Emory Healthcare
Renal Replacement Therapy Surge Plan

EHC RRT Surge Planning Committee

Last Update Date: 4/6/2020

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- Shaun Conlon
- Tahsin Masud
- Harold Franch
- Jeff Sands
- Craig Coopersmith
- Ibironke Apata
- Kari Love
- Carolyn Holder
- Doris Wong
- Mary Still
- Porcia Jones
- Melida Hall
- Brienne Anderson
- Sarah San Fratello

- Lauren Paris
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- Greg Kingsley-Mota
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Renal Replacement Therapy (RRT) During ICU Surge Situation

**Background**
- RRT is commonly required life-support tool for critically ill ICU patients
  - 15-30% ICU patients require RRT
- Multiple methods to provide RRT
  - All methods effective when used appropriately

**Challenge**
- RRT is a finite resource due to limitations in:
  - Machines
  - Supplies
  - Personnel → depending on the type of RRT performed
- Surge in ICU census → surge RRT needs
RRT Surge Plan

**Goal:**

- Use multiple methods of RRT to maximize the number of patients who can receive appropriate RRT to meet their individual support needs.
- Equitable distribution and utilization of RRT resources to provide benefit to the most patients.

**Challenge:**

- Develop resource distribution systems to meet this goal.
  - Staffing
  - Supply chains
  - Machine use → when machines are limited, system to minimize machine down-time
Acute Renal Support in the ICU

**Spectrum of RRT – Duration of RRT**

- **CRRT**
  - Cardiovascular instability (cardiogenic shock, septic shock, acute liver failure)
  - Metabolic acidosis
  - Volume control
  - Cerebral edema

- **IHD/PIRRT**
  - Hyperkalemia
  - Profound acidosis
  - Drug poisonings
  - Anticoagulation issues with CRRT

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## Acute RRT Options in ICU

### CRRT – 24h
- Prismaflex CRRT machine
- 24hr continuous RRT
- Work force = ICU RNs

### Shift-based CRRT
- Prismaflex CRRT machine
- 10-12 hr RRT sessions
- Work force = ICU RNs

### PIRRT/SLED
- Conventional HD machine
  - or Tablo®
- 6-8 hr RRT sessions
  - Usually overnight
- Work force = collaborative:
  - HD RNs: set-up, start, & terminate HD
  - ICU RN: monitors & calls HD RN for issues

### Intermittent Hemodialysis (IHD)
- Conventional HD machine
- 3-4 hr RRT sessions
- Work force = Hemodialysis RN

### Peritoneal Dialysis (PD)
- 2 Options:
  - Continuous treatments (CAPD)
  - Automated PD (APD)
- CAPD: exchanges q3-4 hrs, 24 hrs/day by ICU or general ward RN
- APD: HD RN sets up & starts APD session lasting 10-12 hr

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# EHC: Pandemic ICU RRT Surge Plan

## Plan A: Conventional Operations
- **24h CRRT**
- IHD if/when clinically indicated
- CRRT preferred to decrease exposure of additional RNs needed for HD

## Plan B: Machine Load Balance
- **24h CRRT**
- IHD only if clinically indicated
- Intermittently move CRRT machines between EHC institutions as load balance needed
- CRRT preferred to decrease exposure of additional RNs needed for HD

## Plan C: Mixed CRRT Duration
- Mix of CRRT-24h & shift-based CRRT based on clinical needs of patient
- Some CRRT machines will perform RRT on 2+ patients per day
- IHD only if clinically indicated
- CRRT machine use preferred to decrease exposure of additional RNs needed for HD

## Plan D: Mixed CRRT + HD/SLED
- Mix of CRRT-24h & shift-based CRRT based on clinical needs of patient
- Some CRRT machines will perform RRT on 2+ patients per day
- **Overnight SLED with HD machines**
- IHD as soon as clinically appropriate

## Plan E: CAPD + all hemoRRT
- Acute bed-side PD catheter insertion & CAPD
- Sedated/ventilated COVID+ patients
- Mix of CRRT-24h & shift-based CRRT based on clinical needs of patient
- **Overnight SLED with HD machines**
- IHD as soon as clinically appropriate

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Determinant of RRT Surge Plan

Plan A: Conventional Operations
Plan B: Machine Load Balance
Plan C: Mixed CRRT Duration
Plan D: Mixed CRRT + HD/SLED
Plan E: CAPD + all hemoRRT

Total # of Patients needing ICU RRT
RRT Surge Plan: contingency vs crisis

**Contingency Plans/Mode**

- **Plan A**: Conventional Operations
- **Plan B**: Machine Load Balance
- **Plan C**: Mixed CRRT Duration
- **Plan D**: Mixed CRRT + HD/SLED
- **Plan E**: CAPD + all hemoRRT

**Risk of errors**

- No significant new risks
- Supply Chains Intact
- Staffing Intact (generally)

**Disposable Supplies & Machines**

Crisis Plans/Mode

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RRT Surge Plan – EHC Current State (4/6/20)

