

# HDU Drugs Ready Reckoner

## Intro:

For Adults:

Based from document compiled from Tim Laux, Chetanya Malik, Anup Agrawal and others which details COVID care protocol in detail

\*\*\* add link

## COVID specific issues/startegy:

	Mild	Severe	Critical
Disposition	HOME	HOSPITALIZATION WARD or HDU	HOSPITALIZATION ICU
Education	Home and community safety including home quarantine / isolation. Covid course Return precautions	Home and community safety including home quarantine / isolation. ~ 20 days from sx onset Covid course Prognosis	
Symptomatic Care	(with a focus on preventing aerosol generation) <ul style="list-style-type: none"> <li>• Cough suppressants</li> <li>• Antimetics</li> <li>• Antipyretic and and Analgesic (paracetamol)</li> </ul>	same	Same plus: <ul style="list-style-type: none"> <li>- If intubated -- need to think about analgesia, sedation,</li> </ul>
O2 support	NA	<ul style="list-style-type: none"> <li>• Supplemental O2 (NC, NRB, HiFlo)</li> <li>• Self Proning</li> </ul>	<ul style="list-style-type: none"> <li>• Respiratory support (NIV or mechanical ventilation)</li> <li>• Advanced: <ul style="list-style-type: none"> <li>○ Proning</li> <li>○ NM blockade/paralysis</li> </ul> </li> </ul>
ANTIMICROBIAL	NA	<ul style="list-style-type: none"> <li>• Remdesivir</li> <li>• Rarely abx</li> </ul>	<ul style="list-style-type: none"> <li>• Remdesivir</li> <li>• Often tx empirically for CAP w/</li> </ul>

			abx (5days)
ANTIINFLAMMATORY	NA	<ul style="list-style-type: none"> <li>• Steroids- dexamethasone 6mg x10days</li> </ul>	<ul style="list-style-type: none"> <li>• Steroids- dexamethasone 6mg IV/PO daily x 10days. <ul style="list-style-type: none"> <li>○ If early (within 24-48 hr from ICU admission) some evidence for toci also</li> </ul> </li> </ul>
INSULIN	Can consider usual outpt care (depends on Cr, degree hyperglycemia, A1c) - f new diabteic could consider metformin, if severe may need NPH70/30 with education (starting dose is usually ~ 0.2 - 0.5u/kg per day, split 2/3 before breakfast and 1/3 before dinner	<p>If hyperglycemic on steroids - start and titrate insulin: typical dosing is 0.2-0.5 u/kg insulin per day divided:</p> <ul style="list-style-type: none"> <li>- 50% basal : NPH insulin BID (before breakfast and dinner) split half</li> <li>- 50% nutritional regular insulin split amongs the meals (usually 3 meals)</li> </ul> <p>Be careful re: pt NPO, tube feeds etc when adjusting insulin. RBC check at least TID before meals (or q6H)</p>	
HYDRATION	<p>If dehydrated then resuictaed with LR bolus (if diarrhea for example); otherwise if eating no IVF, if NPO then half maintenance rate and ensure ins = outs. If In &gt;&gt;&gt; out then use furosemide . Goal is euveolemia (even volume status daily)</p> <ul style="list-style-type: none"> <li>- Check K and Cr periodically</li> </ul>		
		DVT PPX - LMWH or HSQ	DVT PPX - LMWH or HSQ

## ICU Care and checklist:

<https://docs.google.com/document/d/1fyfK2tcZ2EzhB0kvHoc4kpSHI52AerfplsZluEdS7E/edit>

## O2 strategy:

[https://docs.google.com/document/d/1H\\_ht2TiQcETXE57R0RdHEAwCRRnhumOSFNQ0hfaVIUg/edit#](https://docs.google.com/document/d/1H_ht2TiQcETXE57R0RdHEAwCRRnhumOSFNQ0hfaVIUg/edit#)

