Global COVID-19 Therapeutics Development

Weekly update

WORKING DRAFT, JULY 16, 2020

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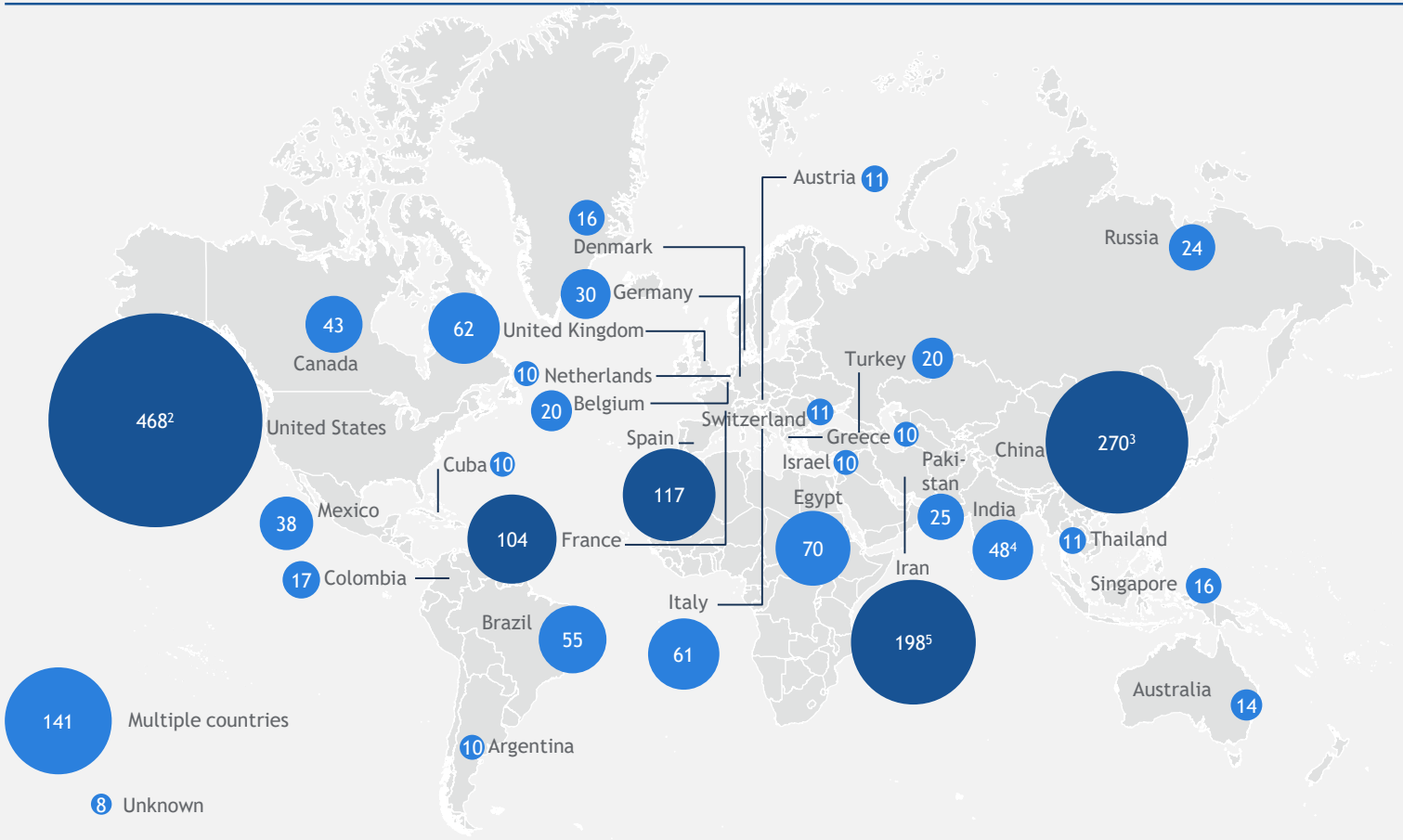
Global COVID-19 clinical trial arms[1] by country

There are no FDA-approved therapies for COVID-19. The therapies below are in development and are being tested in clinical trials.

Top 5 countries X Number of trial arms

Clinical trials arms[1] underway by country



Summary

Top 5 countries developing treatments for COVID-19 based on number of trial arms:

1. United States
2. China
3. Iran
4. Spain
5. France

1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Excludes trials investigating vaccines. Separates out multi-arm trials into distinct counts. Countries with trial arms less than 10 are not shown. May not be fully comprehensive. 2 Includes 50 trial arms for which primary location is not US but has at least 1 trial site in the US. These trial arms are also included in the multiple countries trial arms count. 3 Excludes 149 trial arms testing Traditional Chinese Medicine. 4 Excludes 83 trial arms testing Traditional Chinese Medicine. 5 Excludes 35 trial arms testing Traditional Chinese Medicine.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

Number of clinical trial arms[1] by treatment approach

There are no FDA-approved therapies for COVID-19. The therapies below are in development and are being tested in clinical trials.

Additional details in appendix

Type of approach[2]	Type of medical product	Number of global trial arms[1]	
		Randomized, adequately powered[3]	All other
Antivirals	Direct-acting antivirals, e.g., Remdesivir	27	179
	Targets intracellular environment, e.g., Hydroxychloroquine	25	228
Immunomodulators	IL-6 inhibitors	4	81
	Other immunomodulators, e.g., Corticosteroids, TNF-inhibitors, etc.	15	475
Antibody therapy	Convalescent plasma	4	151
	Hyperimmune globulin[4]	0	6
	Neutralizing antibodies	0	12
Other[5]	All other therapeutics being tested	23	462
Combination regimen	E.g., Hydroxychloroquine + Lopinavir/Ritonavir + Tocilizumab	19	310
Multiple options	Multiple options	3	11
Total		120	1915

Summary

~6% of global trial arms are 'randomized, adequately powered', i.e., are part of randomized controlled trials in Phase 2 or beyond with sufficient expected enrollment per arm to be powered to show efficacy

Direct acting antivirals have the highest proportion (~13%) of 'randomized, adequately powered' trials

There are 6 additional neutralizing antibody arms being tested as a combination therapy

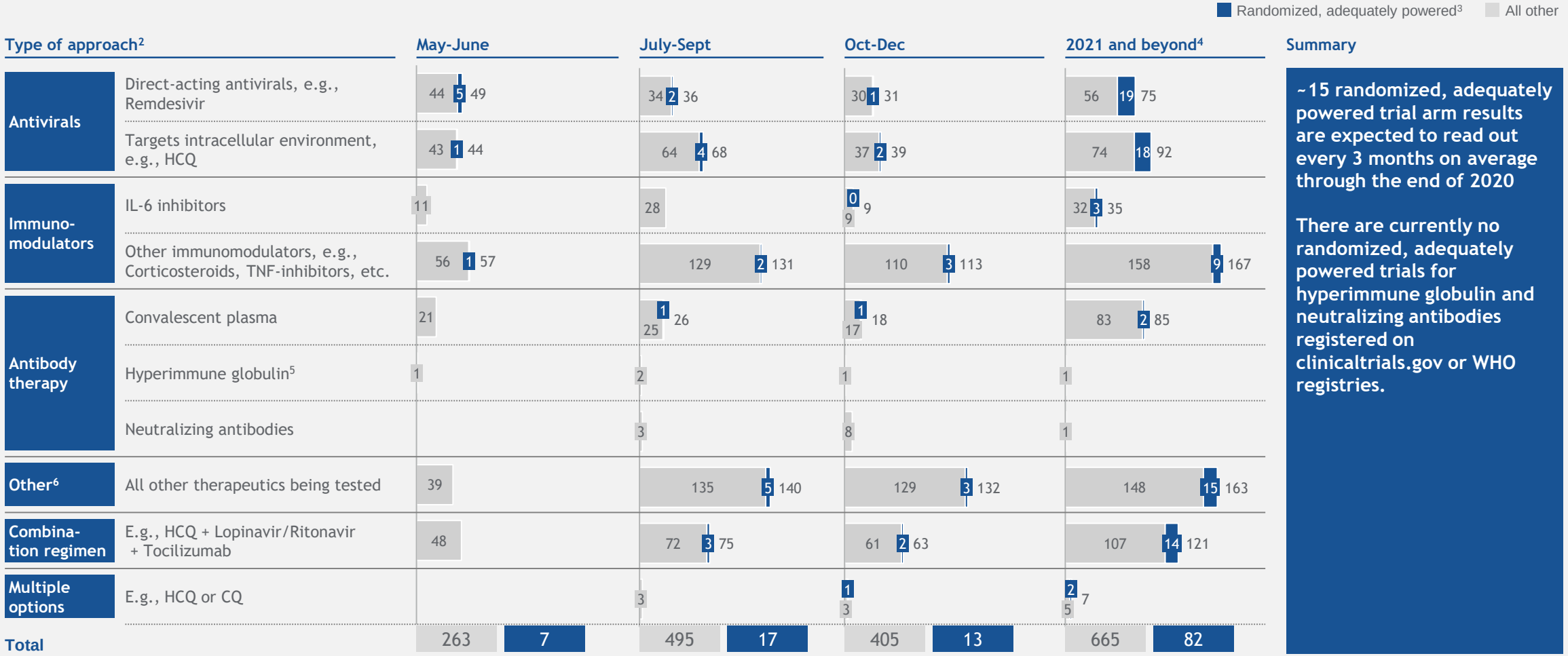
~50 pre-clinical neutralizing antibody development efforts are underway[6]

1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. May not be fully comprehensive. Excludes Traditional Chinese Medicine and vaccine trials. 2 Counts represented under each approach are trial arms that involve single agents relevant to the approach. Trial arms testing interventions as part of a regimen are included under "Combination regimen". Trial arms testing interventions through multiple options (i.e., HCQ or CQ) are included under "Multiple options". 3 Randomized, adequately powered is defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 4 Includes non-human polyclonal antibodies. 5 Included are (not exhaustive) ACE inhibitors, ARBs, NSAIDs, other anti-infectives, other anti-hypertensives, oncolytics, and supplements. 6 Additional details in the neutralizing antibody specific pages.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020, Pinksheet and BioCentury accessed 7/13/2020.

Breakdown of clinical trial arms[1] by potential readout dates

There are no FDA-approved therapies for COVID-19. Therapies below are in development and are being tested in clinical trials.



Summary

~15 randomized, adequately powered trial arm results are expected to read out every 3 months on average through the end of 2020

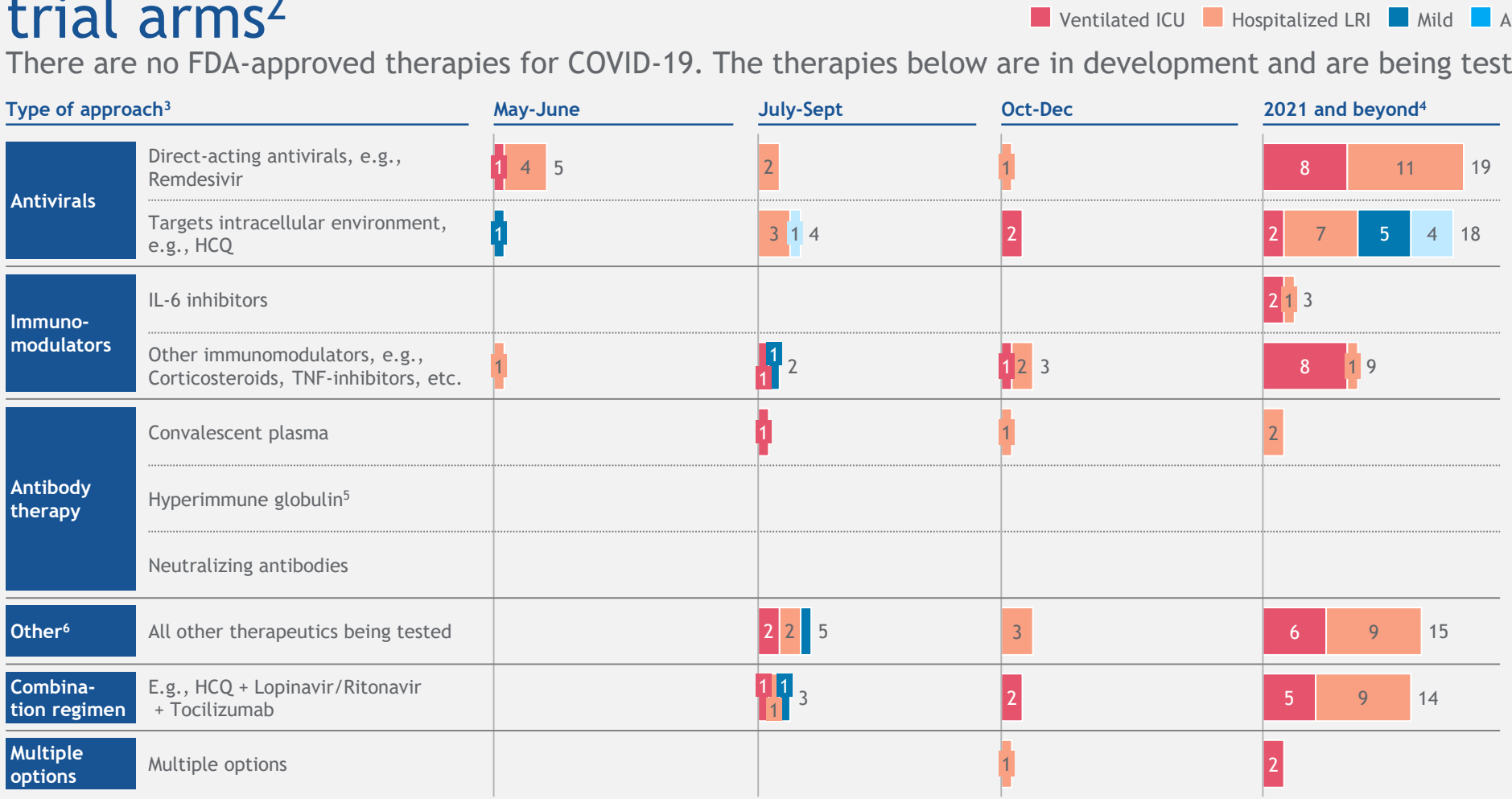
There are currently no randomized, adequately powered trials for hyperimmune globulin and neutralizing antibodies registered on clinicaltrials.gov or WHO registries.

1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. May not be fully comprehensive. Excludes Traditional Chinese Medicine and vaccine trials. 2 Counts represented under each approach are trial arms that involve single agents relevant to the approach. Trial arms testing interventions as part of a regimen are included under "Combination regimen". Trial arms testing interventions through multiple options (i.e., HCQ or CQ) are included under "Multiple options". 3 Randomized, adequately powered is defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). Enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment. 4 Includes trials with unknown primary end dates. 5 Includes non-human polyclonal antibody. 6 Included are (not exhaustive) ACE inhibitors, ARBs, NSAIDs, other anti-infectives, other anti-hypertensives, oncolytics, and supplements.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

Target patient cohorts of randomized, adequately powered[1] clinical trial arms[2]

There are no FDA-approved therapies for COVID-19. The therapies below are in development and are being tested in clinical trials.



