

Cardiogenic Shock Collaborative

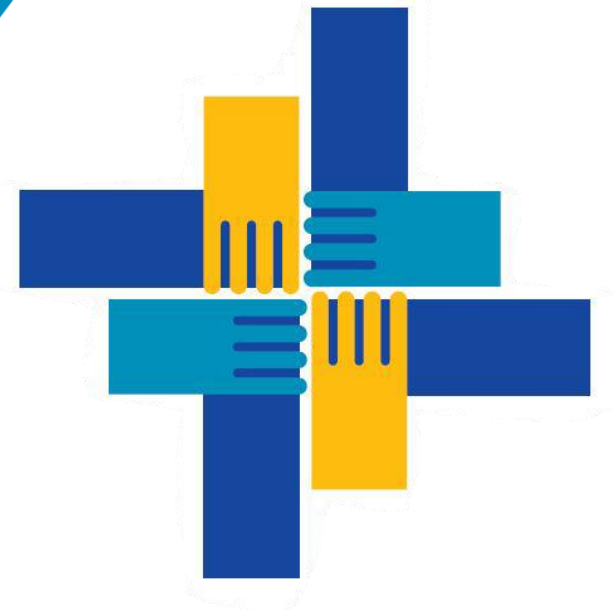
BUMC ED Provider Meeting

MD Project Leader:

**Shelley Hall, MD, FACC, FHFA,
FAST**

Chief of Transplant Cardiology &
Mechanical Support/Heart Failure
Baylor University Medical Center

May 26, 2021



Today's Agenda

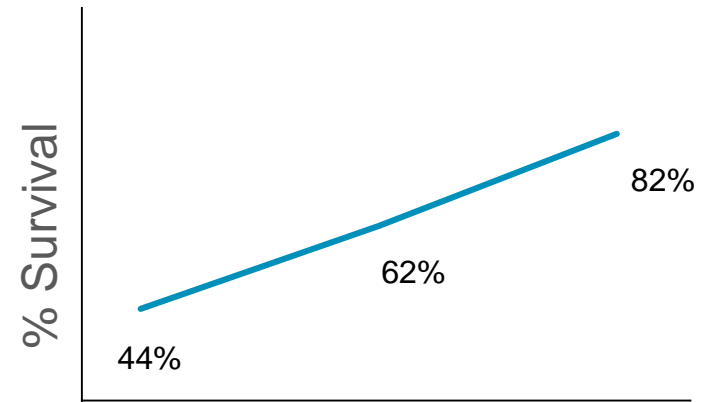
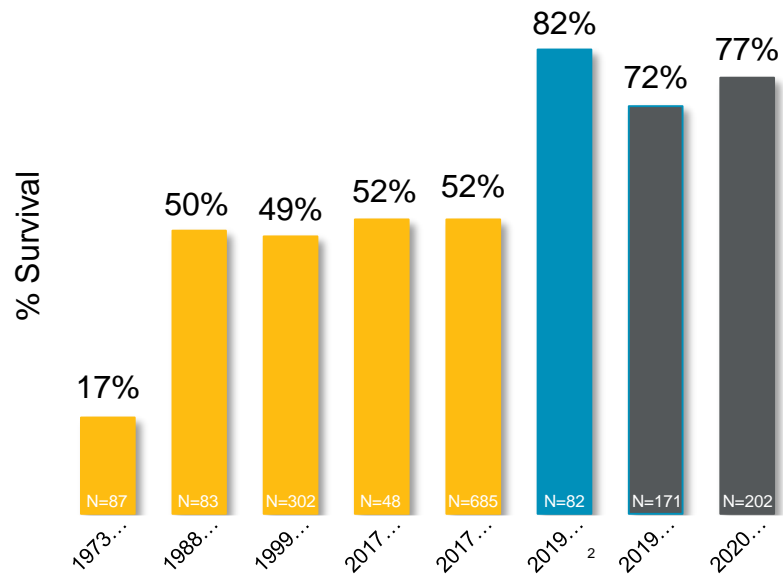
Goals of call is to: Orient you to the BSWH System Cardiogenic Collaborative project structure and share the progress made to date.