## Specific Drugs

Class	Indication	Adult (1st and 2ndLine) Dose, preparation	Notes	Price (per tablet / per adult course)
PARALYTI CS	Induction of Intubation - Paralysis	Succinycholine / Scoline (comes in 10 mL vial, 1 mL = 50 mg, total 500 mg) Dose: 1 – 2 mg / kg IV X 1	<ul style="list-style-type: none"> <li>o Onset: ~15 – 60 seconds until paralysis; wait for eyebrow / palpebral fasciculations</li> <li>o Shortcomings: Beware hyperkalemia; short acting</li> </ul>	
PARALYTI CS	Induction of Intubation - Paralysis	Atracurium (1 ampule contains 25 mg) · Dose (for intubation): 0.4 – 0.5 mg / kg IV X 1 (some anecdotal evidence for 1 mg / kg in our population)	<ul style="list-style-type: none"> <li>o Onset: 2 – 5 minutes</li> <li>o Shortcomings: Longer acting, so if intubation fails will have to bag mask ventilate for a prolonged period</li> </ul>	
SEDATIVES / AMNESTICS	Induction of Intubation - anesthesia/sedation	Propofol · Dose o Age < 55 years old § 2 – 2.5 mg / kg IV bolus o Age ≥ 55 years old § 1 – 1.5 mg / kg IV bolus o Preparation: Comes in 20 mL vials with 200 mg of propofol total (10 mg / mL)	<ul style="list-style-type: none"> <li>o Positives</li> <li>§ Rapid Acting: 10 – 60 seconds</li> <li>§ Lasts for 3 to 10 minutes</li> <li>o Shortcomings</li> <li>§ Limited supply</li> <li>o Take Homes:</li> <li>§ Likely can only be used to intubate at JSS but not maintain sedation given limited supply.</li> </ul>	
SEDATIVES / AMNESTICS	Induction of Intubation - anesthesia/sedation	Thiopentone (1 ampule contains 500 mg) · Dose: Thiopentone 5 mg / kg IV X 1		
SEDATIVES / AMNESTICS	Induction of Intubation - anesthesia/sedation	Midazolam (1 vial contains 10 mL, 1 mg / mL, 10 mg total) · Dose: 2 mg IV, repeat q3-5minutes SOS		

SEDATIVES / AMNESTICS	Induction of Intubation - anesthesia/sedation	Ketamine (10 mL vials, 1 mL = 50 mg, 500 mg total) · Dose: Give 1 mg / kg IV NOW and repeat bolus dose of 1 mg / kg in 5 minutes if patient remains unседated		
SEDATIVES / AMNESTICS	Maintenance Sedation while Intubated - analgesia - Narcotics	o Morphine: Comes in 10 mL ampules that have 10 mg total (1 mg / mL) § Preparation: Place 10 mL (10 mg) of morphine in 90 mL of NS, 100 mL total · Start at 10 microdrops / minute (or 1 drop / 6 seconds) (1 mg / hour) and increase to a maximum of 50 microdrops / minute (or 1 drop / ~1 second) (5 mg / hour), titrating to effect	§ Populations to avoid in: · Chronic kidney disease § Populations to consider in: · Chronic narcotic users	
	Maintenance Sedation while Intubated while Intubated - analgesia - Narcotics	§ Pentazocine 30 mg IV q3-4h scheduled	o If morphine unavailable:	
	Maintenance Sedation while Intubated - sedation - Benzodiazepines	o Midazolam 2 mg IV q1-2h SOS for agitation	§ Goal to minimize quantity of benzodiazepine as evidence of longer term complications in HDU / ICU patients	
	Maintenance Sedation while Intubated - sedation - Non-Narcotic Sedatives	o Ketamine: Come in 10 mL vials with 500 mg total (50 mg / mL) § Preparation · Bolus: Give 1 mg / kg IV NOW and repeat bolus dose of 1 mg / kg in 5 minutes if patient remains unседated · Drip: Put 1 mL (50 mg) in 99 mL of NS (100 mL total) o Start at 12 microdrops / minute (or 1 drops / 5 seconds) (0.1 mg / min) and increase to a maximum of 60 microdrops / minute (or 1 drop / 1 second) (0.5 mg / min), titrating to effect	§ Populations to avoid in: · Increased intracranial pressure · Cardiac disease especially ischemic disease · Psychiatric co-morbidities o Should always be administered with a benzodiazepine § Populations to consider in: · Asthmatics / Bronchospasm	