Plan A: Conventional Operations
Plan B: Machine Load Balance
Plan C: Mixed CRRT Duration
Plan D: Mixed CRRT + HD/SLED
Plan E: CAPD + all hemoRRT

Current Location
Contingency Plans/Mode
Crisis Plans/Mode

Total # of Patients needing ICU RRT
Plan A – Conventional Operations

### Challenges

- **No specific new challenges**
- **Enough machines & disposable supplies to meet ICU RRT demands with 24h CRRT & IHD**
- **Usual challenges:**
  - ICU RN & HD RN staffing
  - Adequate distribution of supplies including filters, CRRT solutions, citrate/calcium availability

### Pandemic Surge Preparations

- **Plan adapted for pandemic isolation needs**
- **Prefer CRRT use to minimize additional staff exposures to isolation environment**
  - HD RN to deliver IHD
- **IHD may continue in ICUs**
  - Facilitate liberation from CRRT for PT/OT
  - ESRD patient with native AVF/AVG
### Plan B – Machine Load Balance

#### Surge Challenge

- Surge of patient at a given EHC facility → do not have enough machines to meet demand at a given facility

- Supply chains intact:
  - RRT supplies come from EHC offsite warehouse → easy to increase deliveries to meet demand

- Limited staffing impact

#### Pandemic Surge Preparations

- Move RRT machines periodically *between EHC institutions* to meet RRT demands

- Coordination between:
  - Biomedical engineering departments
  - Clinical leadership teams
  - Asset administration
  - Movers
  - Others

- Takes time to implement
Plan C – Mixed CRRT Durations

**Challenges**

- Unable to meet RRT demands
  - # of ICU RRT pts > CRRT machines

- Different patients will require different RRT plans
  - One shift-based RRT plan will not fit all

- Highly complex to orchestrate
  - Matching available machines to appropriate pts
  - Complex scheduling

**Surge Preparations – Needs**

- Operational expertise to implement

- Daily CRRT machine deployment schedule
  - Staff to develop deployment schedule

- Staff to orchestrate machine deployment

- Appropriate RRT orders to match plan
Plan D – Mixed CRRT + HD/SLED

**Challenges**

- **Unable to meet RRT demands**
  - # of ICU RRT pts > CRRT machines (even with shift-based CRRT implementation)

- Will have to more widely use HD machines & HD RNs for ICU HD & SLED
  - HD RN staffing impact → ? less non-ICU HD

- Highly complex to orchestrate

- ICU RNs unfamiliar with HD equipment

**Surge Preparations – Needs**

- New machine: *Tablo*® – 10 have been ordered
- EHC Fresenius HD Machines: require chip upgrade to perform SLED

- Operational expertise to implement

- Daily CRRT & HD machine & staff deployment schedule → staff needed to develop schedule & orchestrate deployments

- SLED: Overnight HD RN(s) to set-up, initiate, terminate HD sessions & to make rounds while patients are running on SLED.
Plan E – CAPD & all HemoRRT

Challenges

- Unable to meet RRT demands
  - # of ICU RRT pts > CRRT + HD machine + staff availability

- ICU RNs CAPD educational needs
  - CAPD performed rarely in EHC ICUs

- Bed-side PD catheter insertion → surgeons

- CAPD charting

Surge Preparations – Needs

- Identifying & train surgeon partners
- RN training for and delivery of CAPD versus
- HD RN performing APD with limited ICU RN involvement
- Continue need for CRRT & HD machine & staff deployment program/resources
- Determine supplies for CAPD & purchase soon
  - Surgeons’ & nephrologists’ preferred PD catheter
  - Disposable supplies for PD exchanges
  - PD solutions

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ICU RRT for ESRD Patients

- During pandemic, RRT for ICU patients with ESRD should be guided by:
  1. Patients preferred outpatient dialysis method
     - HD via AVF/AVG
     - HD via Permcath (PC)
     - PD
  2. Native dialysis vascular access
  3. Clinical condition

- Native AVF/AVG: preference is HD via AVF/AVG unless too hemodynamically unstable
- Native PC: HD via PC or CRRT-24h/CRRT-shift via PC
- PD: PD
RRT Surge Plan

Ethical Considerations
RRT Surge Plan – Ethics

- **No strong data** that 1 method of RRT is *clearly superior* to another
  
  - When prescribed & performed well, all methods of RRT are effective at achieving patient-centered goals (correction of acid-base or electrolyte disorders, fluid management goals, etc)

- Provided EHC can provide appropriate RRT to meet a patient’s needs, then there are little (if any) ethical implication of any of these techniques

- Ethical issues arise if/when we do not have the supplies or capacity to meet a given patient’s needs
RRT Surge Plan

Summary
Summary

- System-wide RRT surge plan is **required**

- System-wide expertise will be needed to operationalize & implement any RRT surge plan
  - MDs, APPs
  - RNs & staff
  - Educators
  - Administrative leadership
  - Administrative expertise
  - Supply Chain Management