HEMODYNAMIC SUPPORT AND IV FLUIDS

MITIGATION STRATEGIES FOR SCARCE RESOURCES

NORTHWEST HEALTHCARE Response Network.

Conventional Capacity – The spaces, staff, and supplies used are consistent with daily practices within the institution. These spaces and practices are used during a major mass casualty incident that triggers activation of the facility emergency operations plan.	**Contingency Capacity** – The spaces, staff, and supplies used are not consistent with daily practices, but provide care to a standard that is functionally equivalent to usual patient care practices. These spaces or practices may be used temporarily during a major mass casualty incident or on a more sustained basis during a disaster (when the demands of the incident exceed community resources)	**Crisis Capacity** – Adaptive spaces, staff, and supplies are not consistent with usual standards of care, but provide sufficiency of care in the setting of a catastrophic disaster (i.e., provide the best possible care to patients given the circumstances and resources available). Crisis capacity activation constitutes a significant and adjustment to standards of care (Hick et al, 2009).

RECOMMENDATIONS	***Strategy***	***Conventional***	***Contingency***	***Crisis***
Equipment and Supplies and Training 1. Cache intravenous (IV) cannulas, tubing, fluids, medications, and administration supplies, oral rehydration packets (ORS) and intraosseous (IO) equipment, including drill and manual placement needles. 2. Conduct training and education re: oral and enteral hydration, IO and hypodermoclysis fluid administration options. 3. Develop system wide scarce resource communication plans with clear lines of responsibility and accountability to keep staff aware of shortages and conservation strategies. 4. Consider centralized inventory control of critical medications and fluids (e.g. procedural areas, ORs, day surgery areas may have separate inventory control of critical resources).	*Prepare*			
IV Fluid Conservation Strategies[1] 5. Monitor CDC, FDA and ASHP updates on supply and conservation strategies. 6. Switch to oral therapy whenever possible (e.g. antibiotics, anticoagulants, electrolyte replacements).				
7. Discontinue KVO (Keep vein open) orders. 8. Adopt NPO strategies as recommended by the ASA[2] (2 hours for liquids, 4 hours for breast milk, 6 hours for infant formula, light meal or nonhuman milk) to limit "maintenance IVF". 9. Review electronic medical record order sets to ensure conservation strategies are being enforced. 10. If oral therapy is not feasible or indicated consider IM or SQ injection.				
11. If IV medications must be used, consider alternative compounding strategies to minimize IVF use such as syringe infusion pumps; IV push administration, following the "ISMP Safe Practice Guidelines for Adult IV Push Medications".[3] 12. Consider using alternative fluids (e.g. dextrose or LR), or other volume expanders (e.g. colloids) depending on clinical situation. 13. Repackage small bags from larger source following the "Repackaging of certain Human Drug Products by Pharmacies and Outsourcing Facilities" 2017, authored by FDA.[4]				
Emphasize Enteral Hydration Instead of IV Hydration **Provide oral hydration (ORT), when possible** 14. Provide guidelines for oral rehydration therapy, including indications for hospital referral, to outpatient providers. **Utilize Appropriate Oral Rehydration Solution** 15. Oral rehydration solution: 1-liter water (5 cups) + 1 tsp salt + 8 tsp sugar, add flavor (e.g., ½ cup juice) as needed. 16. Rehydration for moderate dehydration 50-100mL / kg over 2-4 hours. **Pediatric Hydration** Pediatric maintenance fluids: 17. Four mL/kg/h for first 10kg of body weight (40 mL/h for 1st 10 kg). 18. Two mL/kg/h for second 10kg of body weight (20 mL/h for 2nd 10kg = 60 mL/h for 20kg child). 19. One mL/kg/h for each kg over 20kg (example - 40 kg child = 60 mL/h plus 20 mL/h = 80 mL/h). Supplement for each diarrhea or emesis.	*Substitute*			
Provide nasogastric or gastrostomy (NG, G-tube) hydration for both adults and pediatric patients when applicable. 20. For fluid support, 8-12F (pediatric: infant 3.5F, < 2yrs 5F) tubes are better tolerated than standard size tubes. 21. For additional equipment size guidelines, refer to a pediatric length-based resuscitation tape, e.g., the Broselow™ Tape. NOTE: Clinical (urine output, etc.) and laboratory (BUN, urine specific gravity) assessments and electrolyte correction are key components of fluid therapy and are not specifically addressed by these recommendations.	*Substitute*			