	Maintenance Sedation while Intubated - sedation - Non-Narcotic Sedatives	<ul style="list-style-type: none"> <li>o Propofol</li> <li>§ Preparation</li> <li>§ Drip: 5 mcg / kg / minute</li> </ul>	§ Issues: We have very little of this medication. Probably only useful for intubation but not maintenance of sedation																
PARALYTI CS	Continuous neuromuscular blockade for severe ARDS	<p>Atracurium (1 ampule contains 25 mg)</p> <ul style="list-style-type: none"> <li>- Dose (for continuous neuromuscular blockade): 0.4 – 0.5 mg / kg IV bolus X 1 then 4 – 20 mcg / kg / minute</li> <li>- Preparation : <ul style="list-style-type: none"> <li>- 40 kg: 4 ampules (100 mg) in 120 total mL NS</li> <li>- 50 kg: 8 ampules (200 mg) in 120 total mL NS</li> </ul> </li> <li>- Dosing : (note different concentration in preparation)</li> </ul> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th>Start: mcg/kg/min</th> <th>Start: drop/min</th> <th>Max: mcg/kg/min</th> <th>Max drop/min</th> </tr> </thead> <tbody> <tr> <td>40 kg</td> <td>10</td> <td>28</td> <td>20</td> <td>58</td> </tr> <tr> <td>50 kg</td> <td>10</td> <td>18</td> <td>20</td> <td>36</td> </tr> </tbody> </table>		Start: mcg/kg/min	Start: drop/min	Max: mcg/kg/min	Max drop/min	40 kg	10	28	20	58	50 kg	10	18	20	36	<ul style="list-style-type: none"> <li>o Positives: There is evidence for possible mortality benefit with 48 hours of early neuromuscular blockade / paralysis.</li> <li>§ This may not be possible in our setting. Consider SOS dosing to overcome vent desynchrony.</li> <li>o Shortcomings: <ul style="list-style-type: none"> <li>§ Much longer lasting than cis-atracurium / vecuronium</li> <li>§ Expensive</li> <li>§ Long term myopathy / weakness issues</li> </ul> </li> <li>o Take Homes: <ul style="list-style-type: none"> <li>§ We will generally avoid use of paralysis / neuromuscular blockade in our setting.</li> </ul> </li> </ul>	
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40 kg	10	28	20	58															
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VASOACTIVE MEDICATIONS	Acute severe hypotension - push dose pressors	<p>Epinephrine ( Has alpha and beta1/2 effects so it is an inopressor)</p> <ul style="list-style-type: none"> <li>- Mixing Instructions: Take a 10 ml syringe with 9 ml of normal saline • Into this syringe, draw up 1 ml of epinephrine from the cardiac amp (Cardiac amp contains Epinephrine 100 mcg/ml) • Now you have 10 mls of Epinephrine 10 mcg/ml.</li> <li>- Dose-0.5-2 ml every 2-5 minutes (5-20 mcg)</li> </ul>	<p>Onset-1 minute Duration-5-10 minutes</p> <p>Caution: do NOT give cardiac arrest doses epinephrine (1 mg) to patients with a pulse</p>																
VASOACTIVE MEDICATIONS	Acute severe hypotension - push	<p>Norepinephrine [(Onwochei et al. 2017)]</p> <ul style="list-style-type: none"> <li>- Mixing Instructions: 0.5 ml from (2 ml</li> </ul>																	