Summary

Overall, most randomized, adequately powered trials are focused on Ventilated ICU and Hospitalized LRI patients

In the near term, there are a handful of randomized, adequately powered trials targeting mild or post-exposure prophylaxis patient cohorts

There are currently no randomized, adequately powered trials for hyperimmune globulin and neutralizing antibodies registered on clinicaltrials.gov or WHO registries

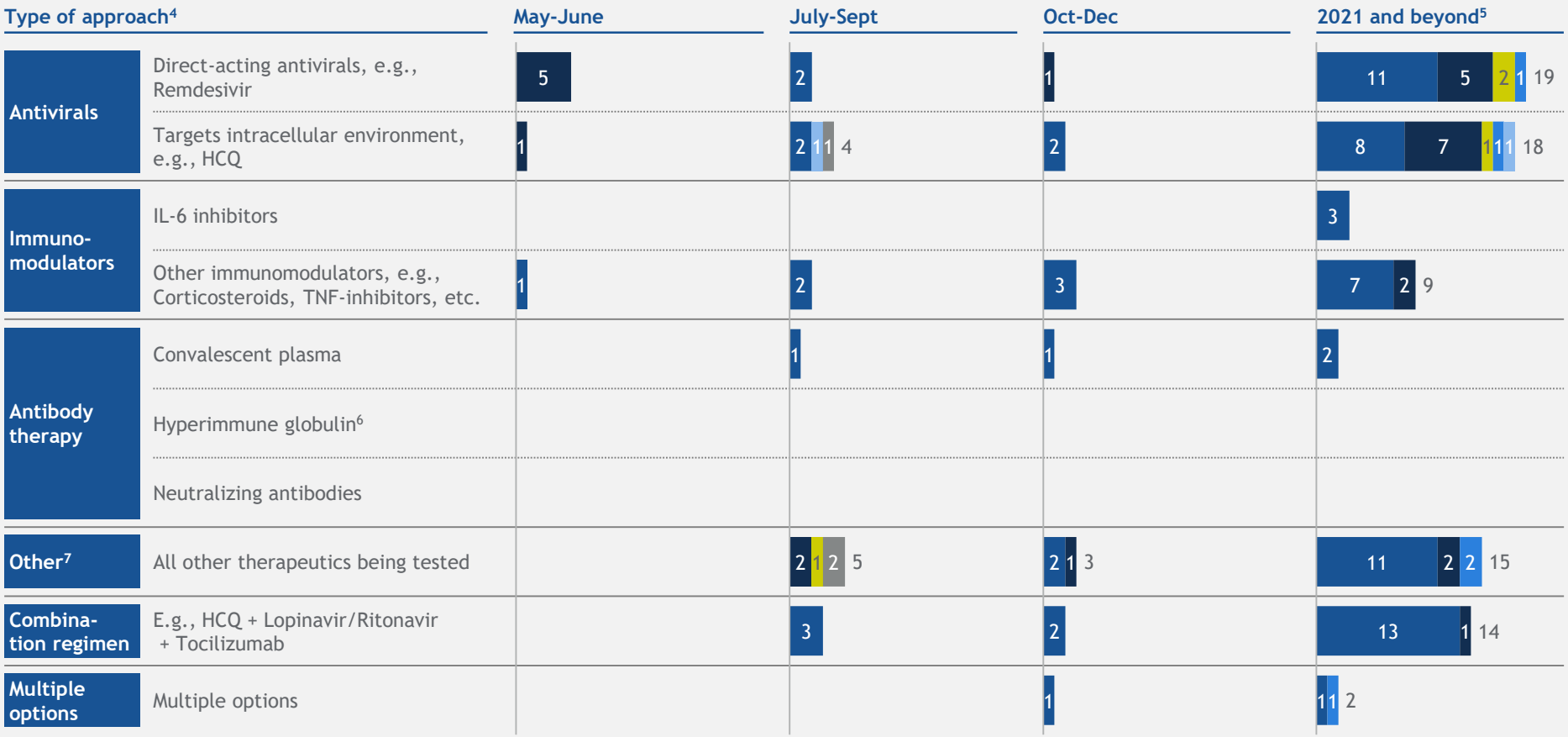
1 Randomized, adequately powered is defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). Enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.
2 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. May not be fully comprehensive. Excludes Traditional Chinese Medicine and vaccine trials. 3 Counts represented under each approach are trial arms that involve single agents relevant to the approach. Trial arms testing interventions as part of a regimen are included under "Combination regimen". Trial arms testing interventions through multiple options (i.e., HCQ or CQ) are included under "Multiple options". 4 Includes trials with unknown primary end dates. 5 Includes non-human polyclonal antibody. 6 Included are (not exhaustive) ACE inhibitors, ARBs, NSAIDs, other anti-infectives, other anti-hypertensives, oncolytics, and supplements.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

Primary endpoints[1] of randomized, adequately powered[2] clinical trial arms[3]

Mortality · Markers of Clinical Status · Setting of Care · Viral Load/Clearance · Infection Prevention · Seroconversion · Adverse events · Other

There are no FDA-approved therapies for COVID-19. The therapies below are in development and are being tested in clinical trials.



Summary

Overall, most randomized, adequately powered trials have mortality as the primary endpoint

There are currently no randomized, adequately powered trials for Hyperimmune globulin and neutralizing antibodies registered on clinicaltrials.gov or WHO registries

1 Primary endpoints use the following grouping classification: mortality = mortality; markers of clinical status = index / composite score, time to recovery, organ failure, oxygenation requirements, imaging data, and other lab data; setting of care = ICU utilization and hospitalization status; viral load = viral load or clearance; adverse events = adverse events (caused by intervention); infection prevention = rate of COVID-19 infection; seroconversion = COVID-19 seroconversion; Other = endpoints not mentioned above including those with unknown endpoints. 2 Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). Enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment. 3 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. May not be fully comprehensive. Excludes Traditional Chinese Medicine and vaccine trials. 4 Counts represented under each approach are trial arms that involve single agents relevant to the approach. Trial arms testing interventions as part of a regimen are included under "Combination regimen". Trial arms testing interventions through multiple options (i.e., HCQ or CQ) are included under "Multiple options". 5 Includes trials with unknown primary end dates. 6 Includes non-human polyclonal antibody. 7 Included are (not exhaustive) ACE inhibitors, ARBs, NSAIDs, other anti-infectives, other anti-hypertensives, oncolytics, and supplements.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

Clinical trial arms[1] expected to start in the next 3 months

There are no FDA-approved therapies for COVID-19. The therapies below are planned trials published on public registries and are a subset of clinical trials that will start

Summary

Not all trial arms starting in the next 3 months are likely to be registered yet

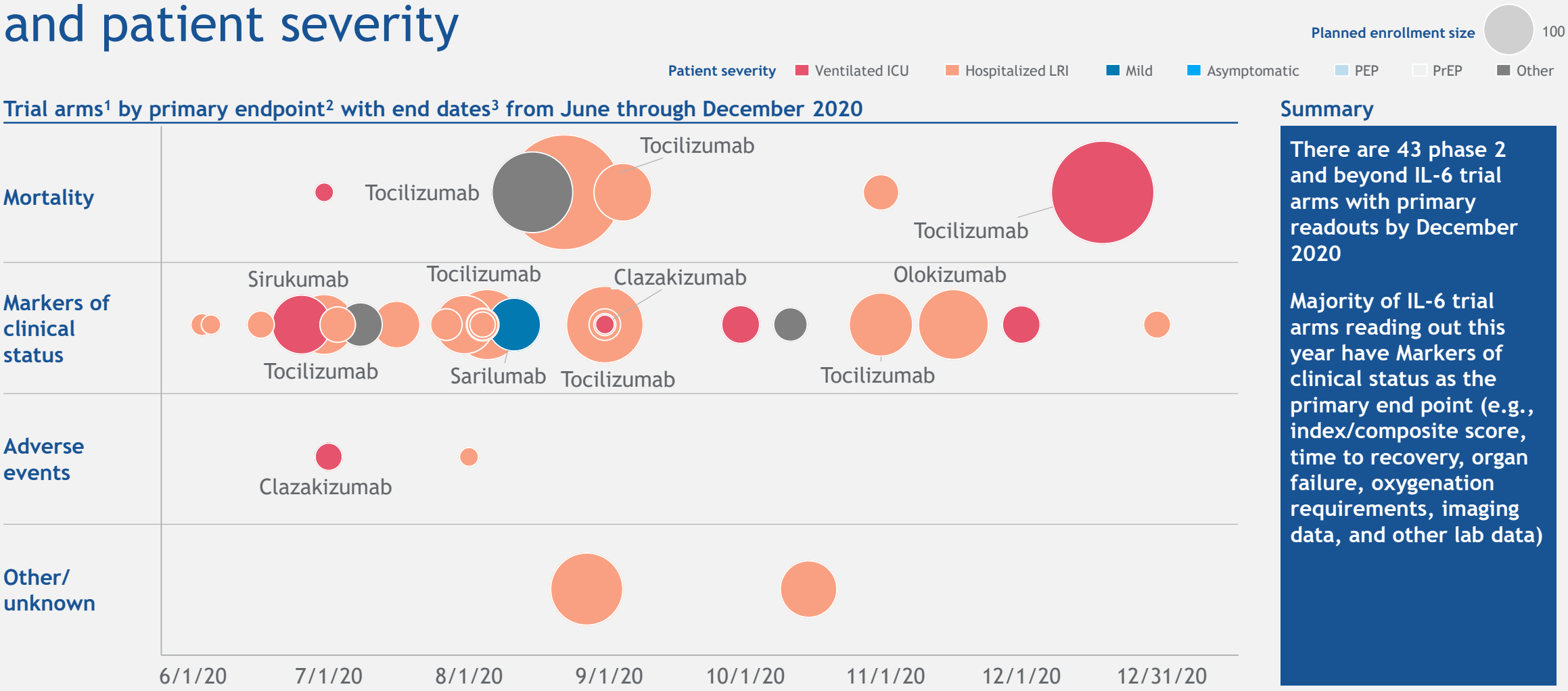
Of the ~170 registered trials scheduled to start in the next 3 months (July-September), there are 13 randomized, adequately powered trials

There are 12 neutralizing antibody (single agent) trial arms scheduled to start by end of July. In addition, there are 6 neutralizing antibody given as combination with scheduled June starts

1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. May not be fully comprehensive. Excludes Traditional Chinese Medicine and vaccine trials. 2 Counts represented under each approach are trial arms that involve single agents relevant to the approach. Trial arms testing interventions as part of a regimen are included under "Combination regimen". Trial arms testing interventions through multiple options (i.e., HCQ or CQ) are included under "Multiple options". 3 Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). Enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment. 4 May include non-human polyclonal antibody. 5 Included are (not exhaustive) ACE inhibitors, ARBs, NSAIDs, other anti-infectives, other anti-hypertensives, oncolytics, and supplements; excludes traditional Chinese medicine trials.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

IL-6: upcoming readouts by primary endpoints, target enrollment, and patient severity



Summary

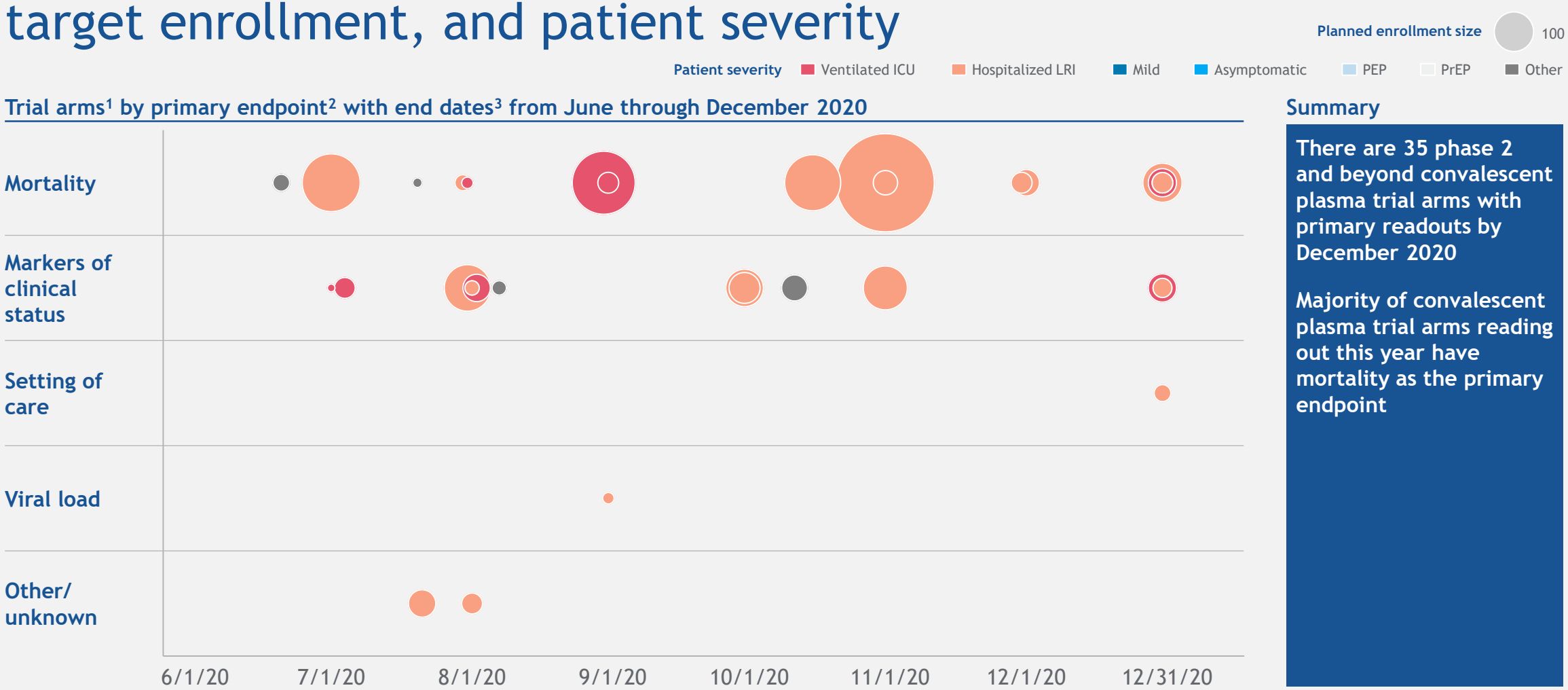
There are 43 phase 2 and beyond IL-6 trial arms with primary readouts by December 2020

Majority of IL-6 trial arms reading out this year have Markers of clinical status as the primary end point (e.g., index/composite score, time to recovery, organ failure, oxygenation requirements, imaging data, and other lab data)

1. Excludes trials that are suspended, terminated, withdrawn or cancelled, excludes Ph1 and Ph1/2 trials. Excludes trials with unknown phase information. Excludes trials for which intervention is given in combination with other interventions. 2 Primary endpoints use the following grouping classification: mortality = mortality; markers of clinical status = index / composite score, time to recovery, organ failure, oxygenation requirements, imaging data, and other lab data; setting of care = ICU utilization and hospitalization status; viral load = viral load or clearance; adverse events = adverse events (caused by intervention); infection prevention = rate of COVID-19 infection; seroconversion = COVID-19 seroconversion; Other = endpoints not mentioned above including those with unknown endpoints. 3 Primary readout for CT.gov trials, final completion dates for EU trials.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

Convalescent plasma: upcoming readouts by primary endpoints, target enrollment, and patient severity



Summary

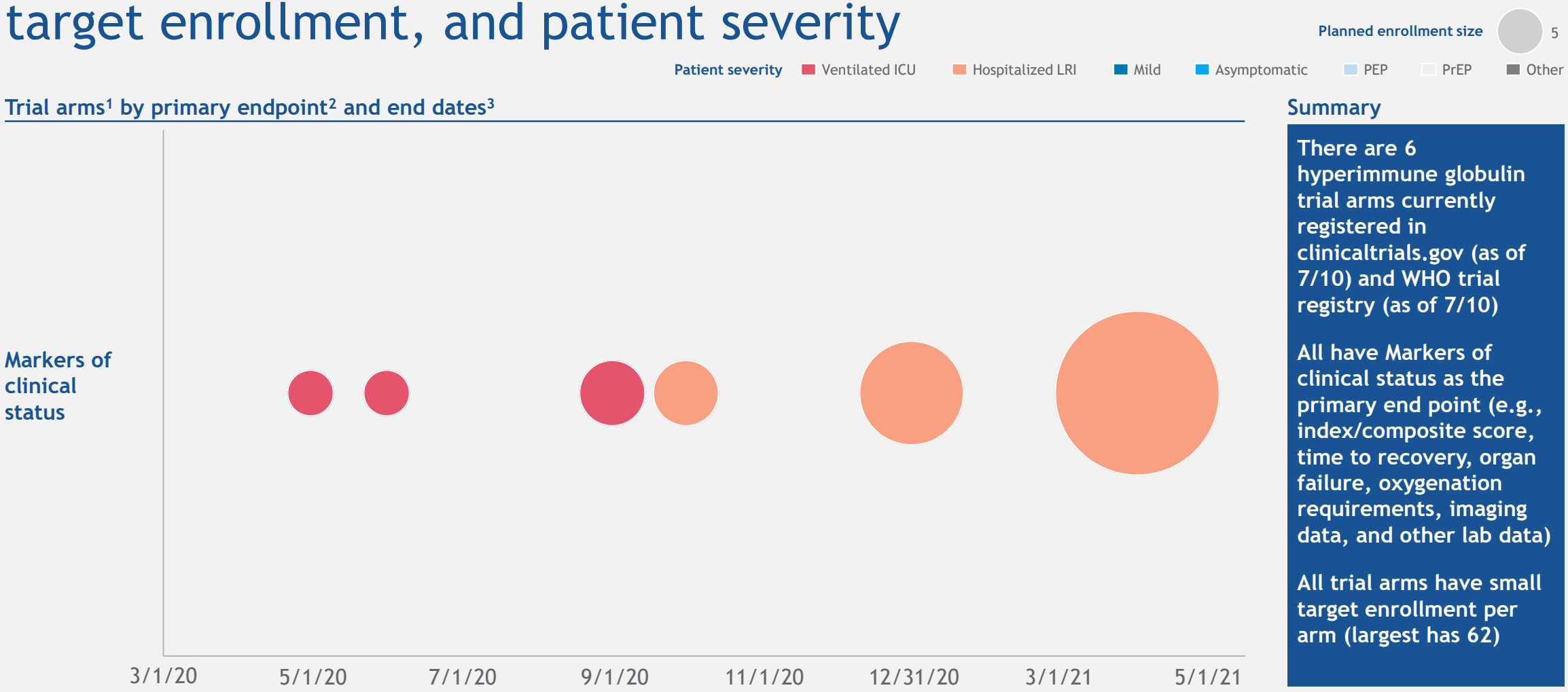
There are 35 phase 2 and beyond convalescent plasma trial arms with primary readouts by December 2020