IV and Syringe Pumps 22. Ensure IV pumps are charged and battery life monitored. 23. Consider stocking alternate emergency equipment for IV administration such as buretrols and drip counters, other devices such as the Drip Assist [T] designed for use in austere environments.	*Conserve*			
24. Reserve IV pumps, if limited, for use for critical medications such as sedatives, analgesics, certain antibiotics and hemodynamic support.	*Conserve*			
Substitute Epinephrine for Other Vasopressor Agents in Shortage 25. For hemodynamically unstable patients > 18 yo who are adequately volume-resuscitated, consider adding 6mg epinephrine (6mL of 1mg/ml) to1000mL NS on mini-drip tubing and titrate to target blood pressure. 26. For children < 18 yrs. add 0.6 X weight(kg) to equal total mg of Epinephrine to add to a 100 mL bag of NS. Run on mini-drip tubing start at 1 mL/hr (= 60 drips/hr or 1 drip/minute). This starting epinephrine rate = 0.1 mcg/kg/min, a standard starting epinephrine dose, assuming that 1 mL=60 drips for mini-drip tubing; increase drip rate to target blood pressure.	*Substitute*			
Re-use CVP, NG, and Other Supplies After Appropriate Sterilizations/Disinfection 27. In crisis situations, when considering re-use of otherwise single use disposable equipment, alternate sterilization techniques should be discussed using available expert opinions such as CDC, WHO, local public health and infection control specialists. When possible, consensus recommendation should be made. Possible sterilization options during crisis include: 27a) High-level disinfection for at least twenty minutes for devices in contact with body surfaces (including mucous membranes); glutaraldehyde, hydrogen peroxide 6%, or bleach (5.25%) diluted 1:20 (2500 ppm) may be acceptable solutions. NOTE: chlorine levels reduced if stored in polyethylene containers - double the bleach concentration to compensate).	*Re-use*			
Intraosseous and Subcutaneous (Hypodermoclysis) Replacement Fluids 28. Consider "clysis" as an option when alternative routes of fluid administration are impossible/unavailable. 29. Intraosseous administration should be considered before hypodermoclysis. **Intraosseous** 30. Intraosseous infusion is not generally recommended for hydration purposes, but may be used until alternative routes are available. Intraosseous infusion requires pump or pressure bag. Rate of fluid delivery is often limited by pain of pressure within the marrow cavity. This may be reduced by pre-medication with lidocaine (preservative-free) 0.5mg/kg slow IV push. **Hypodermoclysis** [5,6] 31. Cannot correct more than moderate dehydration via this technique. 32. Many medications cannot be administered subcutaneously. 33. Common infusion sites: pectoral chest, abdomen, thighs, upper arms. 34. Common fluids: normal saline (NS), D5NS, D5 1/2 NS (Can add up to 20-40 mEq potassium if needed.). 35. Insert 21/24 gauge needle into subcutaneous tissue at a 45 degree angle, adjust drip rate to 1-2 mL per minute (May use 2 sites simultaneously if needed.). 36. Maximal volume about 3 liters / day; requires site rotation. 37. Local swelling can be reduced with massage to area. 38. Hyaluronidase 150 units / liter facilitates fluid absorption but is not required; may not decrease occurrence of local edema.	*Substitute*			
Consider Use of Veterinary and Other Alternative Sources for Intravenous Fluids and Administration Sets	*Adapt*			

Adapted From the Minnesota Department of Health, Office of Emergency Preparedness

Updated: 10/02/2024

Next Update: 05/2027

[1] https://www.fda.gov/downloads/Drugs/DrugSafety/DrugShortages/UCM582461.pdf

[2] *http://anesthesiology.pubs.asahq.org/article.aspx?articleid=2596245&_ga=2.204142672.159725813.1522250986-851673073.1522250986*

[3] https://www.ismp.org/sites/default/files/attachments/2017-11/ISMP97-Guidelines-071415-3.%20FINAL.pdf

[4] *https://www.fda.gov/media/90978/download*

[5] *Caccialanza, R, et al, Subcutaneous Infusions of Fluids for Hydration or Nutrition: A Review, JPEN 2018;42:296-307*

[6] *Bruno, VG, Hypodermoclysis: a literature review to assist in clinical practice, Einstein (Sao Paulo) 2015;13(1):122-8*

Renal Replacement Therapy Card

STRATEGIES FOR SCARCE RESOURCE SITUATIONS

NORTHWEST HEALTHCARE Response Network.