	dose pressors	<p>ampule of 2 mg Norepinephrine) in 100 ml 5% dextrose -&gt; final concentration: 5 µg/ml</p> <p>- Dose: 0.6-1.4 ml pushes (3-7mcg doses)</p>																						
VASOACTIVE MEDICATIONS	Distributive Shock: 1st Line	<p><b>1st Line:</b> Noradrenaline (Norepinephrine) – best evidence in sepsis<sup>18</sup></p> <p>§ Preparation (the more concentrated plan to limit IV fluids): 4 ampules (8 mg) in 50 mL NS</p> <p>o Bolus ***</p> <p>o Drip:</p> <table border="1"> <thead> <tr> <th></th> <th>Start: mcg/kg/min</th> <th>Start: drop/min</th> <th>Max: mcg/kg/min</th> <th>Max drop/min</th> </tr> </thead> <tbody> <tr> <td>40 kg</td> <td>0.075</td> <td>1</td> <td>1.0</td> <td>15</td> </tr> <tr> <td>50 kg</td> <td>0.1</td> <td>2</td> <td>1.0</td> <td>20</td> </tr> <tr> <td>60 kg</td> <td>0.08</td> <td>2</td> <td>1.0</td> <td>25</td> </tr> </tbody> </table>		Start: mcg/kg/min	Start: drop/min	Max: mcg/kg/min	Max drop/min	40 kg	0.075	1	1.0	15	50 kg	0.1	2	1.0	20	60 kg	0.08	2	1.0	25		
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VASOACTIVE MEDICATIONS	Distributive Shock <b>2nd Line:</b>	<p>Adrenaline (Ephinephrine)</p> <p>§ Preparation · 4 mg in 50 mL NS</p> <p>o Bolus ***</p> <p>o Drip:</p> <table border="1"> <thead> <tr> <th></th> <th>Start: - mcg/kg/min</th> <th>Start: - drop/min</th> <th>Max: - mcg/kg/min</th> <th>Max - drop/min</th> </tr> </thead> <tbody> <tr> <td>40 kg</td> <td>0.1</td> <td>3</td> <td>0.3</td> <td>9</td> </tr> <tr> <td>50 kg</td> <td>0.1</td> <td>4</td> <td>0.3</td> <td>12</td> </tr> <tr> <td>60 kg</td> <td>0.1</td> <td>5</td> <td>0.3</td> <td>14</td> </tr> </tbody> </table>		Start: - mcg/kg/min	Start: - drop/min	Max: - mcg/kg/min	Max - drop/min	40 kg	0.1	3	0.3	9	50 kg	0.1	4	0.3	12	60 kg	0.1	5	0.3	14		
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	<p>Cardiogenic Shock (or 2nd Line Distributive shock)</p>	<p>Dobutamine § Preparation · 250 mg in 50 mL NS o Drip:</p> <table border="1" data-bbox="590 228 1266 548"> <thead> <tr> <th></th> <th>Start: - mcg/kg/ min</th> <th>Start: - drop/mi n</th> <th>Max: - mcg/kg/ min</th> <th>Max - drop/mi n</th> </tr> </thead> <tbody> <tr> <td>40 kg</td> <td>5</td> <td>2</td> <td>20</td> <td>10</td> </tr> <tr> <td>50 kg</td> <td>5</td> <td>3</td> <td>20</td> <td>12</td> </tr> <tr> <td>60 kg</td> <td>5</td> <td>4</td> <td>20</td> <td>15</td> </tr> </tbody> </table>		Start: - mcg/kg/ min	Start: - drop/mi n	Max: - mcg/kg/ min	Max - drop/mi n	40 kg	5	2	20	10	50 kg	5	3	20	12	60 kg	5	4	20	15		
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<p>ANTICOAG ULANTS</p>	<p>Anti- Coagulation, Prophylactic (for prevention of thrombotic phenomenon)</p>	<p>· Unfractionated Heparin 5,000 IU subQ BD or TDS</p>																						
<p>ANTICOAG ULANTS</p>	<p>Anti- Coagulation, Prophylactic (for prevention of thrombotic phenomenon)</p>	<p>· Low Molecular Weight Heparin (Enoxaparin): 40 mg daily, some use higher dose of 40 mg BID</p>	<p>o Only for eGFR &gt; 30 and weight &lt; 100 kg, otherwise contraindicated</p>																					
<p>ANTICOAG ULANTS</p>	<p>Anti- Coagulation, Therapeutic (for treatment of confirmed or suspected DVT / PE etc)</p>	<p>· Unfractionated Heparin – can be given either via IV drip or subQ o IV Drip § Initial Bolus: 80 U / kg (Max 5,000 IU) IV THEN § Drip: 18 U / kg / hour (Max 1,333 IU / hour) IV o SubQ § Initial loading: 333 U / kg subQ THEN § Maintenance: 250 U / kg subQ BD</p>																						
<p>ANTICOAG ULANTS</p>	<p>Anti- Coagulation, Therapeutic (for treatment of</p>	<p>· Low Molecular Weight Heparin (Enoxaparin) 1 mg / kg subQ BD or 1.5 mg / kg subQ OD</p>	<p>o Only for eGFR &gt; 30 and weight &lt; 100 kg, otherwise contraindicated</p>																					