Topics

1. Current Issues, Project Roadmap & Structure
2. Baseline Performance: CY 2019 Data assessment
3. Completed Work: Approved Protocols
4. Work in Progress
5. In Summary...What We Need



PROTOCOL DRIVEN CARE IMPROVED SURVIVAL



* Basir, M. B., et al. (2019). *Catheterization and Cardiovascular Interventions*, 93(7), 1173–1183

1. Thiele, H., et al. (2017). *New England Journal Of Medicine*, 377(25), 2419-2432

2. Tehrani, B. N., et al. (2019). *Journal of the American College of Cardiology*, 73(13), 1659–1669

3. O'Neill, W. (2020). *Achieving >70% AMI-CS Survival: Insights from National Cardiogenic Shock Initiative Presentation*, TCT

4. Sato, Y. (2020). *Japanese Circulation Society, Kyoto*





Roadmap for BSWH System Shock Collaborative

OPPORTUNITIES

1. Decrease clinical variations by identifying, establishing and sharing best practices
2. Standardize processes, definitions, and protocols to improve communication
3. Implement early referrals to advance heart failure management and elevate BSWH patient outcomes.

VISION

To design and implement a system-wide, physician led Cardiogenic Shock Collaborative project model at BSWH aiming to improve care coordination and survival rate.



BSWH Shock Collaborative Structure

System Sponsors	CV Governance Council	Meeting Frequency																				
CVG Executive Sponsor	Dr. Kevin Wheelan & Dr. Michael Mack	Monthly project updates to CVG																				
System Project Leadership	MD Project Leader: Dr. Shelley Hall CV Quality & Analytics Team: SME: Ellie Huff, RN Data Analytics: Mo Safa, MSc Project Management: Laila Mallari, MPH	Biweekly meetings																				
Shock Executive Committee	<table border="1"> <thead> <tr> <th>Site</th> <th>MD</th> </tr> </thead> <tbody> <tr> <td>Dallas</td> <td>Dr. Cesar Guerrero-Miranda</td> </tr> <tr> <td>Dallas</td> <td>Dr. Dan Meyer</td> </tr> <tr> <td>Dallas</td> <td>Dr. Kara Monday</td> </tr> <tr> <td>Fort Worth</td> <td>Dr. Salman Gohar</td> </tr> <tr> <td>Plano</td> <td>Dr. Aasim Afzal</td> </tr> <tr> <td>Plano</td> <td>Dr. David Rawitscher</td> </tr> <tr> <td>Temple</td> <td>Dr. Robert Widmer</td> </tr> <tr> <td>Temple</td> <td>Dr. Whitney Prince</td> </tr> <tr> <td>Temple</td> <td>Dr. Michael Koerner</td> </tr> </tbody> </table>	Site	MD	Dallas	Dr. Cesar Guerrero-Miranda	Dallas	Dr. Dan Meyer	Dallas	Dr. Kara Monday	Fort Worth	Dr. Salman Gohar	Plano	Dr. Aasim Afzal	Plano	Dr. David Rawitscher	Temple	Dr. Robert Widmer	Temple	Dr. Whitney Prince	Temple	Dr. Michael Koerner	Monthly meetings
Site	MD																					
Dallas	Dr. Cesar Guerrero-Miranda																					
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Temple	Dr. Michael Koerner																					
Project Deliverables	<ol style="list-style-type: none"> 1. Establish ongoing BSWH Shock Collaborative structure 2. Assessment of current state 3. Development of BSWH SHOCK practice guidelines 4. Development of system cardiogenic shock scorecard/dashboard 	Assessment Findings/Prioritize Improvements <i>Task Force #1- Definitions, Identification & Operationalizing Shock Team</i> <i>Task Force #2- Treatment Algorithm</i> <i>Task Force #3- STEMI Shock</i> <i>Task Force #4- Education & Training</i> <i>Task Force #5- Transfer & Transport Process</i>																				



Baseline Performance

CY 2019 Data assessment

CY 2019 Cardiogenic Shock Billing Data Analysis

Baseline Assessment

Description	Number	% of N (N= 1904)
Patients (N) w/ Cardiogenic Shock R57.0 ICD10 Diagnosis Code	1,904	100%
Patients who had a Swan Ganz	246	12.9%
Patients who had a IABP	12	<1%
Patients who had an ECMO	67	3.5%
Patients who had an LVAD	31	1.6%
Patients who had an Impella	63	3.3%
Patients who received any device	149	7.8%
Patients who had multiple devices	20	1.1%
Patients who had "Shock" medications	867	45.5%
Patients who went to ICU during hospital stay	1,290	67.8%
Patients who had R57.0 ICD 10 Code Present on Admission (POA)	1,094	57.3%