Majority of convalescent plasma trial arms reading out this year have mortality as the primary endpoint

1. Excludes trials that are suspended, terminated, withdrawn or cancelled, excludes Ph1 and Ph1/2 trials. Excludes trials with unknown phase information. Excludes trials for which intervention is given in combination with other interventions. 2 Primary endpoints use the following grouping classification: mortality = mortality; markers of clinical status = index / composite score, time to recovery, organ failure, oxygenation requirements, imaging data, and other lab data; setting of care = ICU utilization and hospitalization status; viral load = viral load or clearance; adverse events = adverse events (caused by intervention); infection prevention = rate of COVID-19 infection; seroconversion = COVID-19 seroconversion; Other = endpoints not mentioned above including those with unknown endpoints. 3 Primary readout for CT.gov trials, final completion dates for EU trials.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

Hyperimmune globulin: upcoming readouts by primary endpoints, target enrollment, and patient severity



Summary

There are 6 hyperimmune globulin trial arms currently registered in clinicaltrials.gov (as of 7/10) and WHO trial registry (as of 7/10)

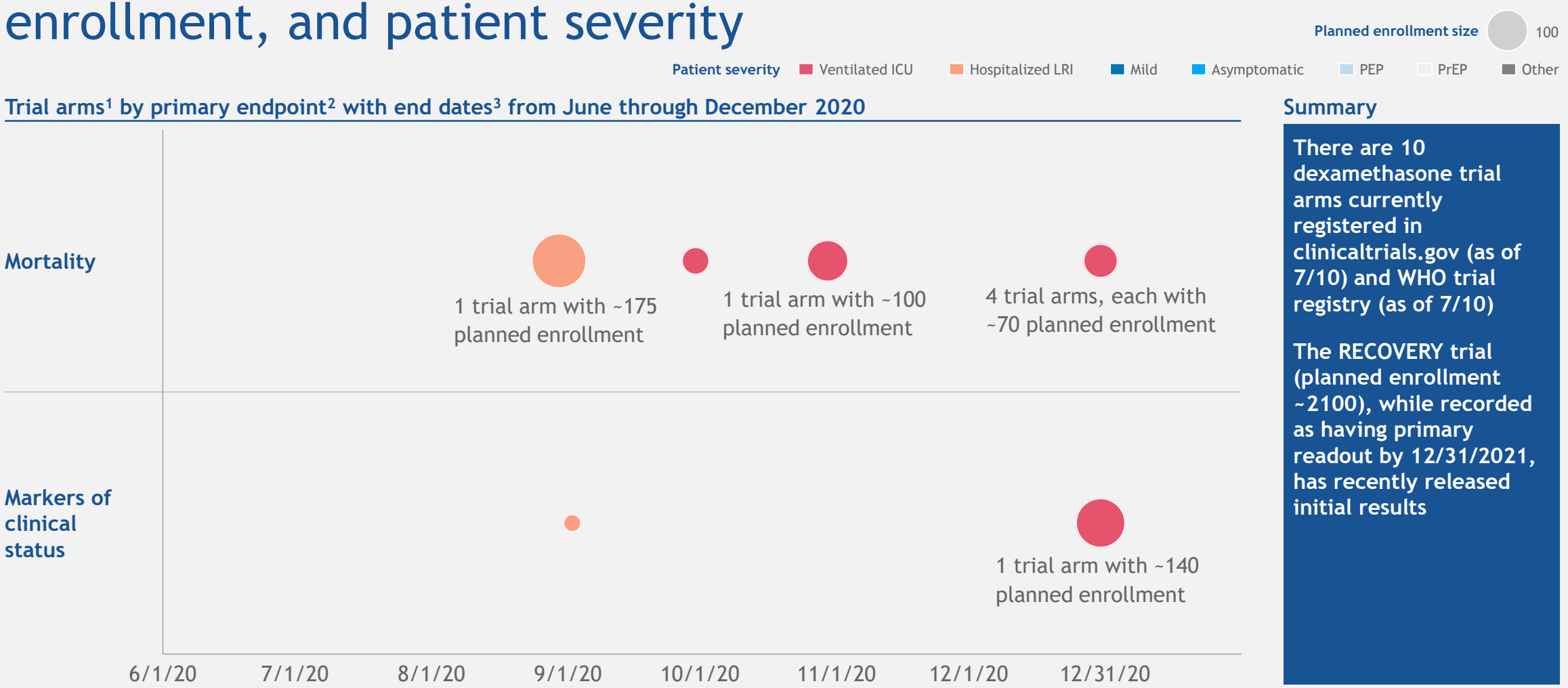
All have Markers of clinical status as the primary end point (e.g., index/composite score, time to recovery, organ failure, oxygenation requirements, imaging data, and other lab data)

All trial arms have small target enrollment per arm (largest has 62)

1. Excludes trials that are suspended, terminated, withdrawn or cancelled. Excludes trials for which intervention is given in combination with other interventions. 2 Primary endpoints use the following grouping classification: mortality = mortality; markers of clinical status = index / composite score, time to recovery, organ failure, oxygenation requirements, imaging data, and other lab data; setting of care = ICU utilization and hospitalization status; viral load = viral load or clearance; adverse events = adverse events (caused by intervention); infection prevention = rate of COVID-19 infection; seroconversion = COVID-19 seroconversion; Other = endpoints not mentioned above including those with unknown endpoints. 3 Primary readout for CT.gov trials, final completion dates for EU trials.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

Dexamethasone: upcoming readouts by primary endpoints, target enrollment, and patient severity



Summary

There are 10 dexamethasone trial arms currently registered in clinicaltrials.gov (as of 7/10) and WHO trial registry (as of 7/10)

The RECOVERY trial (planned enrollment ~2100), while recorded as having primary readout by 12/31/2021, has recently released initial results

1. Excludes trials that are suspended, terminated, withdrawn or cancelled. Excludes trials for which intervention is given in combination with other interventions. 2 Primary endpoints use the following grouping classification: mortality = mortality; markers of clinical status = index / composite score, time to recovery, organ failure, oxygenation requirements, imaging data, and other lab data; setting of care = ICU utilization and hospitalization status; viral load = viral load or clearance; adverse events = adverse events (caused by intervention); infection prevention = rate of COVID-19 infection; seroconversion = COVID-19 seroconversion; Other = endpoints not mentioned above including those with unknown endpoints. 3 Primary readout for CT.gov trials, final completion dates for EU trials.

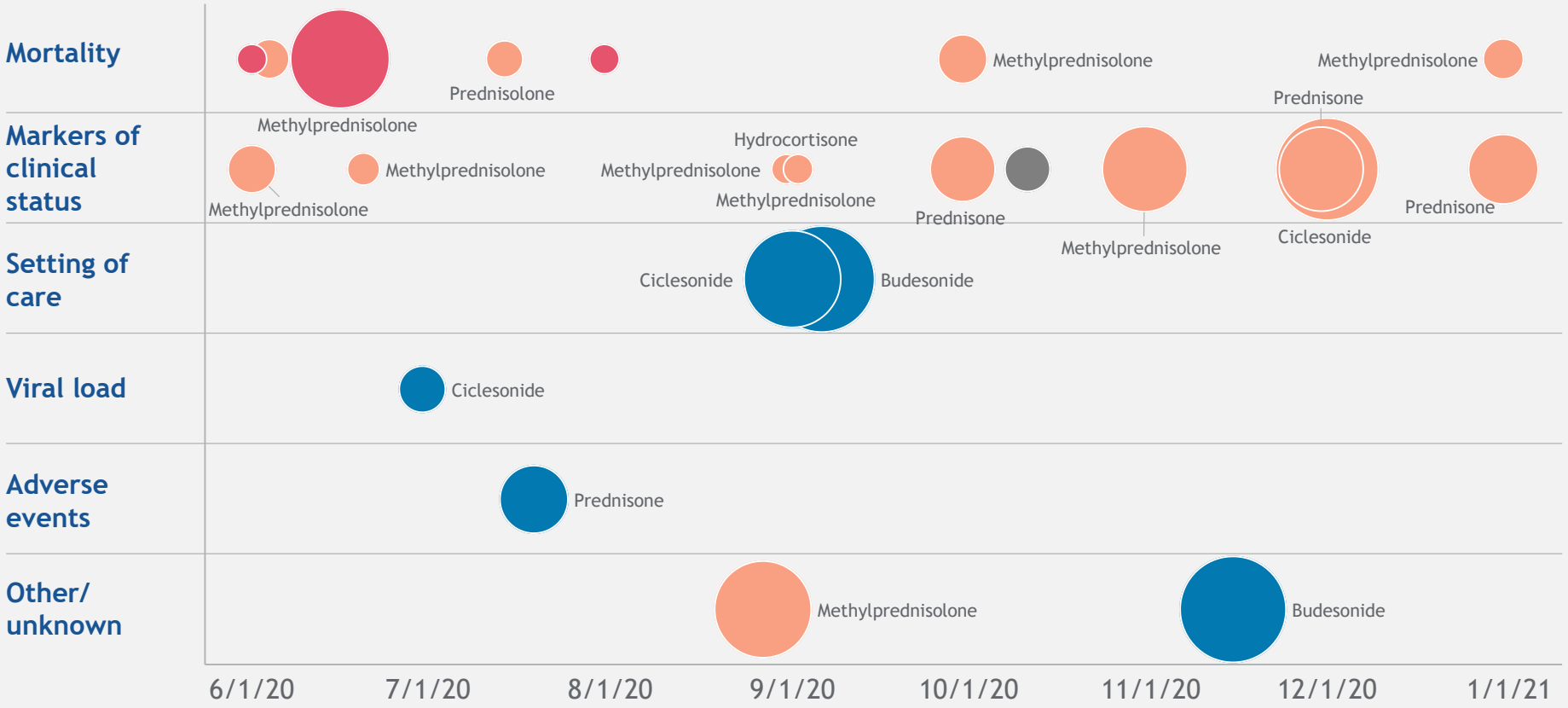
Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

Other corticosteroids[1]: upcoming readouts by primary endpoints, target enrollment, and patient severity

Planned enrollment size 50

Patient severity: Ventilated ICU; Hospitalized LRI; Mild; Asymptomatic; PEP; PrEP; Other

Trial arms[2] by primary endpoint[3] with end dates[4] from June through December 2020



Summary

There are 25 phase 2 and beyond Other corticosteroid trial arms with primary readouts by December 2020

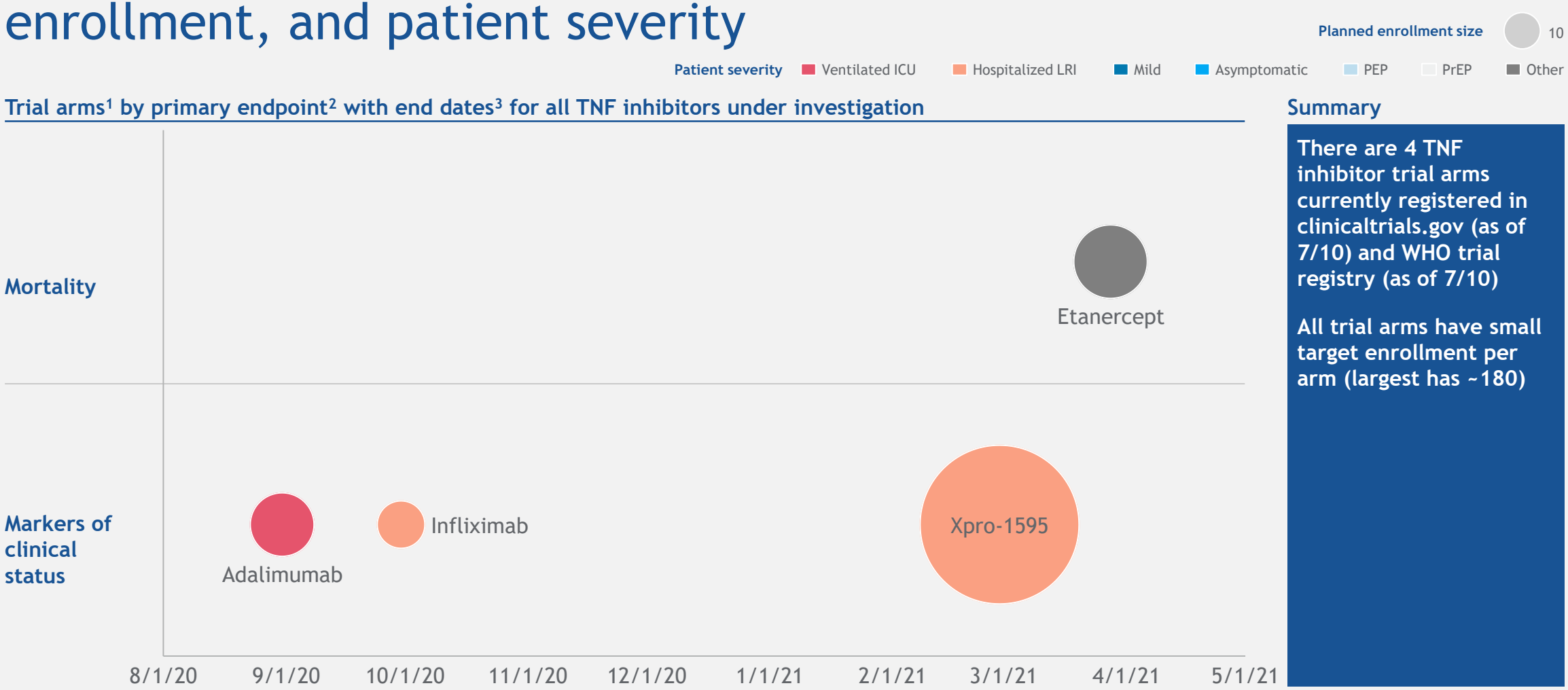
Other corticosteroids under investigation (besides dexamethasone) include methylprednisolone, prednisone, ciclesonide, hydrocortisone, and budesonide

Majority of trial arms have mortality and markers of clinical status as primary endpoints and are targeting severe patients

1. Non-dexamethasone corticosteroids. 2. Excludes trials that are suspended, terminated, withdrawn or cancelled, excludes Ph1 and Ph1/2 trials. Excludes trials with unknown phase information. Excludes trials for which intervention is given in combination with other interventions. 3 Primary endpoints use the following grouping classification: mortality = mortality; markers of clinical status = index / composite score, time to recovery, organ failure, oxygenation requirements, imaging data, and other lab data; setting of care = ICU utilization and hospitalization status; viral load = viral load or clearance; adverse events = adverse events (caused by intervention); infection prevention = rate of COVID-19 infection; seroconversion = COVID-19 seroconversion; Other = endpoints not mentioned above including those with unknown endpoints. 4 Primary readout for CT.gov trials, final completion dates for EU trials.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

TNF inhibitors: upcoming readouts by primary endpoints, target enrollment, and patient severity



Summary

There are 4 TNF inhibitor trial arms currently registered in clinicaltrials.gov (as of 7/10) and WHO trial registry (as of 7/10)

All trial arms have small target enrollment per arm (largest has ~180)

