Emory Healthcare
Renal Replacement Therapy Surge Plan

EHC RRT Surge Planning Committee
Last Update Date: 4/6/2020

EHC RRT Surge Planning Committee

- Michael Connor – chair
- James Bailey
- Shaun Conlon
- Tahsin Masud
- Harold Franch
- Jeff Sands
- Craig Coopersmith
- Ibironke Apaté
- Kari Love
- Carolyn Holder
- Doris Wong
- Mary Still
- Porcia Jones
- Melida Hall
- Brienne Anderson
- Sarah San Fratello
- Lauren Paris
- Sharon Vanairsdale
- Patricia Black
- Palacine Fleming
- William Bender
- MaryBeth Sexton
- Nirvan X Mukerji
- Greg Kingsley-Mota
- Elizabeth Hudson-Weires
- Mardi Davis
- Marcus Urquiaga
- Jonathan Suarez
- Lynn Schlanger
- Seema Tekwani
- Joel Zivot
- Sarah Nicholls
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

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RRT Surge Plan

**Goal:**
- Use multiple methods of RRT to maximize # 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

### Acute RRT Options in ICU

<table>
<thead>
<tr>
<th>CRRT – 24h</th>
<th>Shift-based CRRT</th>
<th>PIRRT/SLED</th>
<th>Intermittent Hemodialysis (IHD)</th>
<th>Peritoneal Dialysis (PD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Prismaflex CRRT machine</td>
<td>• Prismaflex CRRT machine</td>
<td>• Conventional HD machine or Tablo®</td>
<td>• Conventional HD machine</td>
<td>• 2 Options:</td>
</tr>
<tr>
<td>• 24hr continuous RRT</td>
<td>• 10-12 hr RRT sessions</td>
<td>• 6-8 hr RRT sessions Usually overnight</td>
<td>• 3-4 hr RRT sessions</td>
<td>• Continuous treatments (CAPD)</td>
</tr>
<tr>
<td>• Work force = ICU RNs</td>
<td>• Work force = ICU RNs</td>
<td>• Work force = collaborative:</td>
<td>• Work force = Hemodialysis RN</td>
<td>• Automated PD (APD)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• HD RNs: set-up, start, &amp; terminate HD</td>
<td></td>
<td>• CAPD: exchanges q3-4 hrs, 24 hrs/day by ICU or general ward RN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ICU RN: monitors &amp; calls HD RN for issues</td>
<td></td>
<td>• APD: HD RN sets up &amp; starts APD session lasting 10-12 hr</td>
</tr>
</tbody>
</table>
RRT Surge Plan: contingency vs crisis

Contingency Plans/Mode

Crisis 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

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

Risk of errors
Disposable Supplies & Machines

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

Current Location

Contingency Plans/Mode

Crisis 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

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 inserstion → surgeons
- CAPD charting

**Surge Preparations – Needs**
- Identifying & train surgeon partners
- RN training for and delivery of CAPD
  versus
- HD RN preparing 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

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 Permcat (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

- 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
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

ACUTE RRT IS A TEAM SPORT