Days (+/-)	Number	% of N
3	455	23.9%
5	461	24.2%
7	471	24.7%

Lab	Patients Who Had Lab Test	Patients With Abnormal Results	% of N (Patients With Abnormal Results/N)
pH	805	610	32%
Troponin	697	249	13%
WBC	1353	897	47%
Lactate	648	523	27%

Data Source: Performance Manager, EPIC, Patcom, SoftLab



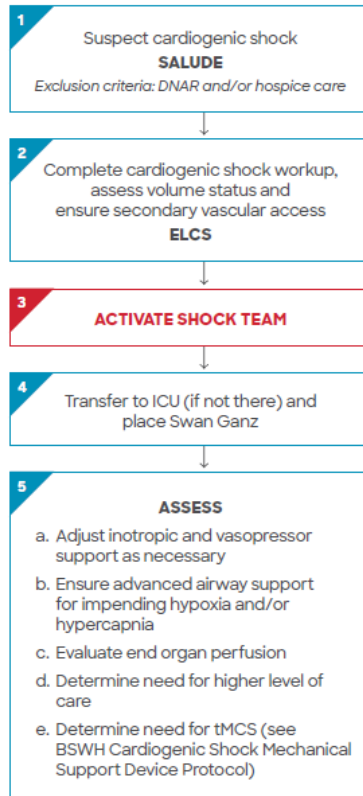
Completed Work

BSWH approved cardiogenic shock protocols

Cardiogenic Shock Assessment Protocol

Objective: Early activation of the SHOCK team with consultation of the cardiology/advanced heart failure specialist to improve outcomes.

Workflow



*CV or HF fellow or attending depending upon site

Suspicion of cardiogenic shock

S SBP	A Arrhythmias	L Labs	U Urine output/function	D Drips	E Examination
<input checked="" type="checkbox"/> SBP <90 mmHg (known baseline SBP >100 mmHg) or <input checked="" type="checkbox"/> \downarrow in SBP >20% for \geq 30 minutes before intervention	<input checked="" type="checkbox"/> Frequent PVCs or sustained VT <input checked="" type="checkbox"/> Unexplained supraventricular tachycardia	<input checked="" type="checkbox"/> Troponin <input checked="" type="checkbox"/> ST elevation/depression <input checked="" type="checkbox"/> \uparrow Cr >0.5 mg/dl within 24 hrs (baseline Cr <2.5 mg/dl)	<input checked="" type="checkbox"/> Cr \uparrow >0.5 mg/dl within 24 hrs <input checked="" type="checkbox"/> Oliguria/anuria (urine output) <400 mL/24 h or <17 mL/h	<input checked="" type="checkbox"/> Drips: Empiric use of vasopressors, vasodilators or <input checked="" type="checkbox"/> IABP	<input checked="" type="checkbox"/> Cool/clammy skin <input checked="" type="checkbox"/> Peripheral cyanosis <input checked="" type="checkbox"/> Altered mental status <input checked="" type="checkbox"/> Respiratory distress

Diagnosing of cardiogenic shock

E EKG & ECHO	L Labs (added)	C Consult	S Swan Ganz
<ul style="list-style-type: none"> 12-lead EKG STAT ECHO 	<ul style="list-style-type: none"> Lactate >2 pH <7.35 Central venous blood gas Procalcitonin <p><i>If not drawn already:</i></p> <ul style="list-style-type: none"> Troponin with high PTP* Metabolic panel LFTs CBC BNP (or pro BNP) 	<ul style="list-style-type: none"> Review findings with cardiogenic shock MD* Goal: Confirm need for Swan Ganz 	<ul style="list-style-type: none"> Insert a Swan Ganz (if no Swan Ganz is available, draw a venous blood gas) CI <2.2 on Inotropes CI <2.0 without Inotropes PCWP >15 CPO <0.6 PAPi <0.9 CVP/PCWP <0.6

Cardiac Power Output (CPO) = MAP x CO/451

Pulmonary Artery Pulsatility Index (PAPI) = (sPAP-dPAP)/RA



Cardiogenic Shock Mechanical Support Device Protocol



Objective: Provide prompt mechanical ventricular unloading management and appropriate device utilization to maximize outcomes.