Conventional Capacity – The spaces, staff, and supplies used are consistent with daily practices within the institution. Resource limitation does not impact clinical decisions or usual practices.	**Contingency Capacity** – Space, staff, and/or supplies are stretched. Attempt to maintain usual standard of care through adapting practices, but some modest reduction in quality of care or added risk to patients is acceptable.	**Crisis Capacity** – Spaces, staff, and/or supplies are severely constricted. Prioritization is made to those with most immediate needs, while care may be withheld or delayed for those with less urgent need.

Category	*RECOMMENDATIONS*	*Inpatient*	*Outpatient*	*Strategy*	*Conventional*	*Contingency*	*Crisis*
A. General	1. All organizations that provide dialysis need to maintain internal emergency plans to provide care for the special needs of dialysis patients during any external or internal emergency that may disrupt standard operations. These plans should address appropriate water and power supply and back-up supply, accurate and updated equipment inventory and plans to address potential supply chain issues; accurate and updated staff/provider information including surge staffing plans . (specific recommendations listed below) • All emergency plans should be communicated throughout the organization and coordinated at a regional level	√	√	*Prepare*			
	2. In-patient facilities should consider developing and documenting emergent PD plan including catheter placement and staffing model (see Attachment A sample below or refer to ASN Toolkit; outpatient dialysis facilities should be prepared to care of potential surge in PD patients.	√	√				
	3. All dialysis providers must advise their patients in developing their own preparedness plans including emergency and contingency plans for food, medications, transportation, and emergency contact resources. • Dialysis patients need to be self-sufficient for up to 96hrs. Note that shelters are unlikely to have foods appropriate for renal dietary needs (low sodium, etc.). Personal planning guidance is available at: National Kidney Foundation Davita Kidney Care Northwest Kidney Center		√				
	4. Medical needs of re-located renal failure patients from outside our region are substantial; the medical leadership of Northwest Kidney Center, DaVita, Fresenius, Puget Sound Kidney and NW Renal Network need to be notified of such incoming patients to plan for their medical needs.[1]	√	√				
	Transportation Interruptions 5. Chronic dialysis patients should coordinate with their service providers/dialysis clinics first for transportation and other assistance during service/transportation interruptions.		√	*Prepare*			
	6. If individual providers/dialysis clinics are unable to meet emergent supplemental transportation needs, first refer to local EOC or public health for possible weather-related emergency transportation planning before calling 911 for non-emergent transport.		√	*Adapt*			

B. Water	**Water Supply** 7. Identify and quantify institutional water-purifying capabilities for dialysis 8. Identify alternative water source if city water is unavailable	√	√	*Prepare*			
	9. Identify limitations and special arrangements needed to use water tanker a) Availability of reverse osmosis (RO) machines with carbon tanks b) Available means to generate adequate water pressure to units providing dialysis	√	√				
	Water Contamination 10. For biologic contaminants (i.e., "Boil Water Alert") city water can still be used if appropriate treatment components are in place to guard against microbial contaminants (https://www.cdc.gov/dialysis/guidelines/water-use.html) 11. For chemical contaminants alternate sources of water should be used. (e.g., water reserve tanks, individual facility wells, etc.)	√	√	*Prepare*			
	12. Consider transferring stable inpatients to outpatient dialysis centers for dialysis treatments and vice versa depending on location of purified water source	√	√	*Substitute* *Adapt*			
	13. Consider use of other regional assets for water reserves a) JBLM assets: well, tanker b) National Guard assets c) Navy assets: desalination and reverse osmosis capabilities (ship dependent) d) Commercial vessels	√	√	*Adapt*			
C. Power	14. If hospital back-up generators are insufficient or fail to meet the needs of dialysis patients within an affected facility, consider transferring stable inpatients from the affected area to other in-patient/ outpatient dialysis centers in unaffected areas for dialysis treatments.	√	√	*Substitute* *Adapt*			
D. Supplies	**Dialysis Catheters, Machines, Reverse Osmosis Machines, and/or Other Supply Shortages** 15. Maintain adequate stock of dialysis tubing sets and venous/peritoneal dialysis catheters (Quinton, etc.) and medications (e.g., Kayexalate)	√	√	*Prepare*			
	16. Identify other sources of supplies and machines	√	√				
	17. Transfer machines/supplies between outpatient centers and hospitals, or between hospitals	√	√	*Substitute*			
	18. Dialysate: • Develop and document pharmacy dialysate plan	√	√				
	• Implement pharmacy dialysate prep for CRRT and PD as situation dictates	√	√				