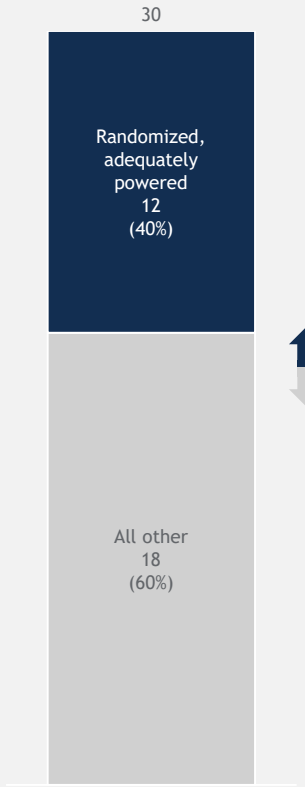
1. Excludes trials that are suspended, terminated, withdrawn or cancelled. Excludes trials for which intervention is given in combination with other interventions. 2 Primary endpoints use the following grouping classification: mortality = mortality; markers of clinical status = index / composite score, time to recovery, organ failure, oxygenation requirements, imaging data, and other lab data; setting of care = ICU utilization and hospitalization status; viral load = viral load or clearance; adverse events = adverse events (caused by intervention); infection prevention = rate of COVID-19 infection; seroconversion = COVID-19 seroconversion; Other = endpoints not mentioned above including those with unknown endpoints. 3 Primary readout for CT.gov trials, final completion dates for EU trials.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

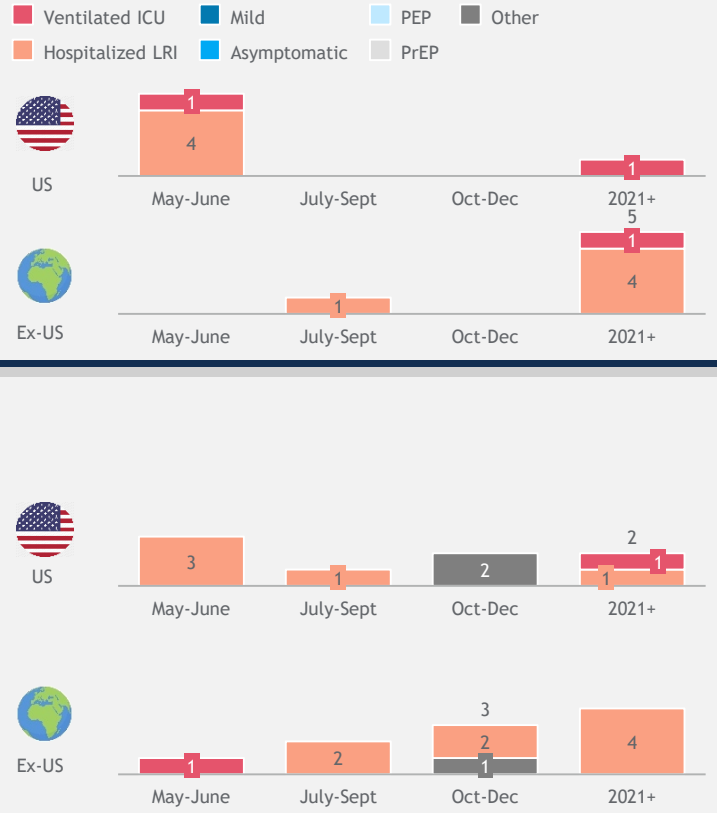
COVID-19 clinical development snapshot for remdesivir single agent

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | Dexamethasone | Other Corticosteroid | Conv. Plasma | Hyperimmune globulin | Neutralizing antibodies | Combo

Randomized, adequately powered trials[1]



Expected readouts by target severity[2]



Details of trial arms with readouts (may not be comprehensive)

USG sponsor marked in red

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Endpoint	Sponsor
1	NCT04280705	US	5/21/2020	531	Ventilated ICU	Markers of Clinical Status	NIAID
2	NCT04292899	US	6/30/2020	1500	Hospitalized LRI	Markers of Clinical Status	Gilead Sciences
3	NCT04292899	US	6/30/2020	1500	Hospitalized LRI	Markers of Clinical Status	Gilead Sciences
4	NCT04292899	US	6/30/2020	1500	Hospitalized LRI	Markers of Clinical Status	Gilead Sciences
5	NCT04292899	US	6/30/2020	1500	Hospitalized LRI	Markers of Clinical Status	Gilead Sciences
6	EUCTR2020-001366-11-ES	Ex-US	9/27/2020	500	Hospitalized LRI	Mortality	FIB-HCSC
7	ISRCTN83971151	Ex-US	2/28/2021	2000	Hospitalized LRI	Mortality	World Health Organization
8	NCT04330690	Ex-US	3/18/2022	725	Hospitalized LRI	Setting of Care	Sunnybrook Health Sciences Centre
9	NCT04315948	Ex-US	3/31/2023	620	Ventilated ICU	Markers of Clinical Status	Institut National de la Santé Et de la Recherche Médicale, France
10	NCT04401579	US	8/1/2023	516	Ventilated ICU	Markers of Clinical Status	NIAID

Randomized, adequately powered

All Other

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Phase	Sponsor
1	EUCTR2020-000982-18-NO	Ex-US	3/26/2021	406	Hospitalized LRI	Ph 3	Oslo University Hospital
2	NCT04292730	US	6/30/2020	400	Hospitalized LRI	Ph 3	Gilead Sciences
3	NCT04292730	US	6/30/2020	400	Hospitalized LRI	Ph 3	Gilead Sciences
4	NCT04292730	US	6/30/2020	400	Hospitalized LRI	Ph 3	Gilead Sciences
5	NCT04321616	Ex-US	8/31/2020	233	Hospitalized LRI	Ph 2/3	Oslo University Hospital
6	NCT04409262	US	7/31/2020	225	Hospitalized LRI	Ph 3	Roche
7	PER-010-20	Ex-US	9/4/2020	200	Hospitalized LRI	Ph 1	OMS/OPS,
8	EUCTR2020-001366-11-IE	Ex-US	11/15/2020	200	Unknown	Ph 4	World Health Organisation
9	LBCTR2020043495	Ex-US	Unknown	200	Hospitalized LRI	Ph 3	WHO
10	EUCTR2020-001784-88-FI	Ex-US	4/29/2021	194	Hospitalized LRI	Ph 3	University of Helsinki

18 All other trials with ~3,200 patients for planned enrollment

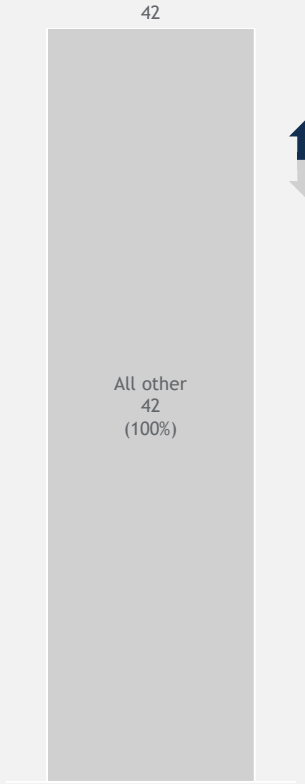
1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 2 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 3 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

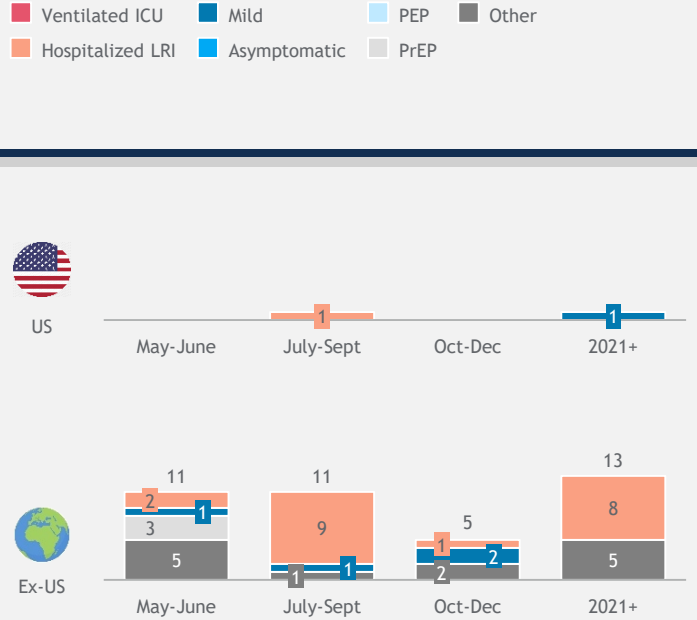
COVID-19 clinical development snapshot for favipiravir single agent

High interest areas: Remdesivir | **Favipiravir** | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | Dexamethasone | Other Corticosteroid | Conv. Plasma | Hyperimmune globulin | Neutralizing antibodies | Combo

Randomized, adequately powered trials[1]



Expected readouts by target severity[2]



Details of trial arms with readouts (may not be comprehensive) — USG sponsor marked in red

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Endpoint	Sponsor

No randomized, adequately powered trials underway as of 7/10 on Clinicaltrials.gov and 7/10 on WHO registry

Randomized, adequately powered

All Other

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Phase	Sponsor
1	NCT04448119	Ex-US	3/31/2021	380	Unknown	Ph 2	Appili Therapeutics Inc.
2	NCT04464408	Ex-US	12/31/2020	288	Unknown	Ph 2/3	King Abdullah International Medical Research Center
3	EUCTR2020-001435-27-FR	Ex-US	12/10/2020	282	Mild	Ph 3	CENTRE HOSPITALIER UNIVERSITAIRE DE BORDEAUX, ETABLISSEMENT PUBLIC
4	NCT04373733	Ex-US	3/31/2021	225	Hospitalized LRI	Ph 3	Chelsea and Westminster NHS Foundation Trust
5	NCT04356495	Ex-US	12/31/2020	211	Mild	Ph 3	University Hospital, Bordeaux
6	NCT04411433	Ex-US	7/30/2020	167	Hospitalized LRI	Ph 3	Ministry of Health, Turkey
7	NCT04411433	Ex-US	7/30/2020	167	Hospitalized LRI	Ph 3	Ministry of Health, Turkey
8	EUCTR2020-001904-41-GB	Ex-US	5/8/2021	151	Hospitalized LRI	Ph 3	NHS Greater Glasgow and Clyde
9	EUCTR2020-001449-38-GB	Ex-US	11/17/2020	150	Hospitalized LRI	Ph 3	Chelsea and Westminster Hospital NHS Foundation Trust
10	NCT04425460	Ex-US	8/31/2020	128	Hospitalized LRI	Ph 3	Zhejiang Hisun Pharmaceutical Co. Ltd.

38 All other trials with ~3,500 patients for planned enrollment

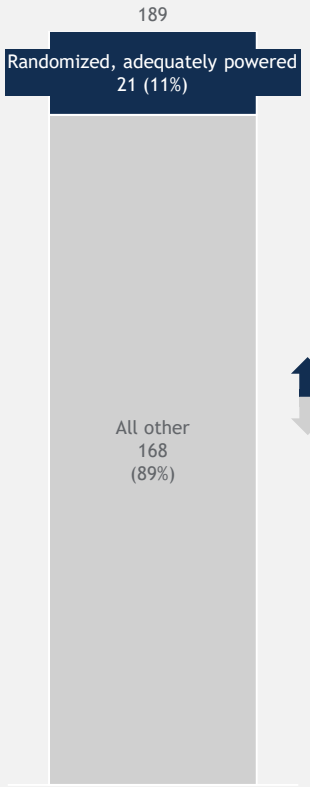
1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 2 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 3 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

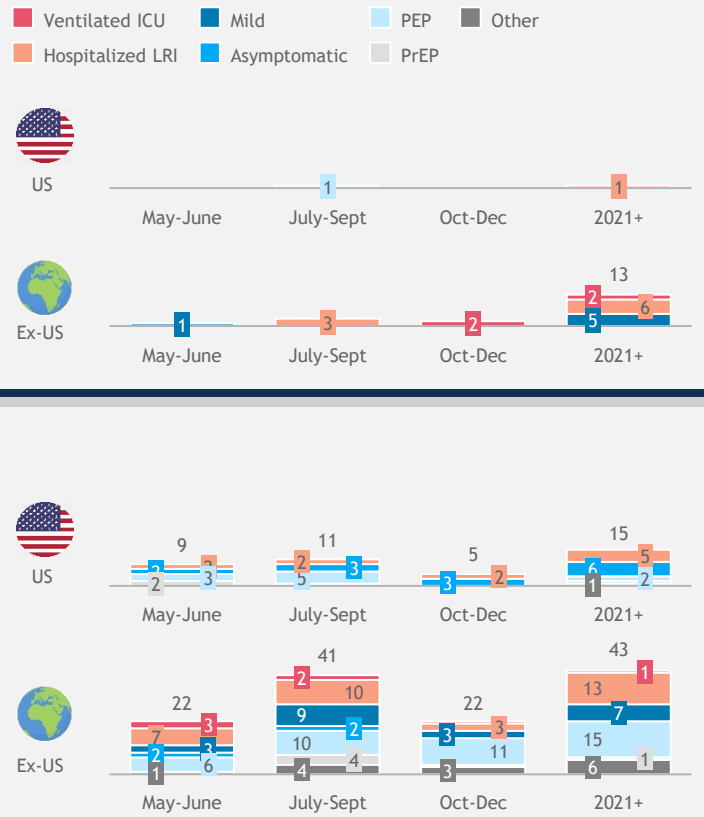
COVID-19 clinical development snapshot for HCQ single agent

High interest areas: **Remdesivir** | **Favipiravir** | **HCQ** | **Tocilizumab** | **Sarilumab** | **Baricitinib** | **TNF inhibitors** | **Dexamethasone** | **Other Corticosteroid** | **Conv. Plasma** | **Hyperimmune globulin** | **Neutralizing antibodies** | **Combo**

Randomized, adequately powered trials[1]



Expected readouts by target severity[2]



Details of trial arms with readouts (may not be comprehensive)

USG sponsor marked in red

Randomized, adequately powered

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Endpoint	Sponsor
1	NCT04304053	Ex-US	6/15/2020	1150	Mild	Markers of Clinical Status	Fundacio Lluita Contra la SIDA
2	NCT04334148	US	7/31/2020	7500	PEP	Infection Prevention	Adrian Hernandez
3	EUCTR2020-001271-33-FR	Ex-US	8/31/2020	650	Hospitalized LRI	Other/Unknown	CHU Angers
4	EUCTR2020-001366-11-ES	Ex-US	9/27/2020	500	Hospitalized LRI	Mortality	FIB-HCSC
5	NCT04325893	Ex-US	9/30/2020	650	Hospitalized LRI	Mortality	University Hospital, Angers
6	NCT04359095	Ex-US	10/11/2020	400	Ventilated ICU	Mortality	Universidad Nacional de Colombia
7	NCT04315896	Ex-US	10/31/2020	250	Ventilated ICU	Mortality	National Institute of Respiratory Diseases, Mexico
8	NCT04328012	US	1/1/2021	1000	Hospitalized LRI	Markers of Clinical Status	Bassett Healthcare
9	EUCTR2020-001501-24-IT	Ex-US	2/28/2021	1150	Mild	Viral Load/Clearance	ISTITUTO SCIENTIFICO ROMAGNOLO PER LO STUDIO E LA CURA DEI TUMORI (IRST) S.R.L. IRCCS
10	ISRCTN83971151	Ex-US	2/28/2021	2000	Hospitalized LRI	Mortality	World Health Organization

All Other

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Phase	Sponsor
1	CTRI/2020/05/025067	Ex-US	Unknown	5495	PEP	Unknown	George Institute for Global Health India
2	NCT04386070	Ex-US	5/14/2021	1600	PrEP	Ph 3	University of Birmingham
3	NCT04330144	Ex-US	3/30/2021	1243	PEP	Ph 3	Gangnam Severance Hospital
4	ACTRN12620000501943	Ex-US	12/31/2020	1125	PEP	Ph 2/3	Walter and Eliza Hall Institute of Medical Research
5	NCT04334928	Ex-US	6/30/2020	1000	PEP	Ph 3	Plan Nacional sobre el Sida (PNS)
6	NCT04446104	Ex-US	7/31/2020	1000	PrEP	Ph 3	National University Hospital, Singapore
7	NCT04328961	US	9/30/2020	1000	PEP	Ph 2/3	University of Washington
8	ChiCTR2000031174	Ex-US	9/30/2020	1000	PrEP	Unknown	Shanghai Public Health Clinical Center
9	ChiCTR2000032487	Ex-US	9/30/2020	1000	PrEP	Ph 4	Shanghai Public Health Clinical Center
10	NCT04400019	Ex-US	12/15/2020	965	PEP	Ph 2/3	University of Malaga