Criteria for refractory shock

- Lactate >3
- Urine output <30cc/hr
- CPO <0.6
- Increasing pressor requirement
- Evidence of organ hypoperfusion

Criteria for RV dysfunction

- PAPI <1.0
- RA >15mmHg
- RA/PCWP ratio >0.63

Common resuscitation medications

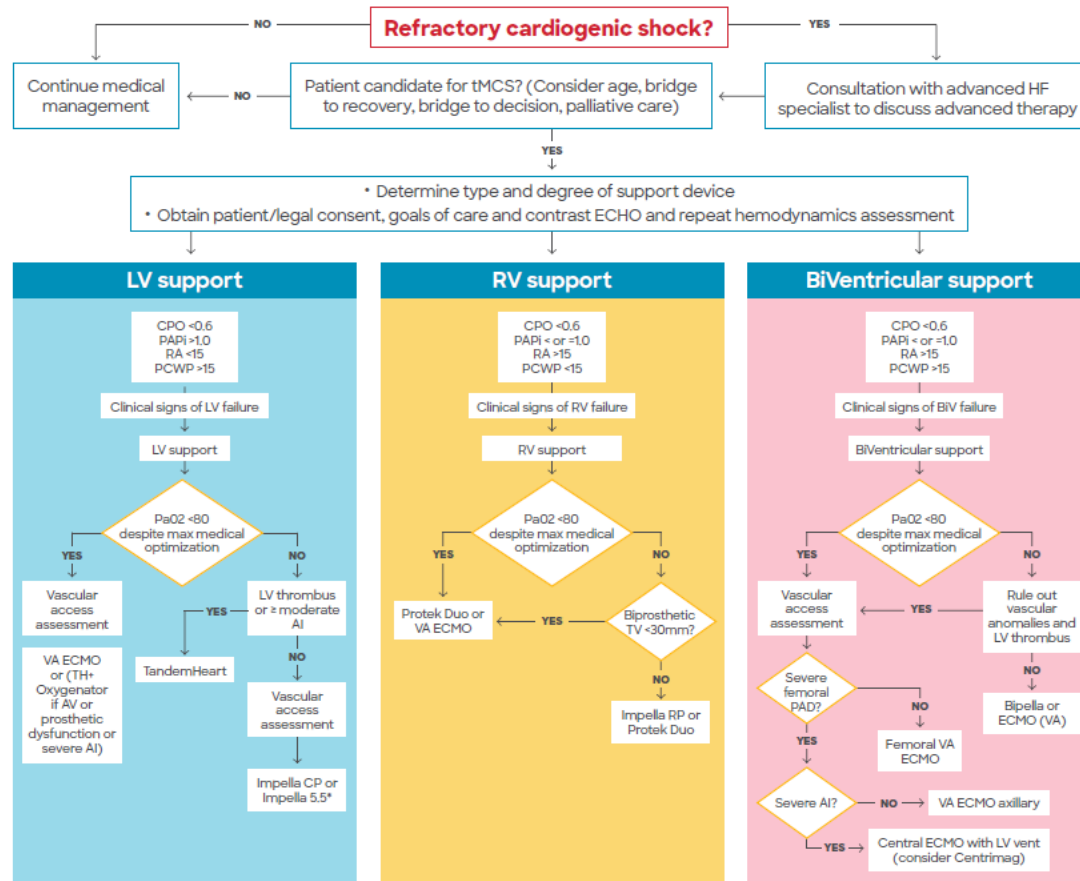
- Dopamine 2-10 mcg/kg/min
- Epi 0.02-0.08 mcg/kg/min
- Norepi 0.02-0.3 mcg/kg/min
- Milrinone 0.125-0.5 mcg/kg/min
- Dobutamine 2-7.5 mcg/kg/min
- Vasopressin 40 units IV

Vascular access assessment

- Evaluate history of PAD
- Obesity
- Groin access consideration
- R/O LV thrombus

Note: IABP should only be considered if no other support device is available.