<table>
<tr>
<td rowspan="4">E. Staff</td>
<td>19. Document number of trained staff
20. Identify and develop staff extender model with JIT training
21. Develop 24/7 staffing model</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Cohort dialysis patients as the situation dictates, to increase staff: patient ratios (for example: COVID-/PUI/COVID+ shifts)</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Staffing for PD: Adjust to manual exchanges as needed depending on staff and cycler availability</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Consider alternative staffing assignments with the following recommendations
<table>
<tr><th colspan="3"><u>Alternative Staff Recommendations</u>
(listed in order of consideration)</th></tr>
<tr><th>Dialysis Techs</th><th>Dialysis Nurses</th><th>MDs (Nephrologist)</th></tr>
<tr>
<td>1. Former Dialysis Techs who are now techs in other specialties

2. General Nurse with prior dialysis experience.</td>
<td>1. General RN or Transplant RN with previous HD[1] or PD[2] experience

2. Critical Care nurse with a dialysis training

3. Critical Care Nurse with no dialysis experience and JIT[3]

4. General nurse with JIT</td>
<td>1. Telemedicine nephrologist

2. Retired nephrologist who has maintained medical license

3. ARNPs/PAs trained in dialysis

4. Critical Care MD with experienced dialysis nurse and JIT training.

5. Dialysis nurse with extensive inpatient dialysis experience</td>
</tr>
<tr><td colspan="3">[1]Hemodialysis
[2]Peritoneal Dialysis
[3]Just-in-time Training (i.e. video, written instructions, handbook, etc.)</td></tr>
</table>
</td>
<td></td>
<td></td>
<td>Substitute</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25. Maintain close communication with hospital command center, consider prioritizing dialysis patients for discharge.
26. For facilities in larger systems, consider consolidating services to fewer facilities to optimize staffing.</td>
<td>√</td>
<td></td>
<td>Adapt</td>
<td></td>
<td></td>
<td></td>
</tr>
</table>

F. Treatment	**Crush Syndrome** 27. Initiate normal saline IV hydration and acidosis prevention protocols immediately either pre-hospital or as soon as possible upon arrival to a healthcare facility to prevent/treat rhabdomyolysis. Treatment recommendations: a) UOP goal 200-300 ml/hr; consider starting normal saline hydration at 1-2L/hr. b) avoid nephrotoxic agents such as NSAIDS, aminoglycosides, ACE/ARB's along with other drugs which may cause hyperkalemia c) aggressive monitoring and treatment of potential hyperkalemia d) close monitoring of fluid status.	√		*Conserve*			
	Mode of Dialysis 28. Optimize the mode of dialysis to provide care for the most patients possible given resources available a) if water is scarce, consider PD and CRRT as modes of dialysis b) if water is readily available but other potential supply chain issues exist, prioritize HD over PD and CRRT	√	√	*Substitute*			
	Increased Demand on Resources: Recommendation below should be based on clinical and laboratory data including hyperkalemia, impaired pulmonary function, and metabolic acidosis. Laboratory and clinical parameters may change based on situation at hand. 29. Shorten duration of dialysis for patients that are more likely to tolerate it safely, for example: • Limit routine hemodialysis to 3 hours • Reduce to twice weekly runs in select patients with significant residual kidney function • Maximize clearance by use of high-efficiency filters and high blood flow	√	√	*Conserve*			
	30. Minimize need for dialysis: • Institute fluid restriction <1000 ml/day • Consider initiating when clinically appropriate ○ potassium binders High dose diuretics if adequate residual kidney function	√	√	*Conserve*			
	31. Institute emergent peritoneal dialysis prioritizing stable non-ICU patients and keeping in mind infection control issues given the situation at hand (See attached examples of emergency PD protocols)	√	√	*Substitute*			
	32. Consider PIRRT when CRRT is in short supply	√		*Substitute*			
	33. Patients to utilize their home "kits" of medication (Kayexalate, Lokelma or Veltassa) and follow dietary plans to help increase time between treatments.		√	*Conserve*			
	Insufficient Resources Available For All Patients Requiring Dialysis 34. Conceivable (but extraordinary) situations may occur where resources are insufficient to the point that some patients may not be able to receive dialysis (for example, pandemic when demand nationwide exceeds available resources). Prioritization should follow the Adult/Pediatric Critical Care Triage Algorithm and Worksheet.	√	√	*Re-allocate*			

Adapted From the Minnesota Department of Health, Office of Emergency Preparedness

1. Contact Information*: DaVita (866-475-7757)**;** Northwest Kidney Centers (855-292-3045); NW Renal Network (206-923-0714); Puget Sound Kidney Center (425-258-9074); Fresenius Medical Care (800-626-1297); Seattle Children's Hospital (206-901-8700)*

Attachment A

COVID-19: RRT Resources and Acute PD Protocol

Revised from: COVID-10 Surge Planning: Dialysis supplies and staff shortages.