	confirmed or suspected DVT / PE etc)			
DIURETICS	Maintain euvolemia	furosemide IV		
COUGH SUPPRESSANTS	Symptomatic Care		- can be given via NG tube	
ANTIEMETICS	Symptomatic Care	<ul style="list-style-type: none"> <li>o Ondansetron (Ondem)</li> <li>o Metoclopramide (Perinorm)</li> </ul>	- can be given IV or via NG tube	
GASTRIC ACID REDUCER		Famotidine		
GASTRIC ACID REDUCER		Omeprazole		
ANTIPIRETIC	Symptomatic Care for fever	Paracetamol Ibuprofen		
BRONCHODILATORS		Albuterol inhaler Ipratropium inhaler		
ANTIHYERTENSIVES		Amlodipine Losartan		
INSULIN	Glycemic management in Diabetes and those with steroid induced hyperglycemia	Insulin NPH and regular		



ANTIBIOTICS		Ceftriaxone and Azithromycin Augmentin and Azithromycin		
GLUCOCORTICOIDS	Immunomodulation in covid pneumonia	<p>Dexamethasone</p> <ul style="list-style-type: none"> <li>- Severe disease (requires O2, &gt;3LNC): 6mg PO OD x 10 days (RECOVERY trial) ** most common and 1st line</li> <li>- Critical: as above, OR some will do dexamethasone 20mg PO OD x5d followed nby 10mg PO OD x 5d (CODEX trial)</li> </ul> <p>If dexamethasone 6 not available,</p> <ul style="list-style-type: none"> <li>- Prednisone 40 mg PO OD x 10d</li> <li>- Methylprednisolone 16 mg PO BDx 10d</li> </ul> <p>If higher dexamethasone not available</p> <ul style="list-style-type: none"> <li>- <a href="#">Methylprednisolone 250 mg IV/d x 3days.</a></li> </ul> <p><a href="#">(EMCrit and Farkas 2020)</a></p>	<ul style="list-style-type: none"> <li>• Highest mortality benefit RR 0.6 for thos on mech ventilation, then suppl O2 RR 0.8; possible harm in those not on O2.</li> <li>• If all are available, dexamethasone is the preferred agent because 1) little mineralocorticoid effect (i.e. no fluid retention, good in ARDS) and 2) longest half life (i.e. least risk of adrenal insufficiency).</li> <li>• Please use steroids for the shortest duration possible due to risk of complications from hyperglycemia like DKA or Mucormycosis.</li> </ul>	
GLUCOCORTICOIDS		Budesonide inhaler		
ANTIVIRAL		<p>Remdesivir <sup>1</sup></p> <ul style="list-style-type: none"> <li>- 200 mg IV once, followed by 100 mg IV OD to complete a five-day course</li> <li>- Follow cr and LFTs</li> </ul>	<ul style="list-style-type: none"> <li>• Best for severe but not critical covid</li> <li>• ACTT1 -&gt; reduction time to recovery (5d) but not mortality 11-15%' SOLIDARITY no chnage mortality</li> </ul>	

<sup>1</sup> <https://www.massgeneral.org/assets/MGH/pdf/news/coronavirus/covid-19-treatment-a-primer-with-talking-points-for-patients-and-families.pdf>

			<ul style="list-style-type: none"> <li>● Renal insufficiency is contraindication crcl &lt;30 excluded; May be teratogenic; avoided inpatients with ALT <math>\geq</math> 5x ULN</li> <li>● SFX - AKI, elevated LFTS, NV</li> </ul>	
ANTIINFLAMMATORY	Immunomodulation in covid pneumonia (IL 6 mAB)	<p>Tocilizumab<sup>2</sup> - severe covid w/ escalating O2 on HFNC/NRB or critical (on NIV or intubated), crp &gt;75 mg/dl, only when added to low dose steroid (dexamethasone 6), ideally within 72 h hospitalization and 24hr ICU</p> <ul style="list-style-type: none"> <li>● Dosing :8 mg/kg IV x1 rounded to nearest 200mg (max 800mg)</li> </ul> <p>Another ref: <a href="#">(EMCrit and Farkas 2020)</a></p>	<ul style="list-style-type: none"> <li>● Contraindication: active bowel perforation or diverticulitis, other concomitant infection (TB, fungal), immunocompromise, ANC &lt; 500, platelets &lt; 50, ALT &gt; 5x ULN</li> </ul>	

Note1: CONSIDER: Published ICU case series report frequent hypotension in the peri-intubation period. Consider either an 1) ongoing bolus or 2) pressor support or 3) both during intubation especially if thiopentone used.