*Consideration should be made regarding timing of implant, bridge to transplant, bridge to LVAD.



Cardiac Power Output (CPO) = MAP x CO/451

Pulmonary Artery Pulsatility Index (PAPI) = (sPAP-dPAP)/RA

BSWH Cardiogenic Shock Collaborative



Management of acute cardiogenic shock in ACS STEMI protocol

Objective: improve survival of acute cardiogenic shock STEMI patients

Workflow

Shock criteria

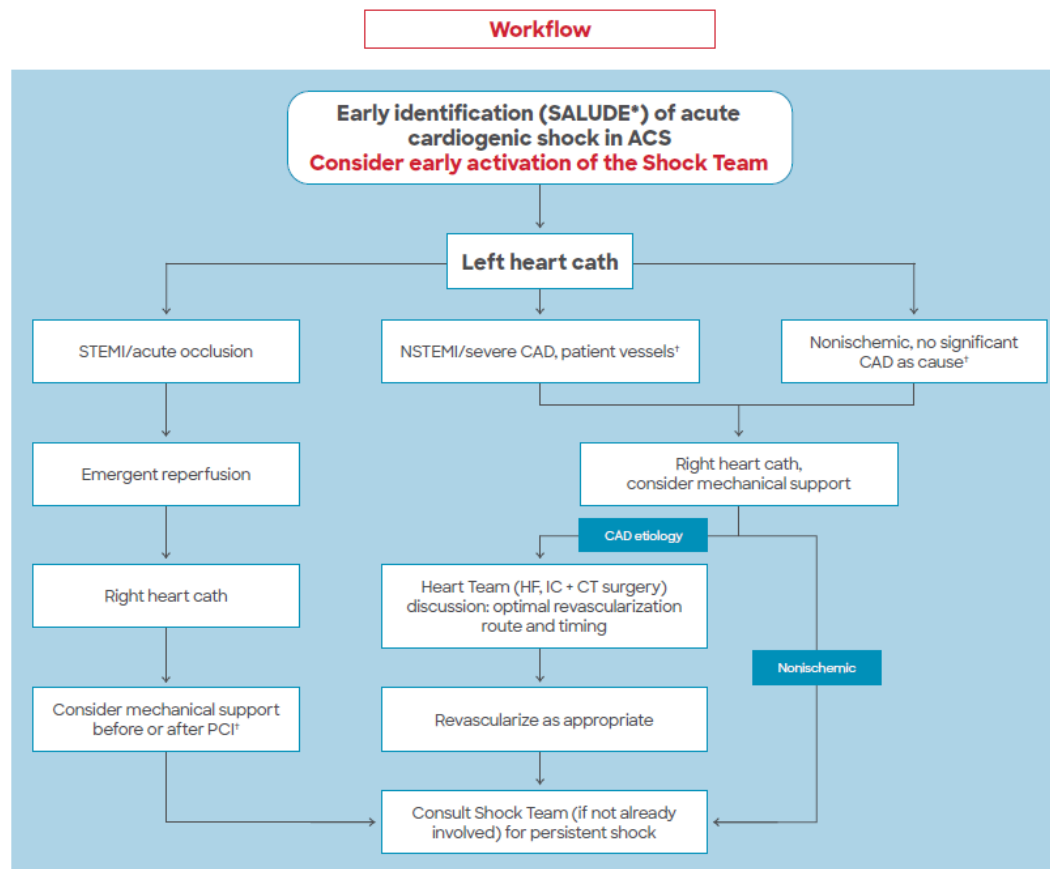
- SBP < 90 mmHg (30 min) or use of vasopressors/inotropes
- Lactate > 2 mmol/L
- End-organ perfusion (cold/clammy, oliguria, acidosis)
- CI < 2.2 L/min/m²
- PCWP > 18 mmHg
- CPO < 0.6 W

Considerations for temporary mechanical circulatory support (tMCS)

- Intra-aortic balloon pump (IABP)
- Impella
- Extracorporeal membrane oxygenation (ECMO)
- TandemHeart

Best practices for access management

- Consider femoral arterial access using micropuncture with imaging guidance (preferably ultrasound)
- Angiography via micropuncture dilator to confirm puncture site and vessel size
- Place appropriately sized arterial sheath
- Obtain venous access (femoral or internal jugular)