Harborview Medical Center, University of Washington – Montlake, and VA Puget Sound Medical Center

Version 2
December 1, 2020

I. AKI and COVID-19

The incidence of AKI among all hospitalized patients with COVID-19 ranges from 5 to 15% (Mohamed et al, Kidney360 2020, Hirsh et al. KI 2020). Rates of AKI are much higher (~70%) in critically ill patients requiring mechanical ventilation, and approximately 20% of these patients will require a form of kidney replacement therapy (Gupta et al. JASN, 2020). The hospital mortality rate in this specific population is 55- 65%, and risk factors for mortality include age > 70 years, oliguria, and higher vasopressor use. Notably, mortality is lower among critically ill patients with pre-existing CKD stage 4 or 5 who require kidney replacement therapy. Since the SOFA score includes a single value for creatinine, it performs poorly in predicting mortality in patients with chronic kidney disease.

Useful references: ASN guidelines for treatment of patients with COVID-19 and AKI

Attachment A

Division of Nephrology
University of Washington

II. Increasing Dialysis Surge Capacity

Table 2. Practical ideas for increasing dialysis surge capacity.

Table 1. Practical ideas for increasing dialysis surge capacity

Fluid restriction	500–750 ml/d (approximately 10 ml/kg per day)
Potassium resins	Sodium polystyrene sulfonate Patiromer: 8.4 g daily; at weekly intervals can be increased or decreased by 8.4 g/d up to a maximum of 25.2 g/d Sodium zirconium cyclosilicate: 10 g three times daily for 48 h
Oral non–potassium-containing alkali therapies	Oral sodium bicarbonate available as tablet or as baking soda: 7.7 mEq HCO_3 per 650 mg tablet 29 mEq HCO_3 per 1/2 teaspoon baking soda Sodium citrate-citric acid solution: 5 mEq HCO_3 per 5 ml solution
Total nephron blockade	Loop diuretic + carbonic anhydrase inhibitor + thiazide diuretic + mineralocorticoid receptor inhibitor (other strategies exist) In the setting of significant kidney impairment, consider using: Furosemide 200 mg intravenously every 6 hours + acetazolamide 250 mg by mouth every 8 hours + metolazone 10 mg by mouth twice a day + spironolactone 100 mg by mouth twice a day
Intermittent HD	Limit dialysis treatment duration to 3 hours for most treatments Limit dialysate flow rate (daily) to 600 ml/min Use twice-weekly dialysis, with proposed schedules: Monday–Thursday; Tuesday–Friday; and Wednesday–Saturday
CRRT replacement fluid recipe	1 L 0.9% NaCl with KCl as needed +1 L D5W with 150 mEq $NaHCO_3$ +1 L 0.9% NaCl with 1 g $MgCl_2$ +1 L 0.9% NaCl with 1 g $CaCl_2$ =4 L (153 mEq/L Na, 37.5 mEq/L HCO_3, 2.6 mmol/L Mg, and 2.25 mmol/L Ca)
SLED technical and logistic considerations	Dialysate flow rate (Q_D) 100–200 ml/min Blood flow rate (Q_B) 200 ml/min Treatment duration 8–12 h (evenings, using HD machines at night) Treatment delivered daily or alternate days depending on patient need ICU nurse monitors machine and records details of treatment like CRRT If no contraindications, systemic anticoagulation with unfractionated heparin to target activated partial thromboplastin time drawn peripherally to be 1.5 times control Dialysate jugs should last the entire treatment
PIRRT technical and logistic considerations	Effluent rate of 40–50 ml/kg per hour Treatment duration 8–12 h Treatment delivered daily or alternate days depending on patient need ICU nurse monitors machine and records details of treatment like CRRT Traditionally, anticoagulation not required but given the reports of the procoagulant nature of the COVID-19 syndrome, systemic anticoagulation with heparin may be necessary Replacement fluid and/or dialysate used should be precisely calculated to not waste fluid

HD, hemodialysis; CRRT, continuous RRT; SLED, sustained, low-efficiency dialysis; PIRRT, prolonged intermittent RRT; ICU, intensive care unit; QD, dialysate flow rate; QB, blood flow rate; D5W, 5% dextrose in water.