163 All other trials with ~49,000 patients for planned enrollment

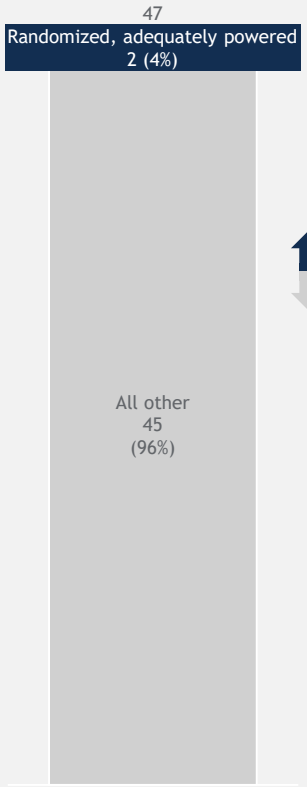
1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 2 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 3 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

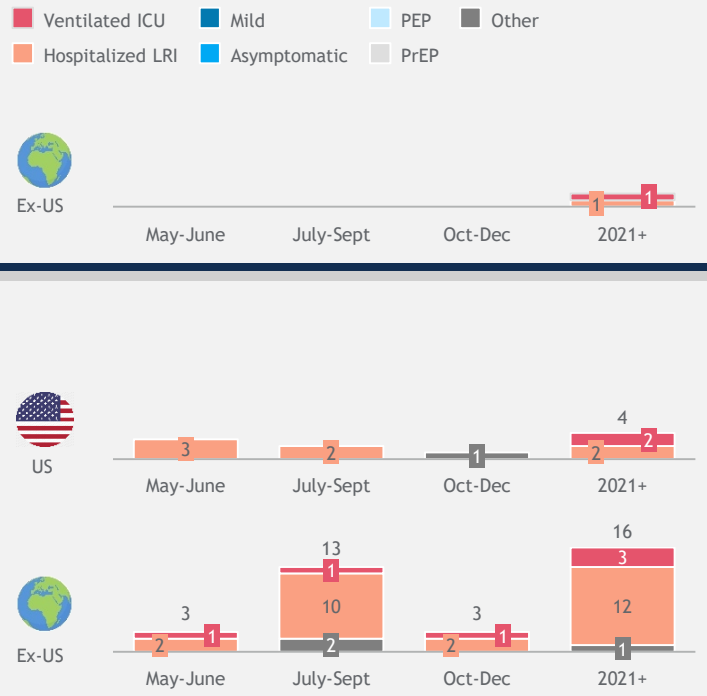
COVID-19 clinical development snapshot for tocilizumab single agent

High interest areas: Remdesivir | Favipiravir | HCQ | **Tocilizumab** | Sarilumab | Baricitinib | TNF inhibitors | Dexamethasone | Other Corticosteroid | Conv. Plasma | Hyperimmune globulin | Neutralizing antibodies | Combo

Randomized, adequately powered trials[1]



Expected readouts by target severity[2]



Details of trial arms with readouts (may not be comprehensive)

USG sponsor marked in red

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Endpoint	Sponsor
1	NCT04381936 *RECOVERY*	Ex-US	12/31/2021	2143	Hospitalized LRI	Mortality	University of Oxford
2	NCT02735707 *REMAP*	Ex-US	12/31/2021	309	Ventilated ICU	Mortality	MJM Bonten

Randomized, adequately powered

All Other

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Phase	Sponsor
1	NCT04445272	Ex-US	8/22/2020	500	Hospitalized LRI	Ph 2	Fundacion SEIMC-GESIDA
2	NCT04317092	Ex-US	12/19/2020	400	Ventilated ICU	Ph 2	National Cancer Institute, Naples
3	EUCTR2020-001995-13-ES	Ex-US	8/15/2020	250	Unknown	Ph 3	Fundación SEIMC-GESIDA
4	NCT04320615	US	8/31/2020	225	Hospitalized LRI	Ph 3	Roche
5	NCT04370834	US	11/1/2021	217	Ventilated ICU	Ph 2	National Cancer Institute (NCI)
6	EUCTR2020-001854-23-IT	Ex-US	8/27/2020	200	Hospitalized LRI	Ph 2/3	SOCIETA' ITALIANA MALATTIE INFETTIVE E TROPICALI
7	EUCTR2020-001854-23-IT	Ex-US	6/1/2021	200	Hospitalized LRI	Ph 2/3	SOCIETA' ITALIANA MALATTIE INFETTIVE E TROPICALI
8	NCT04363853	Ex-US	8/5/2020	200	Ventilated ICU	Ph 2	Instituto Nacional de Cancerologia de Mexico
9	NCT04372186	Ex-US	7/3/2021	190	Hospitalized LRI	Ph 3	Roche
10	EUCTR2020-001375-32-NL	Ex-US	10/31/2020	177	Hospitalized LRI	Ph 3	UMCG

45 All other trials with ~4,300 patients for planned enrollment

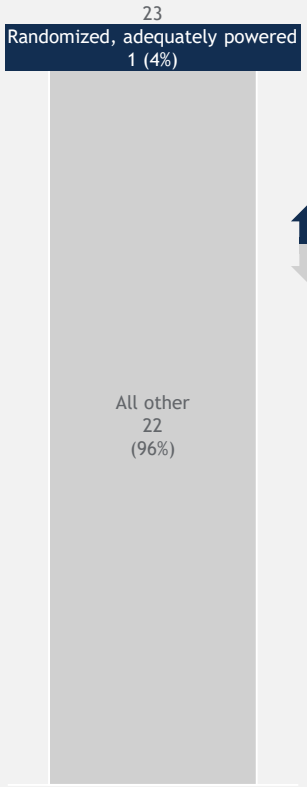
1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 2 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 3 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

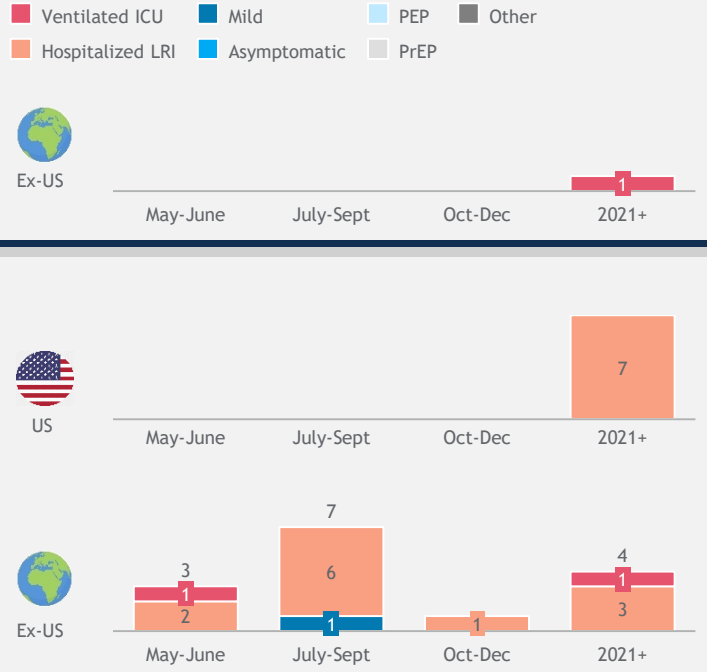
COVID-19 clinical development snapshot for sarilumab single agent

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | **Sarilumab** | Baricitinib | TNF inhibitors | Dexamethasone | Other Corticosteroid | Conv. Plasma | Hyperimmune globulin | Neutralizing antibodies | Combo

Randomized, adequately powered trials[1]



Expected readouts by target severity[2]



Details of trial arms with readouts (may not be comprehensive)

USG sponsor marked in red

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Endpoint	Sponsor
1	NCT02735707 *REMAP*	Ex-US	12/31/2021	309	Ventilated ICU	Mortality	MJM Bonten

Randomized, adequately powered

All Other

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Phase	Sponsor
1	NCT04315298	US	5/20/2021	417	Hospitalized LRI	Ph 2/3	Regeneron Pharmaceuticals
2	NCT04315298	US	5/20/2021	417	Hospitalized LRI	Ph 2/3	Regeneron Pharmaceuticals
3	NCT04315298	US	5/20/2021	417	Hospitalized LRI	Ph 2/3	Regeneron Pharmaceuticals
4	NCT04315298	US	5/20/2021	417	Hospitalized LRI	Ph 2/3	Regeneron Pharmaceuticals
5	NCT04315298	US	5/20/2021	417	Hospitalized LRI	Ph 2/3	Regeneron Pharmaceuticals
6	NCT04315298	US	5/20/2021	417	Hospitalized LRI	Ph 2/3	Regeneron Pharmaceuticals
7	NCT04345289	Ex-US	6/15/2021	250	Hospitalized LRI	Ph 3	Thomas Benfield
8	EUCTR2020-001854-23-IT	Ex-US	8/27/2020	200	Hospitalized LRI	Ph 2/3	SOCIETA' ITALIANA MALATTIE INFETTIVE E TROPICALI
9	NCT04327388	Ex-US	7/31/2020	133	Hospitalized LRI	Ph 3	Sanofi
10	NCT04327388	Ex-US	7/31/2020	133	Hospitalized LRI	Ph 3	Sanofi

22 All other trials with ~3,900 patients for planned enrollment

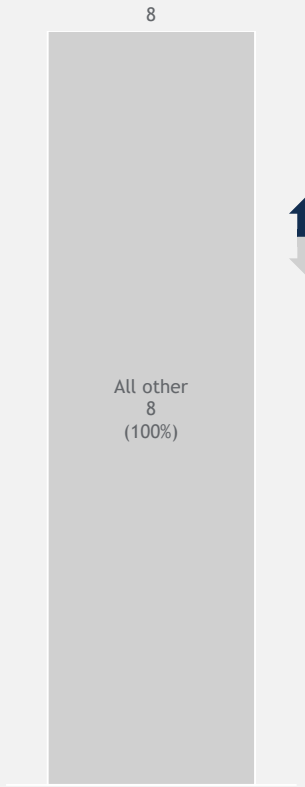
1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 2 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 3 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

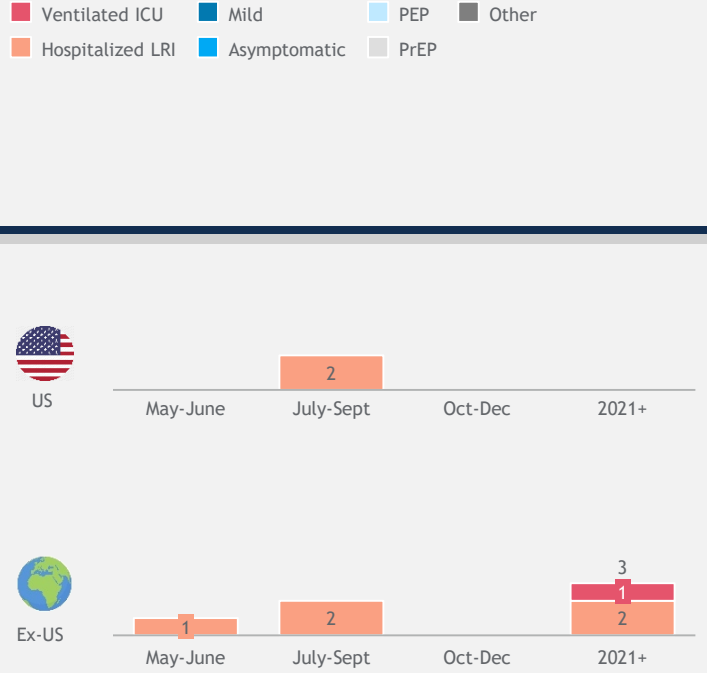
COVID-19 clinical development snapshot for baricitinib single agent

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | **Baricitinib** | TNF inhibitors | Dexamethasone | Other Corticosteroid | Conv. Plasma | Hyperimmune globulin | Neutralizing antibodies | Combo

Randomized, adequately powered trials[1]



Expected readouts by target severity[2]



Details of trial arms with readouts (may not be comprehensive) — USG sponsor marked in red

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Endpoint	Sponsor

No randomized, adequately powered trials underway as of 7/10 on Clinicaltrials.gov and 7/10 on WHO registry

Randomized, adequately powered

All Other

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Phase	Sponsor
1	NCT04390464	Ex-US	5/7/2021	389	Hospitalized LRI	Ph 4	Cambridge University Hospitals NHS Foundation Trust
2	NCT04321993	Ex-US	2/28/2022	333	Ventilated ICU	Ph 2	Lisa Barrett
3	NCT04345289	Ex-US	6/15/2021	250	Hospitalized LRI	Ph 3	Thomas Benfield
4	EUCTR2020-001854-23-IT	Ex-US	8/27/2020	200	Hospitalized LRI	Ph 2/3	SOCIETA' ITALIANA MALATTIE INFETTIVE E TROPICALI
5	NCT04421027	US	9/1/2020	200	Hospitalized LRI	Ph 3	Eli Lilly
6	NCT04340232	US	8/31/2020	80	Hospitalized LRI	Ph 2/3	University of Colorado, Denver
7	NCT04393051	Ex-US	6/30/2020	63	Hospitalized LRI	Ph 2	Azienda Ospedaliero, Universitaria Pisana
8	NCT04399798	Ex-US	9/15/2020	13	Hospitalized LRI	Ph 2	IRCCS Policlinico S. Matteo

8 All other trials with ~1,500 patients for planned enrollment

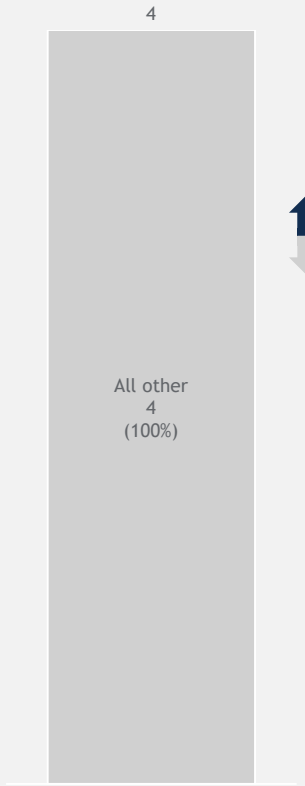
1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 2 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 3 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

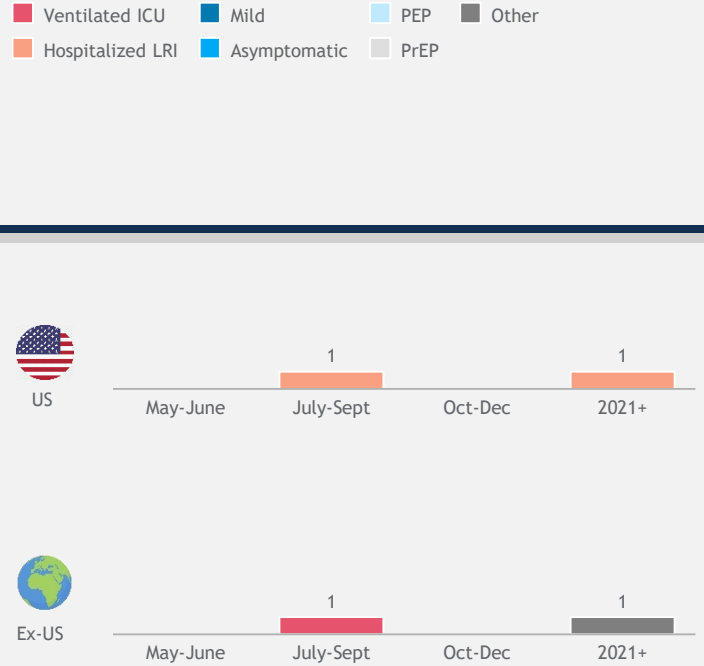
COVID-19 clinical development snapshot for TNF inhibitors single agent

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | **TNF inhibitors** | Dexamethasone | Other Corticosteroid | Conv. Plasma | Hyperimmune globulin | Neutralizing antibodies | Combo

Randomized, adequately powered trials[1]