*For SALUDE, refer to the cardiogenic shock assessment protocol

†If the patient is unstable and requires a higher level of care, consider urgent transfer to a comprehensive cardiac center at this time



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Work in Progress

Establish a multi-disciplinary shock team to treat cardiogenic shock

	TIER 1 Hospital which provides ECMO, LVAD and comprehensive cardiac surgery support.	TIER 2 Hospital with ICU capable of managing Swan Ganz and lactate levels, IABP or Impella		TIER 3 Hospital identifying Cardiogenic shock patient and transferring to appropriate Tier 1 or 2 facility
BSWH Facility	<ul style="list-style-type: none"> ▪ Dallas ▪ Fort Worth ▪ Plano ▪ Temple 	A) Has Swan, IABP & Impella <ul style="list-style-type: none"> ▪ College Station ▪ Denton ▪ Irving ▪ Lake Way ▪ Round Rock ▪ Waco-Hillcrest 	B) Only IABP <ul style="list-style-type: none"> ▪ McKinney ▪ Plano-BSWH ▪ Frisco-Centennial ▪ Grapevine ▪ Lake Pointe-Rowlett 	<ul style="list-style-type: none"> ▪ Aubrey ▪ Austin ▪ Brenham ▪ Buda ▪ Burleson ▪ Cedar Park ▪ Colleyville ▪ Frisco ▪ Grand Prairie ▪ Keller ▪ Killeen ▪ Mansfield ▪ Marble Falls ▪ Murphy ▪ Pflugerville ▪ Roanoke ▪ Rockwall ▪ Taylor ▪ Trophy Club ▪ Waxahachie
Potential Shock Content Expert	<ul style="list-style-type: none"> ▪ RRT member ▪ HF, +/- Interventional ▪ Critical Care ▪ +/- CV Surgery 	<ul style="list-style-type: none"> ▪ Interventional ▪ CVTS ▪ Critical Care ▪ Nursing Champion 		<ul style="list-style-type: none"> ▪ Cardiology ▪ Critical Care ▪ Nursing Champion



Operationalizing the Cardiogenic Shock Team Concept

Facility Shock Team Plan for: Dallas

MD Leader: Dr. Shelley Hall

Action Items	Site Plan	Notes
Considerations for Operationalizing		
<ul style="list-style-type: none"> Site Shock Team Composition <ul style="list-style-type: none"> a. HF? b. Interventional? c. Critical Care? d. CV Surgery? 	<ul style="list-style-type: none"> HF Cardiologist HF Fellow 	
<ul style="list-style-type: none"> Response will be hardwired 24 hours a day? Yes/No 	<ul style="list-style-type: none"> Yes 	<ol style="list-style-type: none"> Via 3SCU just like STEMI STEMI phone # (3SCU) to activate shock: 214-820-0550
<ul style="list-style-type: none"> Activation Process steps 	<ul style="list-style-type: none"> Any MD, Fellow, NP can call 3SCU. Charge nurse would then page/call HF Cardio on call. HF Card would see/review case and determine next steps. If patient is on the floor and nurse calls RRT.... <ol style="list-style-type: none"> RRT suspects shock based on SALUDE, RRT notifies attending Attending assesses patient (obtains labs & conductions examination) Attending calls 3SCU to active shock team if patient meets criteria. 	
<ul style="list-style-type: none"> Who manages local "On-Call" schedule to manage any changes in Shock Team On Call list? 	<ul style="list-style-type: none"> HF schedule on Amion BHVH to make sure info available to 3SCU charge nurse. 	
<ul style="list-style-type: none"> Who tracks and trends activations and response times for your site? 	<ul style="list-style-type: none"> Robert Williams Monthly review of trends/opportunities for improvement 	
<ul style="list-style-type: none"> Will there be any documentation of the response? 	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> Robert Williams
<ul style="list-style-type: none"> Who will debrief these activation to look for ways to improve shock team effectiveness? 	<ul style="list-style-type: none"> Dr. Hall with BHVH team 	
Considerations for Implementation		
<ul style="list-style-type: none"> What are the challenges/barriers? 	<ul style="list-style-type: none"> Beds, awareness Physician buy in for placing orders if pt has a cardiology consult, do we call HMD or cardiology? 	
<ul style="list-style-type: none"> Goals 	<ul style="list-style-type: none"> Allow RRT to order E and L if suspicion strong while working to reach attending and notify. 	
<ul style="list-style-type: none"> How can this collaborative assist? 	<ul style="list-style-type: none"> Education materials and efforts 	
<ul style="list-style-type: none"> Target date for implementation of new process? <ul style="list-style-type: none"> June 2021: Go Live 	<ul style="list-style-type: none"> Once have education materials can get to hospitalists, cardiology and critical care easily; ED to check out process 	
<ul style="list-style-type: none"> Which meetings should we give regular updates to once go live? 	<ul style="list-style-type: none"> HMD monthly, Cardio leadership monthly, critical care monthly 	