From: Burgner, Ikizler, Dwyer, CJASN, 2020. https://cjasn.asnjournals.org/content/15/5/720

Attachment A

Division of Nephrology
University of Washington

III. Acute PD Protocol

Step 1 - Candidate selection:
Patients who are COVID- with AKI requiring dialysis
Patients with advanced CKD who need to initiate dialysis

Absolute and Relative Contraindications:
Proned, mechanically ventilated patients
Pulmonary edema with severe respiratory failure
Recent breach of peritoneum (abdominal surgery)
Active abdominal pathology (peritonitis, bowel obstruction)
Toxic ingestion
Severe hyperkalemia (>7 or refractory to medical management)

Step 2 - Access:

1. Bowel regimen prior to access and during therapy - suggested regimen:
    a. Colace 100 mg bid
    b. Lactulose 30 g daily
    c. Polyethylene glycol 17 g daily
2. PD catheter placement (laparoscopic vs. percutaneous) as per agreement with local surgeon
    a. Confirm with surgeon if possible to use immediately vs 24-48 hours to flush

Step 3 - Therapy options:

1. Low volume APD (preferred): 750-1000 mL exchanges with 60-90 minute cycle times for 8-12 hours (allows for ambulation, procedures, etc.)
    a. Consider volume of available PD dialysate bags when writing prescription
2. Low volume CAPD: 750-1000 mL q4-6h
3. All exchanges must be performed in supine position, sit or ambulate only when empty
4. If leak detected, discontinue PD and wait 24 hours before resuming
5. If tolerating well and no leak, evaluate for increasing volume of exchanges
6. Start with 2.5% dextrose for mild/moderate fluid overload and adjust based on ultrafiltration needs
7. Consider addition of intraperitoneal heparin (500-1000 units/L) to prevent fibrin clot formation or as needed based on appearance of effluent fibrin to maintain PD catheter patency
8. Monitor and replace potassium as needed
9. Use nystatin or fluconazole for fungal peritonitis prophylaxis in patients receiving antibiotics
10. Reevaluate prescription and/or modality if not meeting metabolic and/or fluid removal goals after 48 hours

Step 4: Target prescription:
In resource-limited situations, the ISPD guidelines recommend targeting a minimum daily Kt/Vurea of 0.3, which is equivalent to a weekly Kt/Vurea of 2.1 for PD and considered equivalent to Kt/Vurea of 1.2 for thrice-weekly hemodialysis.
Regular measurement of Kt/Vurea is not necessary and PD adequacy should be assessed by the clinical improvement of fluid overload, hyperkalemia and metabolic acidosis.

HMC operations: Contact General Surgery. Four surgeons place PD catheters [Names]. PD catheters will be placed laparoscopically. COVID (-) patients should be prioritized for acute PD to preserve PPE and limit exposure during PD catheter placement. If OR space becomes an issue, surgeons would consider placement with local anesthesia and sedation in a procedure room.

VII. References

Acute PD protocol:

1. Srivatana V, Aggarawal V, Finkelstein FO, Naljayan M, Crabtree JH, Perl J. Peritoneal Dialysis for Acute Kidney Injury Treatment in the United States: Brought to you by the COVID-19 Pandemic. *Kidney 360*. 2020;1(5):410-415.
2. Shimonov D, Srivatana V. Peritoneal Dialysis for Acute Kidney Injury During the COVID-19 Pandemic. *CJASN*. E-published ahead of print. doi: https://doi.org/10.2215/CJN.09240620.

Medical management without dialysis for patients with kidney disease:

Davison SN, Tupala B, Wasylynuk BA, Siu V, Sinnarajah A, Triscott J. Recommendations for the Care of Patients Receiving Conservative Kidney Management: Focus on Management of CKD and Symptoms. *Clin J Am Soc Nephrol.* 2019;14(4):626- 634.

Lam DY, Scherer JS, Brown M, Grubbs V, Schell JO. A Conceptual Framework of Palliative Care across the Continuum of Advanced Kidney Disease. *Clin J Am Soc Nephrol*