Expected readouts by target severity[2]



Details of trial arms with readouts (may not be comprehensive) — **USG sponsor marked in red**

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Endpoint	Sponsor

No randomized, adequately powered trials underway as of 7/10 on Clinicaltrials.gov and 7/10 on WHO registry

Randomized, adequately powered

All Other

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Phase	Sponsor
1	NCT04370236	US	2/28/2021	183	Hospitalized LRI	Ph 2/3	Inmune Bio, Inc.
2	IRCT20200312046749N1	Ex-US	3/28/2021	40	Unknown	Ph 2/3	Tehran University of Medical Sciences
3	ChiCTR2000030089	Ex-US	8/31/2020	30	Ventilated ICU	Ph 4	Shanghai Changzheng Hospital
4	NCT04425538	US	9/30/2020	17	Unknown	Ph 2	Tufts Medical Center

4 All other trials with ~300 patients for planned enrollment

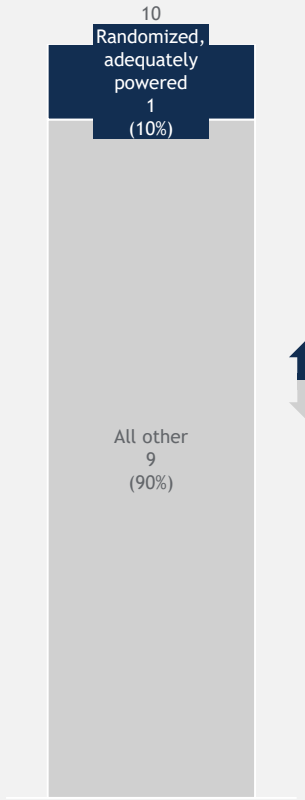
1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 2 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 3 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

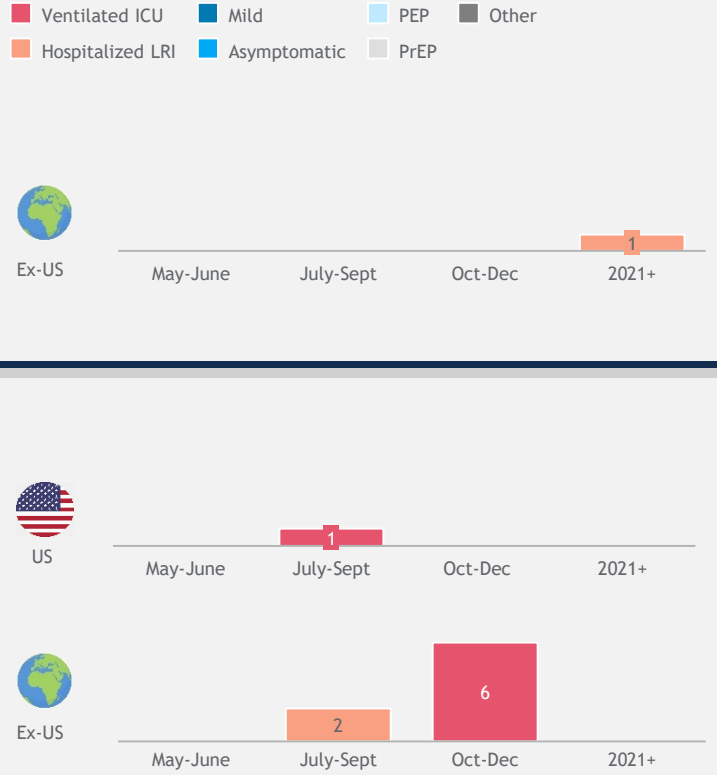
COVID-19 clinical development snapshot for dexamethasone single agent

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | **Dexamethasone** | Other Corticosteroid | Conv. Plasma | Hyperimmune globulin | Neutralizing antibodies | Combo

Randomized, adequately powered trials[1]



Expected readouts by target severity[2]



Details of trial arms with readouts (may not be comprehensive) — USG sponsor marked in red

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Endpoint	Sponsor
1	NCT04381936 *(RECOVERY)*	Ex-US	12/31/2021	2143	Hospitalized LRI	Mortality	University of Oxford

Randomized, adequately powered

All Other

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Phase	Sponsor
1	NCT04327401	Ex-US	8/30/2020	175	Hospitalized LRI	Ph 3	Hospital Sirio-Libanes
2	NCT04395105	Ex-US	12/31/2020	142	Ventilated ICU	Ph 3	Centro de Educación Medica e Investigaciones
3	NCT04325061	Ex-US	10/30/2020	100	Ventilated ICU	Ph 4	Dr. Negrin University Hospital
4	NCT04344730	Ex-US	12/31/2020	69	Ventilated ICU	Unknown	Assistance Publique - Hôpitaux de Paris
5	NCT04344730	Ex-US	12/31/2020	69	Ventilated ICU	Unknown	Assistance Publique - Hôpitaux de Paris
6	NCT04344730	Ex-US	12/31/2020	69	Ventilated ICU	Unknown	Assistance Publique - Hôpitaux de Paris
7	NCT04344730	Ex-US	12/31/2020	69	Ventilated ICU	Unknown	Assistance Publique - Hôpitaux de Paris
8	NCT04360876	US	9/30/2020	45	Ventilated ICU	Ph 2	University of Colorado
9	IRCT20120215009014N354	Ex-US	9/02/2020	20	Hospitalized LRI	Ph 2	Hamedan University of Medical Sciences

9 All other trials with ~750 patients for planned enrollment

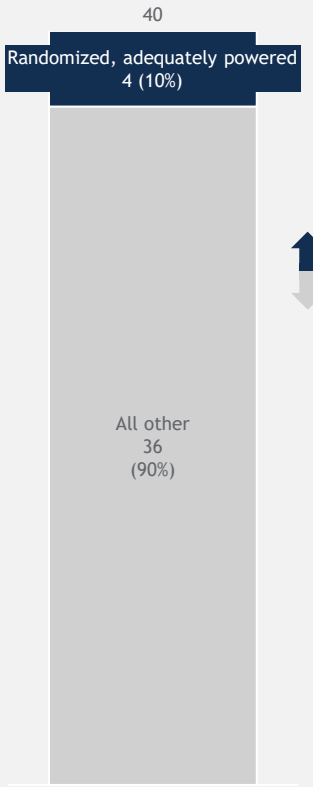
1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 2 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 3 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

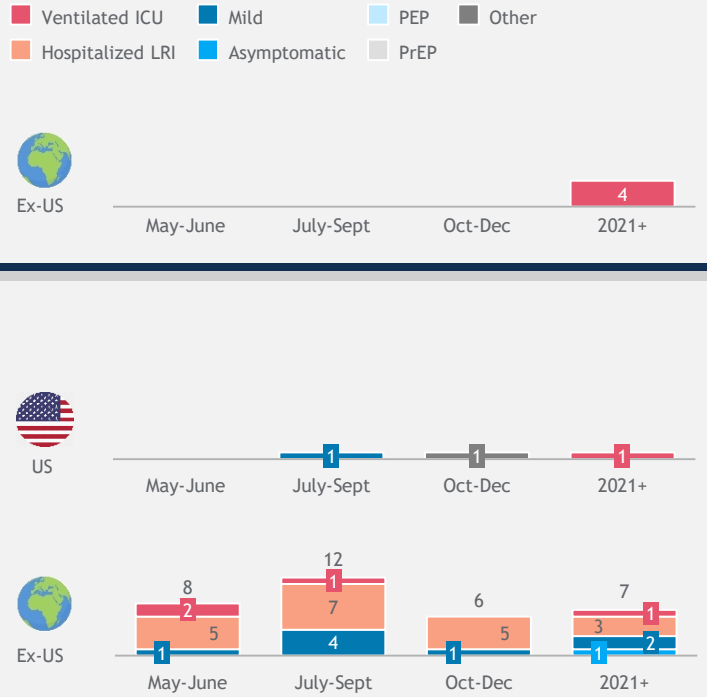
COVID-19 clinical development snapshot for other corticosteroid[1] single agent

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | Dexamethasone | **Other Corticosteroid** | Conv. Plasma | Hyperimmune globulin | Neutralizing antibodies | Combo

Randomized, adequately powered trials[2]



Expected readouts by target severity[3]



Details of trial arms with readouts (may not be comprehensive) — USG sponsor marked in red

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[4]	Severity	Endpoint	Sponsor
1	NCT04348305	Ex-US	3/30/2021	500	Ventilated ICU	Mortality	Scandinavian Critical Care Trials Group
2	NCT02735707 *(REMAP)*	Ex-US	12/31/2021	309	Ventilated ICU	Mortality	MJM Bonten
3	NCT02735707 *(REMAP)*	Ex-US	12/31/2021	309	Ventilated ICU	Mortality	MJM Bonten
4	NCT02735707 *(REMAP)*	Ex-US	12/31/2021	309	Ventilated ICU	Mortality	MJM Bonten

Randomized, adequately powered

All Other

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Phase	Sponsor
1	EUCTR2020-001889-10-GB	Ex-US	9/6/2020	239	Mild	Ph 3	University of Oxford, Clinical Trials and Research Governance
2	NCT04416399	Ex-US	11/15/2020	239	Mild	Ph 2	University of Oxford
3	NCT04435795	Ex-US	2/25/2021	227	Mild	Ph 2/3	McGill University Health Centre
4	NCT04381364	Ex-US	12/1/2020	223	Hospitalized LRI	Ph 2	Ola Blennow, MD, PhD
5	NCT04343729	Ex-US	6/16/2020	208	Ventilated ICU	Ph 2	Fundação de Medicina Tropical Dr. Heitor Vieira Dourado
6	EUCTR2020-001854-23-IT	Ex-US	8/27/2020	200	Hospitalized LRI	Ph 2/3	SOCIETA' ITALIANA MALATTIE INFETTIVE E TROPICALI
7	NCT04377711	US	9/1/2020	200	Mild	Ph 3	Covis Pharma S.à.r.l.
8	NCT04345445	Ex-US	10/31/2020	155	Hospitalized LRI	Ph 3	University of Malaya
9	NCT04344288	Ex-US	11/30/2020	152	Hospitalized LRI	Ph 2	Hospices Civils de Lyon
10	NCT04359511	Ex-US	12/31/2020	105	Hospitalized LRI	Ph 3	University Hospital, Tours

36 All other trials with ~3,100 patients for planned enrollment

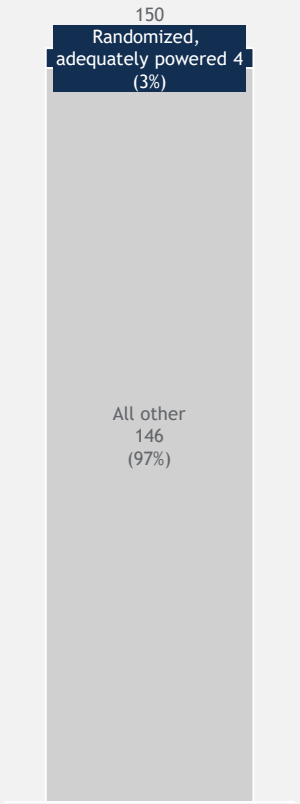
1 Non-dexamethasone corticosteroids. 2 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 3 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 4 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

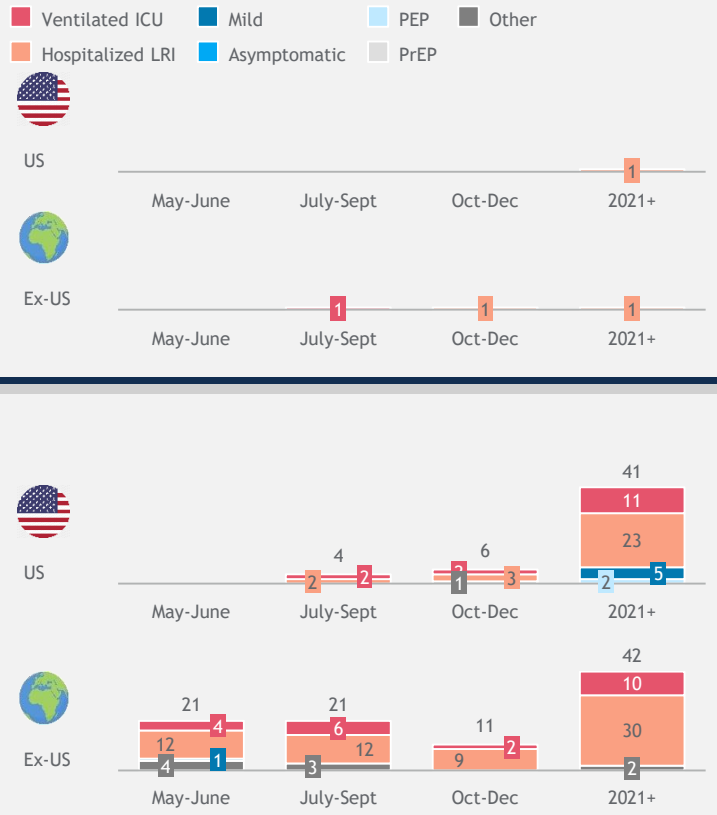
COVID-19 clinical development snapshot for convalescent plasma

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | Dexamethasone | Other Corticosteroid | **Conv. Plasma** | Hyperimmune globulin | Neutralizing antibodies | Combo

Randomized, adequately powered trials[1]



Expected readouts by target severity[2]



Details of trial arms with readouts (may not be comprehensive)

USG sponsor marked in red

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Endpoint	Sponsor
1	NCT04381858	Ex-US	8/30/2020	250	Ventilated ICU	Mortality	Centenario Hospital Miguel Hidalgo
2	NCT04348656	Ex-US	10/31/2020	600	Hospitalized LRI	Mortality	Hamilton Health Sciences Corporation
3	NCT04418518	US	6/30/2021	600	Hospitalized LRI	Mortality	Weill Medical College of Cornell University
4	NCT04381936	Ex-US	12/31/2021	2143	Hospitalized LRI	Mortality	University of Oxford

Randomized, adequately powered — All Other

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Phase	Sponsor
1	NCT04352751	Ex-US	4/30/2021	2000	Hospitalized LRI	Unknown	Hilton Pharma
2	NCT04373460	US	12/21/2022	672	Mild	Ph 2	Johns Hopkins University
3	NCT04355767	US	12/31/2022	300	Mild	Ph 3	Stanford University
4	NCT04344535	US	4/30/2021	250	Hospitalized LRI	Ph 1/2	Stony Brook University
5	NCT04362176	US	4/30/2021	250	Hospitalized LRI	Ph 3	Vanderbilt University Medical Center
6	NCT04345289	Ex-US	6/15/2021	250	Hospitalized LRI	Ph 3	Thomas Benfield
7	NCT04432272	US	6/30/2021	250	Hospitalized LRI	Ph 2	William Beaumont Hospitals
8	NCT04432272	US	6/30/2021	250	Hospitalized LRI	Ph 2	William Beaumont Hospitals
9	NCT04323800	US	12/31/2022	244	PEP	Ph 2	Johns Hopkins University
10	NCT04429854	Ex-US	11/2/2021	242	Hospitalized LRI	Ph 2	Universitaire Ziekenhuizen Leuven

146 All other trials with ~12,000 patients for planned enrollment

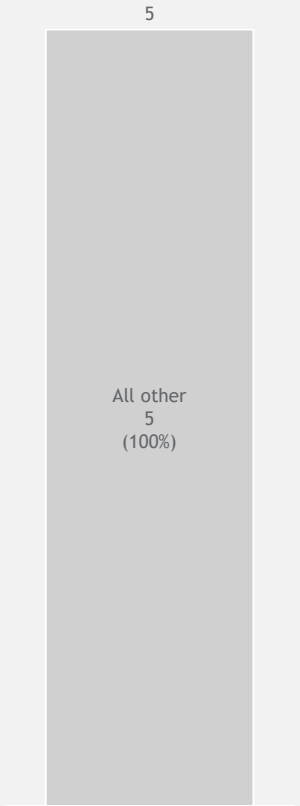
1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 2 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 3 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