Note 2: Recommended combinations (as supplies last): While ketamine has some data in certain types of airway disease, there is little data on the use of ketamine in ARDS and no comparison of ketamine versus narcotics in ARDS.

o Morphine drip with Midazolam IV SOS § Can substitute bolus pentazocine if morphine supplies run out

Note 3: Vasoactive Medications (Pressors / Stress Dose Steroids) : If patient's MAP < 65 mm Hg, consider vasoactive medicines to attempt to raise the MAP. This may be required more than in our usual HDU due to a restrictive fluid resuscitation strategy. Does patient have adequate IV access?

<sup>2</sup> <http://covidprotocols.herokuapp.com/pdf/Immunomodulator%20Algorithm%20in%20COVID-19%20v23%203-05-21.pdf>

- If “No,” do not provide vasoactive medications until such an IV access is in place. Options include a IV placed in a proximal vein (proximal to the antecubital fossa including the EJ) or a central line

Note 4: If you are at 75% of the maximum dose of noradrenaline or higher, consider starting 2nd line agent

Note 5: We would recommend against starting a third vasoactive medication.

Note 6 :

- There are multiple case reports of COVID-19 predisposing to a hypercoagulable state and concerns that thrombotic phenomenon may explain some of the profound V/Q mismatching and hypoxia.
- Therapeutic dose anticoagulation seems to be safe in COVID-19<sup>19</sup> and in one retrospective trial delayed in-hospital mortality. Some institutions recommend therapeutic anticoagulation for anyone who is critically ill without contraindications.

Note 7 : Diuretics While there is no evidence of a mortality benefit with diuretics, as a general rule “dry lungs” are “happy lungs” in ARDS. Consider gentle diuresis as able.

Note 8: Overall, use of remdesivir is controversial. There is some benefit (shorter duration of symptoms) - but no mortality benefit. Different sources recommend for or against (WHO, RECOVERY trial). Seems to be freely available and blindly used at the moment in the district hospital level. If expensive and out of pocket overall I feel that the benefits are not worth the risks

Note 9: Tocilizumab - not yet available but some recent evidence supports its use. I have not used this drug myself and not recommended on the covidprotocol site yet<sup>3</sup>. I worry, with reports of opportunistic infections seen with steroids whether it is beneficial in our setting.

## OTHER CONSIDERATIONS

### Special Populations:

- 1) Acute kidney injury / Chronic kidney disease: Acute renal failure requiring dialysis is a known (but not frequent) complication of COVID-19 infection. In such settings, transfer to a facility providing both dialysis and COVID-19 care will be considered (CIMS / District Hospital Bilaspur)
- 2) Pregnant women – no higher risk than other, similar adults. Questionable / Possible evidence to date of intrauterine transmission of COVID-19 debated.<sup>21</sup>
- 3) Palliative Care – We will likely use bolus dosed midazolam 2 mg IV SOS and pentazocine 30 mg IV SOS to minimize agitation, pain and air hunger at the end of life.
  - a. Morphine will be saved for sedation during intubation.

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<sup>3</sup> <https://covidprotocols.org/en/chapters/treatments/#anti-il-6-agents-e-g-zfd20b4imlc1>

## References

### Excellent Reference:

- <https://covidprotocols.org/en/chapters/treatments/#anti-il-6-agents-e-g-zfd20b4imlc1>
- <https://app.magicapp.org/#/guideline/j1WBYn/section/L0bmdE>

### Other references:

Onwochei, Desire N., Warwick D. Ngan Kee, Lillia Fung, Kristi Downey, Xiang Y. Ye, and Jose C. A. Carvalho. 2017. "Norepinephrine Intermittent Intravenous Boluses to Prevent Hypotension During Spinal Anesthesia for Cesarean Delivery: A Sequential Allocation Dose-Finding Study." *Anesthesia and Analgesia* 125 (1): 212–18.