In Summary.....What We Need From You

- **Go live:**
 - Dallas & Fort Worth: June
 - Plano & Temple: July
- **Massive Education for this month**
- **Thoughts? We welcome your feedback**



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Appendix

Cardiogenic Shock Task Force Structure

BSWH Cardiogenic Shock Executive Committee

Task Force # 1 CS Assessment (Completed) Identification & Operationalizing Shock Team

- Dallas**
 - Dr. Shelley Hall
 - Dr. Detlef Wencker
 - Dr. Kara Monday
 - Dr. Catherine Raver
 - Andres Sisneros
- Fort Worth**
 - Dr. Salman Gohar
 - Dr. Farhan Ali
 - Dr. Jamil Abbasi
 - Mike Walsh
 - Jovita Ford
- Plano**
 - Dr. David Rawitscher
 - Dr. Henry Allen
 - Sherri Long
- Temple**
 - Dr. Lazaros Nikolaidis
 - Dr. Whitney Prince
 - Dr. Monish Sheth
 - Judson LaGrone

Task Force # 2 Treatment Algorithm (Completed)

- Dallas**
 - Dr. Shelley Hall
 - Dr. Dan Meyer
 - Dr. Cesar Guerrero
 - Scott Noesges
- Fort Worth**
 - Dr. Salman Gohar
 - Dr. Scott Ewing
- Plano**
 - Dr. Sameh Sayfo
 - Dr. Aasim Afzal
- Temple**
 - Dr. Robert Widmer
 - Chris Martin

Task Force # 3 STEMI Shock Algorithm (Completed)

- Dallas**
 - Dr. Shelley Hall
 - Dr. Robert Stoler
 - Dr. Gary Schwartz
 - Dr Melody Sherwood
 - Dr. Jeff Schussler
 - Dr. Kara Monday
 - Scott Noesges
 - Andres Sisneros
 - Dr. Catherine Raver
- Fort Worth**
 - Dr. Salman Gohar
 - Dr. Farhan Ali
 - Dr. Jamil Abbasi
 - Mike Walsh
 - Jovita Ford
- Plano**
 - Dr. Aasim Afzal
 - Dr. Karim Al-Azizi
 - Dr. Chadi Dib
 - Dr. Srin Potluri
 - Dr. Henry Allen
 - Sherri Long
- Temple**
 - Dr. Robert Widmer
 - Dr. Tim Mixon
 - Dr. Whitney Prince
 - Dr. Monish Sheth
 - Judson LaGrone
 - Round Rock
 - Dr. Vijay Divakaran
 - Candace Cymerman

Task Force #4 Education & Training

- Dallas**
 - Dr. Shelley Hall
 - Dr. Dan Meyer
 - Dr. Cesar Guerrero
 - Dr. Jeff Schussler
 - Dr. Kara Monday
 - Scott Noesges
 - Andres Sisneros
 - Dr. Catherine Raver
- Fort Worth**
 - Dr. Salman Gohar
 - Dr. Scott Ewing
 - Dr. Farhan Ali
 - Dr. Jamil Abbasi
 - Mike Walsh
 - Jovita Ford
- Plano**
 - Dr. Sameh Sayfo
 - Dr. Aasim Afzal
 - Dr. Henry Allen
 - Sherri Long
- Temple**
 - Dr. Robert Widmer
 - Dr. Whitney Prince
 - Dr. Monish Sheth
 - Chris Martin
 - Judson LaGrone

HOLD- Task Force #5 Transfer & Transport Process

TBD