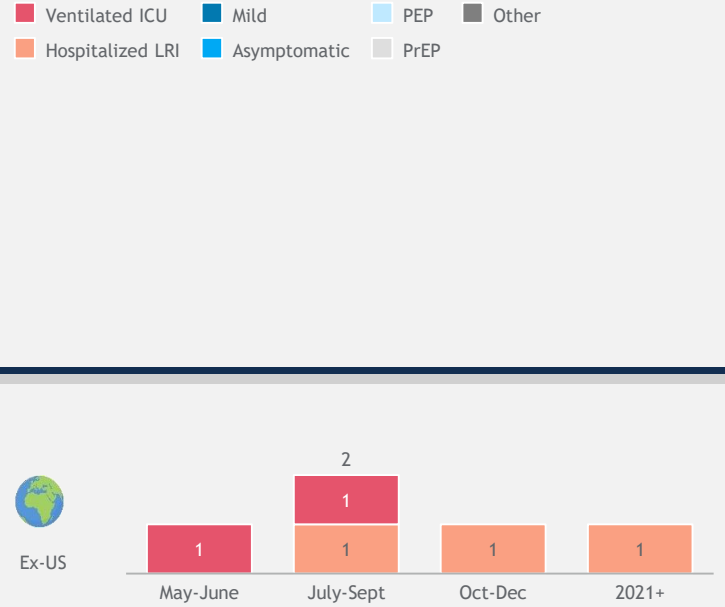
COVID-19 clinical development snapshot for hyperimmune globulin

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | Dexamethasone | Other Corticosteroid | Conv. Plasma | **Hyperimmune globulin** | Neutralizing antibodies | Combo

Randomized, adequately powered trials[1]



Expected readouts by target severity[2]



Details of trial arms with readouts (may not be comprehensive) — USG sponsor marked in red

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Endpoint	Sponsor

No randomized, adequately powered trials underway as of 7/10 on Clinicaltrials.gov and 7/10 on WHO registry

Randomized, adequately powered

All Other

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Phase	Sponsor
1	IRCT20200508047346N1	Ex-US	4/2/2021	62	Hospitalized LRI	Ph 3	Kowsar Biotechnology Co.
2	NCT04395170	Ex-US	12/31/2020	25	Hospitalized LRI	Ph 2/3	Lifefactors Zona Franca, SAS
3	NCT04346589	Ex-US	7/31/2020	10	Ventilated ICU	Unknown	A.O. Ospedale Papa Giovanni XXIII
4	NCT04418531	Ex-US	9/30/2020	10	Hospitalized LRI	Unknown	Piero Luigi Ruggenenti
5	ChiCTR2000030841	Ex-US	5/31/2020	5	Ventilated ICU	Ph 1	Union hospital of Tongji Medical College

5 All other trials with ~100 patients for planned enrollment

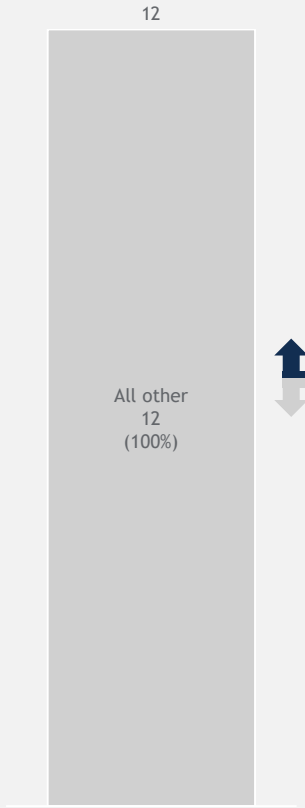
1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 2 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 3 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

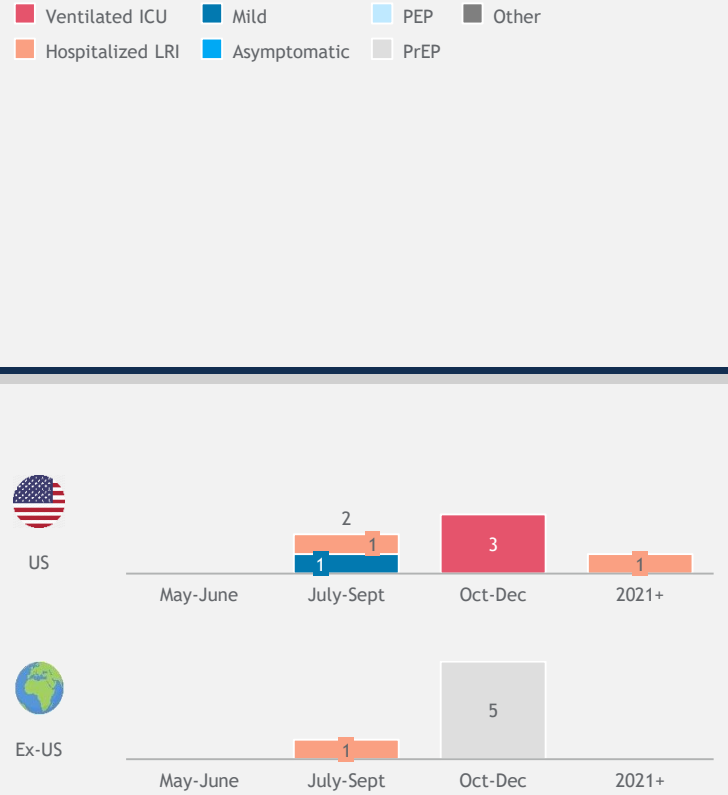
COVID-19 clinical development snapshot for neutralizing antibodies

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | Dexamethasone | Other Corticosteroid | Conv. Plasma | Hyperimmune globulin | **Neutralizing antibodies** | Combo

Randomized, adequately powered trials[1]



Expected readouts by target severity[2]



Details of trial arms with readouts (may not be comprehensive)

USG sponsor marked in red

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Endpoint	Sponsor

No randomized, adequately powered trials underway as of 7/10 on Clinicaltrials.gov and 7/10 on WHO registry

Randomized, adequately powered

All Other

#	Trial ID	US/Ex-US	Readout date	Planned enrollment[3]	Severity	Phase	Sponsor
1	NCT04427501	US	9/15/2020	200	Mild	Ph 2	Eli Lilly
2	NCT04453384	Ex-US	09/30/2020	184	Hospitalized LRI	Ph 2	Nantes University Hospital
3	NCT04432766	US	10/3/2020	58	Ventilated ICU	Ph 1	Bio-Thera Solutions
4	NCT04432766	US	10/3/2020	58	Ventilated ICU	Ph 1	Bio-Thera Solutions
5	NCT04432766	US	10/3/2020	58	Ventilated ICU	Ph 1	Bio-Thera Solutions
6	NCT04411628	US	8/23/2020	20	Hospitalized LRI	Ph 1	Eli Lilly
7	NCT04441918	Ex-US	12/11/2020	20	PrEP	Ph 1	Shanghai Junshi Bioscience Co., Ltd.
8	NCT04454398	US	01/31/2021	12	Hospitalized LRI	Ph 1	Sorrento Therapeutics, Inc.
9	NCT04429529	Ex-US	10/31/2020	3	PrEP	Ph 1	Tychan Pte Ltd.
10	NCT04429529	Ex-US	10/31/2020	3	PrEP	Ph 1	Tychan Pte Ltd.

12 All other trials with ~600 patients for planned enrollment

There are 6 additional trial arms involving a combination product: Regeneron sponsored trial arms involving two antibodies

1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 2 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 3 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

COVID-19 pre-clinical development snapshot for neutralizing antibodies[1] (1/5)

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | CTLA-4 | Cortico-steroids | Conv. Plasma | Hyperimmune globulin | **Neutralizing antibodies** | Combo

COVID-19 neutralizing antibodies in pre-clinical development2

Organization	Product description[3]	Estimated start date[4]	Additional notes[4]
Celltrion	Antibody to SAR-CoV-2 Spike (S) protein that recognizes multiple epitopes	Jul-20	Product CT-P59
AstraZeneca; Vanderbilt University; Chinese Academy of Sciences	SARS-CoV-2 spike protein (SARS-CoV-2 S)	Aug-20	Monoclonal antibody combination therapy; supported by BARDA, DoD
Distributed Bio; Centivax; SwiftScale Biologics	Monoclonal antibodies targeting the SARS-CoV-2 receptor binding domain, blocking ACE2 receptor interaction with the virus	Summer 2020	Discovery phase; several candidates have been identified
Brii Bio; Tsinghua University; Third People's Hospital of Shenzhen	Fully human neutralizing antibodies characterized from convalescent patients in China	Q3 2020	Products BRII-196 and BRII-198
Sorrento Therapeutics	SARS-CoV-2 spike protein (SARS-CoV-2 S)	Q3 2020[5]	Products COVID-GUARD (STI-1499), COVI-SHIELD (cocktail), COVIDTRAP (STI-4398)
Vir Biotechnology; GlaxoSmithKline	VIR-7831 and VIR-7832, antibodies with an affinity for the SARS-CoV-2 spike protein	Q3 2020	Product VIR-7831; expected start date July-September 2020
Vir Biotechnology; GlaxoSmithKline	VIR-7831 and VIR-7832, antibodies with an affinity for the SARS-CoV-2 spike protein	Q3 2020	Product VIR-7832; expected start date July-September 2020
Boehringer Ingelheim; Yumab	Fully human monoclonal antibodies that bind to a SARS-CoV-2 surface protein	Fall 2020	May overlap with Yumab (CORAT Therapeutics) effort
Virna Therapeutics; University of Toronto	SARS-CoV-2 neutralizing antibodies against the Spike (S) protein	Fall 2020	
Bharat Biotech; Council of Scientific and Industrial Research (India)	Cocktail of SARS-CoV-2 virus-neutralizing antibodies	Dec-20	Discovery phase; no evidence of a specific candidate
Yumab (CORAT Therapeutics)	Undisclosed	Dec-20	May overlap with Boehringer Ingelheim collaboration

1 May not be comprehensive. 2 Based on public sources; excludes products which are included in the clinical development snapshot as registered clinical trials. 3 Language included in Pinksheet or Biocentury, may include other ongoing work (e.g., discovery services). 4 Based on press search. 5 STI-1499 (COVID-GUARD) monotherapy trial ongoing; estimated launch date of Q3 2020 for COVID-SHIELD antibody cocktail

Source: Pinksheet accessed 7/13/2020, Biocentury accessed 7/13/2020, press releases

COVID-19 pre-clinical development snapshot for neutralizing antibodies[1] (2/5)

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | CTLA-4 | Cortico-steroids | Conv. Plasma | Hyperimmune globulin | **Neutralizing antibodies** | Combo

COVID-19 neutralizing antibodies in pre-clinical development[2]

Organization	Product description[3]	Estimated start date[4]	Additional notes[4]
Memo Therapeutics	Undisclosed	Q4 2020[5]	Identified antibodies; no evidence of specific product
Neurimmune; Ethris	Inhaled mRNA-encoded antibodies to neutralize SARS-CoV-2	Q4 2020	Product NI007; discovery phase
Beroni Group; Tianjin University	Undisclosed	H2 2020	Identified 24 types of nanobodies to support the development of a COVID-19 treatment
Kleo Pharmaceuticals; Green Cross LabCell (GCLC)	Kleo's antibody recruiting molecule (ARM) synthetic bispecific platform combined with GCLC's allogeneic natural killer (NK) cell therapy	H2 2020	Antibody recruiting molecule and NK cell combination therapy
Atreca, IGM Biosciences, Beigene	Undisclosed	H1 2021	Discovery phase focused on IgM and IgA antibodies; no specific candidate identified
Kleo Pharmaceuticals	SARS-CoV-2 spike protein (SARS-CoV-2 S)	H1 2021	Hyperimmunoglobulin mimic
Abbvie; Harbour BioMed	47D11, a fully human monoclonal antibody that binds to a domain conserved in both SARS-CoV and SARS-CoV-2		Product 47D11
Abcore	SARS-CoV-2 spike protein (SARS-CoV-2 S)		Discovered a panel of therapeutic candidates
Ablexis; AlivaMab; Berkeley Lights	SARS-CoV-2 spike protein (SARS-CoV-2 S)		Discovered a panel of therapeutic candidates
Amgen; Adaptive Biotechnologies	Neutralizing antibodies to SARS-CoV-2 derived from study of convalescent patients using Amgen subsidiary deCode's genetic analysis and Adaptive's screening for diversity of B-cell receptors		Discovery phase; no evidence of a specific candidate
AstraZeneca	Undisclosed		Work may overlap with listed partnerships

1 May not be comprehensive. 2 Based on public sources; excludes products which are included in the clinical development snapshot as registered clinical trials. 3 Language included in Pinksheet or Biocentury, may include other ongoing work (e.g., discovery services). 4 Based on press search. 5 PoC study anticipated in Q4.

Source: Pinksheet accessed 7/13/2020, Biocentury accessed 7/13/2020, press releases

COVID-19 pre-clinical development snapshot for neutralizing antibodies[1] (3/5)

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | CTLA-4 | Cortico-steroids | Conv. Plasma | Hyperimmune globulin | **Neutralizing antibodies** | Combo

COVID-19 neutralizing antibodies in pre-clinical development[2]

Organization	Product description[3]	Estimated start date[4]	Additional notes[4]
AstraZeneca; University of Maryland; USAMRIID	SARS-CoV-2 spike protein (SARS-CoV-2 S)		Partners conducting preclinical safety and efficacy assessments of candidates; work may overlap with Vanderbilt collaboration
Bio-Thera Solutions	SARS-CoV-2 spike protein (SARS-CoV-2 S)		Product BAT2019
Celltrion	Cocktail of antibodies to SARS-CoV-2		May overlap with product CT-P59 effort
Chugai; Agency for Science; Technology and Research (A*STAR; Singapore)	Therapeutic antibody isolated from a high diversity synthetic human antibody library at A*STAR's Singapore Immunology Network, optimized using Chugai's antibody engineering technologies		Discovery phase; potential therapeutic antibody identified
Creative Biolabs	SARS-CoV-2 spike protein (SARS-CoV-2 S)		Services; not a specific candidate
Doherty Institute	Undisclosed		No evidence of specific candidate
Eli Lilly; AbCellera	Cocktail of coronavirus antibody therapies modelled on antibodies from convalescent COVID-19 patients, using AbCellera's rapid pandemic response platform		Cocktail could include product Ly-CoV555 and product JS016
Eutilex	COVID-19 therapeutic antibody[5]		
FairJourney; Iontas	Undisclosed		Antibody discovery services; not a specific candidate
Flanders Institute for Biotechnology (VIB); Ghent University	SARS-CoV-2 spike protein (SARS-CoV-2 S); MERS-CoV S protein; Fc gamma receptor (FCGR)		Work may overlap with University of Texas at Austin efforts
Fred Hutchinson Cancer Research Center	SARS-CoV-2 spike protein (SARS-CoV-2 S)		Discovery phase; no candidate identified
ImmuneCyte	SARS-CoV-2 spike protein (SARS-CoV-2 S)		Discovery phase; four candidates have been identified

1 May not be comprehensive. 2 Based on public sources; excludes products which are included in the clinical development snapshot as registered clinical trials. 3 Language included in Pinksheet or Biocentury, may include other ongoing work (e.g., discovery services). 4 Based on press search. 5 Listed as neutralizing antibody in Pinksheet but immunostimulant in Biocentury.

Source: Pinksheet accessed 7/13/2020, Biocentury accessed 7/13/2020, press releases

COVID-19 pre-clinical development snapshot for neutralizing antibodies[1] (4/5)

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | CTLA-4 | Cortico-steroids | Conv. Plasma | Hyperimmune globulin | **Neutralizing antibodies** | Combo

COVID-19 neutralizing antibodies in pre-clinical development[2]

Organization	Product description[3]	Estimated start date[4]	Additional notes[4]
ImmunoPrecise Antibodies; EVQLV	COVID-19 therapeutic antibodies		Numerous lead candidates identified
Israel Institute for Biological Research (IIBR); Dyadic International	Undisclosed		Discovery phase; no evidence of a specific candidate
Kleo Pharmaceuticals; Celularity	Kleo's antibody recruiting molecule (ARM) synthetic bispecific platform combined with Celularity's human placenta-derived allogeneic natural killer (NK) cells		Antibody recruiting molecule and NK cell combination therapy
Mabpharm; Sorrento Therapeutics	ACE-MAB, also known as STI-4920 and CMAB020, a bi-specific fusion protein that binds to the spike protein		ACE-MAB fusion protein. Sorrento product STI-4920 / Mabpharm product CMAB020
Mateon Therapeutics	COVID-19 antibody therapy		Antisense against TGF-beta protein. Product OT-101
Mitsubishi Tanabe (Medicago); Laval University	SARS-CoV-2 antibodies		Discovery phase; no candidate identified
Nascent Biotech	Pritumumab, a fully natural human IgG antibody that targets ecto-domain vimentin		Product Pritumumab
National Institutes of Health	Undisclosed		Work may overlap with University of Texas at Austin effort
Ology Bioservices; Vanderbilt University Medical Center; Evotec Biologics	Human monoclonal antibodies to SARS-CoV-2 for the Department of Defense Pandemic Preparation Program		In collaboration with DoD
Ossianix	SARS-CoV-2 spike protein (SARS-CoV-2 S)		Screening VNAR antibodies
Shanghai Henlius Biotech; Sanyou Biopharmaceuticals; Shanghai ZJ Bio-Tech	SARS-CoV-2 spike protein (SARS-CoV-2 S)		
SK Bioscience	COVID-19 therapeutic antibody		

1 May not be comprehensive. 2 Based on public sources; excludes products which are included in the clinical development snapshot as registered clinical trials. 3 Language included in Pinksheet or Biocentury, may include other ongoing work (e.g., discovery services). 4 Based on press search.

