canberra Hospital (Anil Ramnani, Mary Nourse, Tash.L.Edmunds, Bree McDonald, Susan Donnelly), Concord Hospital (Mark Kol, Helen Wong), Casey Hospital (Umesh Kadam Sandra Cork, Tammy Lamac), Dandenong Hospital (Gopal Taori,, Amanda Hulley), Epworth Richmond (Jonathan Barrett, Gabrielle Hanlon), Fiona Stanley Hospital (Edward Litton, Annamaria Palermo, Nicholas Anthony), Flinders Medical Centre (Shailesh Bihari, Joanne McIntyre, Laura Grear), Frankston Hospital ( Ravindranath Tiruvoipati, Kavi Haji, Mike Gomez), Gold Coast University Hospital (James McCullough, Brent Richards, Shane George, Mandy Tallott, Julie Pitman, Maree Houbert, Maimoonbe Gough), Hervey Bay Hospital (Wei Han Choy, Angela Ratsch), Ipswich Hospital (Neeraj Bhadange, Steven Tyler), John Hunter Hospital (Eduardo Martinez, Amber Louise Poulter, Sarah Dalton), Joondalup Health Campus (David Hawkins, Ben Mulholland), Launceston General Hospital (Matthew Brain, Laurie McKeon, Jo Chen, Sarah Mineall), Lismore Base Hospital (Brigit Weld, David Bihari, Myrene Kilminster Tina Johnstone), Liverpool Hospital (Peter McCanny, Danielle Austin, Jennene Miller, Alyson France, Kelsey Dobell-Brown), Logan Hospital (Hayden White, Kristine Estensen, Lynette Morrison, Joanne Sutton, Melanie Cooper, Rebecca Stokman), Lyell McEwan Hospital ( Rajaram Ramadoss, Natalie Soar), Maroondah Hospital (Peter Chan, Kym Gellie, Nicole Robertson), Mater Hospital Brisbane (Isabel Anne Leditschke, Katherine Jongebloed, Mackenzie Finnis), Mildura Base Hospital (Alison Walker, Anita Harper, Andrea Bock), Monash Children's Hospital (Felix Oberender, Jess Waghorn, Jim Buttery, Marine Sosso, Sarah Cleary, Megan O'Brien), Monash Medical Centre (Wisam Albassam, Amanda Hulley, Jacqueline Flanagan, Joanne Lillie, Stephanie Guo, Alice Li), Nepean Hospital (Ian Seppelt, Kirsty Masters, Sheeja Joy, Rebecca Gresham, Julie Lowrey), Northeast Health Wangaratta (Nicole Humphreys, Rowan O'Hagan), Northern Hospital (David Crosbie, Simone Said), Perth Children's Hospital (Simon Erickson, Hannah Thomson, Dainah Stacey, Jenipher Chumbes Flores), Prince of Wales Hospital (Gavin Salt, Solomon Thambiraj), Princess Alexandra Hospital (Kyle White, Meg Harward, Ellen Venz, Niki McGuinness), Queensland Children's Hospital (Adrian Mattke, Kerry Johnson), Redcliffe Hospital (Alexis Tabah, Maree Duroux, Megan Ratcliffe), Rockingham Hospital (Ravikiran Sonawane), Royal Adelaide Hospital (Benjamin Reddi, Stephanie O'Connor, Justine Rivett, Kathleen Glasby, Nerissa Brown, Sarah Doherty) Royal Brisbane and Women's Hospital (Jeremy Cohen, Kevin Laupland, Melissa Lassig Smith, Cheryl Fourie, Janine Stuart, Amelia Livermore), Royal Children's Hospital (Thomas Rozen, Carmel Delzoppo, Alyssa Serratore, Thein Theingi Myint ), Royal Darwin Hospital (Lewis Campbell, Martin Hansen, Kirsty Smith, Rebecca Garcia, Elizabeth Ross, Brittney Mackenzie), Royal Hobart Hospital (David Cooper, Richard McAllister), Royal Melbourne Hospital (Hannah Rothetham, Annabelle Clancy, Liam Finlay, Cara Moore), Royal North Shore Hospital (Naomi Hammond, Pierre Janin, Angela Ashelford, Elizabeth Yarad, Frances Bass, Anne O'Connor), Royal Perth Hospital (Steve Webb, Matt Morgan, Sharon Waterson, Melanie Boardman), Royal Prince Alfred Hospital (Richard Totaro, Heidi Buhr, Jennifer Coles, Carla Walsh), Sir Charles Gairdner Hospital (Matthew Anstey, Bhaumik Mevavala, Erina Myers, Rashmi Runiyar), St George Hospital (Kush Deshpande, Deborah Inskip, Belinda Anderson, Garnette Fuller, Rebeca Sidoli, Adeline Kintono, Chloe Moore), St John of God Hospital Midland (Edward Fysh, Bhaumik Mevavala, Isuru Sirisinghe, Zoe Hartman), St John of God Hospital Murdoch (Adrian Regli, Bart

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