Source: Pinksheet accessed 7/13/2020, Biocentury accessed 7/13/2020, press releases

COVID-19 pre-clinical development snapshot for neutralizing antibodies[1] (5/5)

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | CTLA-4 | Cortico-steroids | Conv. Plasma | Hyperimmune globulin | **Neutralizing antibodies** | Combo

COVID-19 neutralizing antibodies in pre-clinical development[2]

Organization	Product description[3]	Estimated start date[4]	Additional notes[4]
Specifica	Neutralizing antibodies against SARS-CoV-2 spike protein using Generation 3 library platform		
Symvivo Corporation	Undisclosed		
Twist Bioscience	Monoclonal antibodies that bind to the receptor binding domain (RBD) on the S1 spike protein of SARS-CoV-2		Possibly in partnership with Serimmune
Twist Bioscience	Monoclonal antibodies that bind to the extracellular domain (ECD) of ACE2 in human cells		Possibly in partnership with Serimmune
University of Texas at Austin; NIH; Ghent University	SARS-CoV-2 spike protein (SARS-CoV-2 S)		Camelid antibody
Vir Biotechnology	Monoclonal antibodies targeting SARS-CoV-2 surface glycoproteins		Work may overlap with listed partnerships
Vir Biotechnology; Generation Bio	Vir's neutralizing antibodies combined with Generation's non-viral gene therapy platform based on closed-ended DNA (ceDNA) and a cell-targeted nanoparticle delivery system (ctLNP)		Technology and manufacturing partnership; may not represent a unique product
Vir Biotechnology; WuXi Biologics and Biogen	Fc engineered monoclonal antibody that binds to a SARS-CoV-2 epitope that is shared with SARS-CoV-1		Manufacturing partnerships; may not represent a unique product
Vir Biotechnology; WuXi Biologics and Biogen	Fc engineered monoclonal antibody that binds to a SARS-CoV-2 epitope, with a "vaccinal" mutation to increase short-term potency and generate CD8+ T cells		Manufacturing partnerships; may not represent a unique product
Vir Biotechnology; Xencor	Undisclosed		Not a product; technology license agreement
Virna Therapeutics; University of Toronto	SARS-CoV-2 neutralizing antibodies against additional epitopes on the Spike (S) protein		May overlap with other Virna Therapeutics work
XBiotech; BioBridge	Antibodies isolated from blood donors with a vigourous antibody response against SARS-CoV-2 in the absence of serious COVID-19 illness, using XBiotech's True Human antibody process		

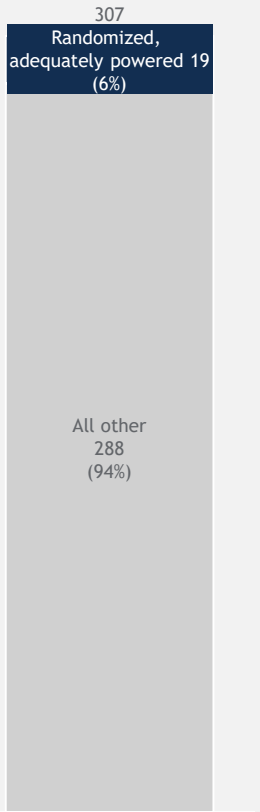
1 May not be comprehensive. 2 Based on public sources; excludes products which are included in the clinical development snapshot as registered clinical trials. 3 Language included in Pinksheet or Biocentury, may include other ongoing work (e.g., discovery services). 4 Based on press search.

Source: Pinksheet accessed 7/13/2020, Biocentury accessed 7/13/2020, press releases

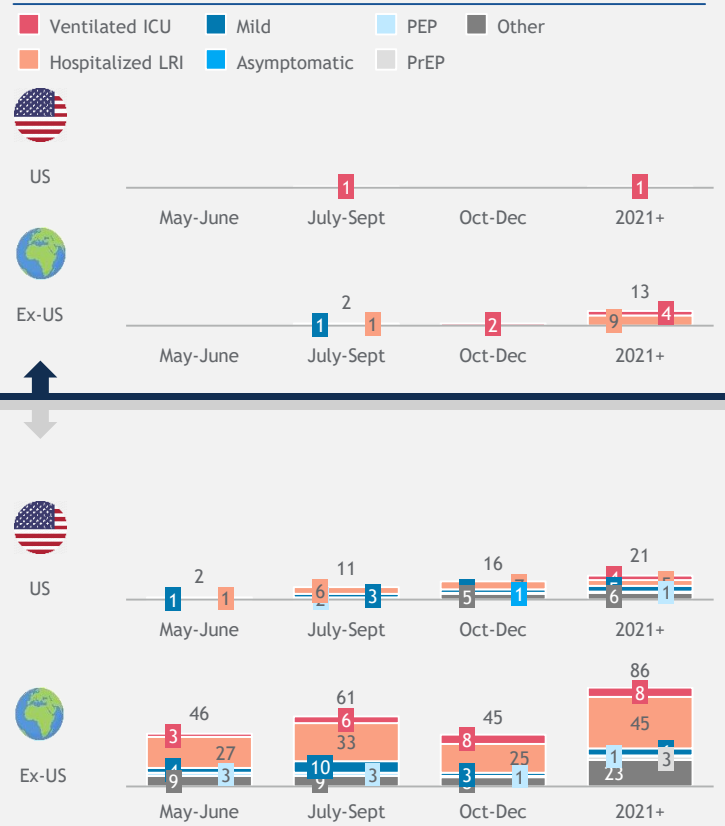
COVID-19 clinical development snapshot for combination agents (1/2)

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | Dexamethasone | Other Corticosteroid | Conv. Plasma | Hyperimmune globulin | Neutralizing antibodies | **Combo**

Randomized, adequately powered trials[1]



Expected readouts by target severity[2]



Details of trial arms with readouts (may not be comprehensive) — USG sponsor marked in red

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment[3]	Severity	Endpoint	Sponsor
1	NCT04371406	Ex-US	08/02/2020	1385	Mild	Mortality	Assistance Publique - Hôpitaux de Paris
2	NCT04370262	US	09/07/2020	471	Ventilated ICU	Mortality	Northwell Health, BARDA
3	EUCTR2020-001366-11-ES	Ex-US	09/27/2020	500	Hospitalized LRI	Mortality	FIB-HCSC
4	NCT04359095	Ex-US	10/11/2020	400	Ventilated ICU	Mortality	Universidad Nacional de Colombia
5	NCT04359095	Ex-US	10/11/2020	400	Ventilated ICU	Mortality	Universidad Nacional de Colombia
6	ISRCTN83971151	Ex-US	02/28/2021	2000	Hospitalized LRI	Mortality	World Health Organization
7	NCT04343001	Ex-US	04/30/2021	1250	Hospitalized LRI	Mortality	London School of Hygiene and Tropical Medicine
8	NCT04343001	Ex-US	04/30/2021	1250	Hospitalized LRI	Mortality	London School of Hygiene and Tropical Medicine
9	NCT04343001	Ex-US	04/30/2021	1250	Hospitalized LRI	Mortality	London School of Hygiene and Tropical Medicine
10	NCT04343001	Ex-US	04/30/2021	1250	Hospitalized LRI	Mortality	London School of Hygiene and Tropical Medicine

Randomized, adequately powered

All Other

#	Trial ID	US/ Ex-US	Readout date	Planned enrollment	Severity	Phase	Sponsor
1	NCT04458948	US	3/24/2021	10000	Hospitalized LRI	Ph 2	University of New Mexico
2	NCT04386070	Ex-US	5/14/2021	1600	PrEP	Ph 3	University of Birmingham
3	NCT04333407	Ex-US	3/30/2021	1585	Hospitalized LRI	Unknown	Imperial College London
4	NCT04351490	Ex-US	7/31/2020	1570	Mild	Unknown	University Hospital, Lille
5	NCT04320238	Ex-US	5/31/2020	1472	PEP	Ph 3	Shanghai Jiao Tong University School of Medicine
6	NCT04334928	Ex-US	6/30/2020	1000	PEP	Ph 3	Plan Nacional sobre el Sida (PNS)
7	NCT04452318	Ex-US	4/11/2021	1000	PEP	Ph 3	Regeneron Pharmaceuticals
8	NCT04426695	US	3/3/2021	620	Ventilated ICU	Ph 1/2	Regeneron Pharmaceuticals
9	NCT04426695	US	3/3/2021	620	Ventilated ICU	Ph 1/2	Regeneron Pharmaceuticals
10	NCT04426695	US	3/3/2021	620	Ventilated ICU	Ph 1/2	Regeneron Pharmaceuticals

288 All other trials with ~43,000 patients for planned enrollment

1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. Only includes intervention given as a single agent. May not be fully comprehensive. Randomized, adequately powered trials are defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 2 Readout dates defined as primary end dates. May not be reflective of the true readout date. Trials with unknown primary end dates are shown in the '2021+' category. Other severity category includes trials with Unknown severity information or trials targeting Recovered patients. 3 Planned enrollment defined as enrollment per arm estimated from total enrollment by assuming even distribution of patients across all arms. It is not reflective of actual enrollment.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

COVID-19 clinical development snapshot for combination agents (2/2)

High interest areas: Remdesivir | Favipiravir | HCQ | Tocilizumab | Sarilumab | Baricitinib | TNF inhibitors | Dexamethasone | Other Corticosteroid | Conv. Plasma | Hyperimmune globulin | Neutralizing antibodies | **Combo**

Details of trial arms with readouts (may not be comprehensive)

USG sponsor marked in red

#	Trial ID	Intervention	US/Ex-US	Readout date	Planned enrollment	Severity	Endpoint	Sponsor
1	NCT04371406	Azithromycin ++ Hydroxychloroquine [e]	Ex-US	08/02/2020	1385	Mild	Mortality	Assistance Publique - Hôpitaux de Paris
2	NCT04370262	Famotidine ++ Remdesivir [e]	US	09/07/2020	471	Ventilated ICU	Mortality	Northwell Health, BARDA
3	EUCTR2020-001366-11-ES	IFN-b ++ Lopinavir/Ritonavir [e]	Ex-US	09/27/2020	500	Hospitalized LRI	Mortality	FIB-HCSC
4	NCT04359095	Hydroxychloroquine ++ Lopinavir/ritonavir [e]	Ex-US	10/11/2020	400	Ventilated ICU	Mortality	Universidad Nacional de Colombia
5	NCT04359095	Azithromycin ++ Hydroxychloroquine [e]	Ex-US	10/11/2020	400	Ventilated ICU	Mortality	Universidad Nacional de Colombia
6	ISRCTN83971151	IFN-b ++ Lopinavir/ritonavir [e]	Ex-US	02/28/2021	2000	Hospitalized LRI	Mortality	World Health Organization
7	NCT04343001	Aspirin ++ losartan [e]	Ex-US	04/30/2021	1250	Hospitalized LRI	Mortality	London School of Hygiene and Tropical Medicine
8	NCT04343001	Aspirin ++ Simvastatin [e]	Ex-US	04/30/2021	1250	Hospitalized LRI	Mortality	London School of Hygiene and Tropical Medicine
9	NCT04343001	Losartan ++ Simvastatin [e]	Ex-US	04/30/2021	1250	Hospitalized LRI	Mortality	London School of Hygiene and Tropical Medicine
10	NCT04343001	Aspirin ++ losartan ++ Simvastatin [e]	Ex-US	04/30/2021	1250	Hospitalized LRI	Mortality	London School of Hygiene and Tropical Medicine

#	Trial ID	Intervention	US/Ex-US	Readout date	Planned enrollment	Severity	Phase	Sponsor
1	NCT04458948	Azithromycin ++ Hydroxychloroquine [e]	US	3/24/2021	10000	Hospitalized LRI	Ph 2	University of New Mexico
2	NCT04386070	Hydroxychloroquine ++ Lopinavir/Ritonavir [e]	Ex-US	5/14/2021	1600	PrEP	Ph 3	University of Birmingham
3	NCT04333407	Aspirin ++ Atorvastatin ++ Clopidogrel ++ Omeprazole ++ Rivaroxaban [e]	Ex-US	3/30/2021	1585	Hospitalized LRI	Unknown	Imperial College London
4	NCT04351490	Vitamin D ++ Zinc [e]	Ex-US	7/31/2020	1570	Mild	Unknown	University Hospital, Lille
5	NCT04320238	IFN-a1B ++ Thymosin Alpha 1 [e]	Ex-US	5/31/2020	1472	PEP	Ph 3	Shanghai Jiao Tong University School of Medicine
6	NCT04334928	Emtricitabine/tenofovir ++ Hydroxychloroquine [e]	Ex-US	6/30/2020	1000	PEP	Ph 3	Plan Nacional sobre el Sida (PNS)
7	NCT04452318	REGN10933 + REGN10987 [e]	Ex-US	4/11/2021	1000	PEP	Ph 3	Regeneron Pharmaceuticals
8	NCT04426695	REGN10933 + REGN10987 [e]	US	3/3/2021	620	Ventilated ICU	Ph 1/2	Regeneron Pharmaceuticals
9	NCT04426695	REGN10933 + REGN10987 [e]	US	3/3/2021	620	Ventilated ICU	Ph 1/2	Regeneron Pharmaceuticals
10	NCT04426695	REGN10933 + REGN10987 [e]	US	3/3/2021	620	Ventilated ICU	Ph 1/2	Regeneron Pharmaceuticals

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020

Appendix

Number of clinical trial arms underway by treatment approach: Detail on combination regimen

There are no FDA-approved therapies for COVID-19. The therapies below are in development and are being tested in clinical trials.

Combination regimen type[2]	Examples	Number of global trial arms[1]	
		Randomized, adequately powered trials[3]	All other
Antivirals	Lopinavir/Ritonavir + Hydroxychloroquine	6	141
Immunomodulators	Masitinib + Isoquercetin	0	34
Antibody therapy	Convalescent plasma + Methylene Blue	0	8
Antivirals + immunomodulators	Lopinavir/Ritonavir + Interferon	5	57
Antivirals + antibody therapy	Hydroxychloroquine + Convalescent plasma + Azithromycin	0	1
Other[4]	Losartan + Simvastatin	8	34

Summary

List of randomized, adequately powered antiviral combination drugs include:

- **Lopinavir/Ritonavir + HCQ**
- **HCQ + Azithromycin**
- **HCQ + Remdesivir**

1 Corresponds to number of global investigational trials recruiting or completed. Excludes trials that have been terminated (or equivalent). Separates out multi-arm trials into distinct counts, including arms testing the same intervention in different doses or durations. May not be fully comprehensive. Excludes Traditional Chinese Medicine and vaccine trials. 2 Combination categories may contain treatment from 'Other' category (e.g., trials under Antivirals may include Antivirals + Other regimen). 3 Randomized, adequately powered is defined as randomized controlled trials in Phase 2 or beyond with expected enrollment of 250+ per arm for ventilated ICU, 500+ for hospitalized LRI, 1,000+ for early mild or asymptomatic, and 5,000+ for post-exposure prophylaxis (PEP) or pre-exposure prophylaxis (PrEP). 4 Included are (not exhaustive) ACE inhibitors, ARBs, NSAIDs, other anti-infectives, other anti-hypertensives, oncolytics, and supplements; excludes traditional Chinese medicine trials.

Source: Clinicaltrials.gov accessed 7/10/2020 and WHO clinical trial registry accessed 7/10/2020