Advanced Resuscitation Training

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People should not die before they are done living.
What makes ART unique?

• System of care
  • Inpatient & prehospital

• Approach to education
  • Cognitive psychology

• Curriculum breadth
  • Reduce preventable death

• CQI data collection & analytics
  • Six sigma-based

• Clinical outcomes
  • Consistency across multiple institutions
System of Care
System of Care

Best Practices

Scientific Evidence

CQI

Training

Technology
## The ART Enchilada

<table>
<thead>
<tr>
<th>Afferents</th>
<th>Screening</th>
<th>Monitoring</th>
<th>Early recognition</th>
<th>Critical care (including procedural)</th>
<th>Arrest resuscitation</th>
<th>Post-arrest care</th>
<th>End-of-life issues</th>
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<tr>
<td>Internal (Database)</td>
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<tr>
<td>Technology</td>
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<tr>
<td>Efferents</td>
<td>Special projects</td>
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- Past performance  
- Other institutions  
- Manuals/guides  
- Consensus opinion  
- Best practices  
- Guidelines | - Scientific evidence  
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- Consensus opinion  
- Best practices  
- Guidelines |
| Internal (Database) | - Arrest rates  
- Patient diagnoses  
- Comorbidities  
- Arrest classifications  
- Preventability  
- Risk-adjusted mortality  
- Process issues | - Arrest rates  
- Patient diagnoses  
- Comorbidities  
- Arrest classifications  
- Preventability  
- Risk-adjusted mortality  
- Process issues | - Arrest rates  
- Diagnosis/comorbidities  
- Arrest classifications  
- Preventability  
- Risk-adjusted mortality  
- Process issues | - Arrest rates  
- Diagnosis/comorbidities  
- Arrest classifications  
- Preventability  
- ICU/ventilator days  
- Risk-adjusted mortality  
- Process issues | - ROSC  
- Survival-to-discharge  
- Good neuro outcomes  
- Arrest-related deaths  
- Arrest classifications  
- CPR process measures  
- Process issues | - OOHCA survival  
- ROSC-to-survival rate  
- Temperature management  
- Facilitated PCI  
- Neurocritical care  
- ICU/ventilator days  
- CIBS YAP rates | - Code-DNAP mortality  
- Rate of 2+ Code Blues  
- Advanced directives  
- Family discussions  
- Palliative care consultation  
- Withdrawal  
- Organ donation |
| Technology | - Manual vitals  
- Monitor vitals  
- Advanced monitoring  
- Telemedicine  
- Mechanical ventilation  
- Circulatory assist devices | - Manual vitals  
- Monitor vitals  
- Advanced monitoring  
- Telemedicine  
- Mechanical ventilation  
- Circulatory assist devices | - Manual vitals  
- Monitor vitals  
- MEWS/algorithms  
- Advanced monitoring  
- Telemedicine  
- Mechanical ventilation  
- Circulatory assist devices | - Manual vitals  
- Monitor vitals  
- MEWS/algorithms  
- Advanced monitoring  
- Telemedicine  
- Mechanical ventilation  
- Circulatory assist devices | - Monitor  
- Defibrillation  
- Mechanical resuscitation  
- Oxygenation  
- Ventilation  
- Temperature management  
- ECMO  | - Advanced monitoring  
- Ventilation  
- Oxygenation  
- Temperature management  
- Palliative care  
- Organ donation  | - Advanced monitoring  
- Computer algorithms  
- Prognostication  
- Palliative care  
- Temperature management  
- Comorbidities  
- Palliative care consultation  
- Palliative care  |
| Special projects | - Triad disposition  
- Monitoring  
- Screening approaches  
- Telemedicine  
- Hospital configuration  
- Advance care strategies | - Triad disposition  
- Monitoring  
- Screening approaches  
- Telemedicine  
- Hospital configuration  
- Advance care strategies | - Triad disposition  
- Monitoring  
- Screening approaches  
- Telemedicine  
- Hospital configuration  
- Advance care strategies | - Recognition  
- Monitoring  
- Equipment  
- Code:DNAR  
- Administration  
- Protocols  
- Palliative care  
- Prognostication  | - Advanced monitoring  
- Equipment  
- Neurocritical care  
- Hospital configuration  
- Protocols  
- Palliative care  
- Prognostication  | - Monitoring/equipment  
- Neurocritical care  
- Hospital configuration  
- Palliative care  
- Prognostication  
- Palliative care  
- Family issues  
- End-of-life discussions  |
| Training | - Triad disposition  
- Monitoring  
- ART Matrix  
- Peri-arrest  
- Recognition | - Triad disposition  
- Monitoring  
- ART Matrix  
- Peri-arrest  
- Recognition | - Triad disposition  
- Monitoring  
- ART Matrix  
- Peri-arrest  
- Recognition | - ART Matrix  
- Peri-arrest  
- Recognition  
- Compression  
- Ventilation  
- Medications  
- Survival  
- End-of-life discussions  | - ROSC  
- POV  
- CRP  
- Temperature management  
- Arrhythmia  
- Neurocritical care  
- Reperfusion strategies  
- End-of-life discussions  | - Risk stratification  
- Prognostication  
- Patient/family discussion  
- Conflict resolution  
- Palliative care  
- Ethics  
- Palliative care  
- Organ donation  |
Approach to Education
How We Teach

• Cognitive psychology
• Affective domain
• Conceptual learning
• Vertical perspectivism
• Pattern recognition
• Multiple modalities
• Integrated technology
Curriculum Breadth
What We Teach

• Arrest prevention
  • The Theory of Everything
• Arrest resuscitation
  • CPR Island
• Critical Care
  • Integrated Model of Physiology
• Airway Management
  • Advanced Airway Resuscitation Training
The Theory of Everything
Circulatory

- Time
- SBP
- HR

COMPENSATED

UNCOMPENSATED
Respiratory

Time

COMPENSATED

Tidal Volume

UNCOMPENSATED

SpO2

RR

Tidal Volume
GENERAL ARREST ALGORITHM

Assessment
Compressions if “dead”

CPR Island
- Compressions
- Ventilations
- Pressor
- Monitor

Defibrillate
- Shock quickly, resume CPR
- Anti-arrhythmics?

Perfusion check
Confirm “alive”

“Alive”

Post-Arrest Care
- Critical care
- Temperature control
- Consider PCI
CQI Data/Analytics
ART Data/Analytics

- Institutional
- Operational
- Demographics
- Antecedent events
- Intra-arrest
- Post-arrest
- Process issues
- Clinical interpretation
Clinical Outcomes
Los Angeles EMS

Acceptable Compressions (%)

Pre ART

Post ART

Case 62 (pre) 0%
Case 65 (pre) 1%
Case 55 (pre) 2%
Case 74 (post) 88%
Case 72 (post) 81%
Case 71 (post) 82%
Compressions in Target

Before  After
Air Methods Intubations

<table>
<thead>
<tr>
<th>Year</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
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<tbody>
<tr>
<td>2015</td>
<td>80</td>
<td>82</td>
<td>84</td>
<td>86</td>
</tr>
<tr>
<td>2016</td>
<td>88</td>
<td>90</td>
<td>92</td>
<td>94</td>
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<tr>
<td>2017</td>
<td>96</td>
<td>98</td>
<td>100</td>
<td>100</td>
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</tbody>
</table>

Overall

First Attempt

First Attempt without Desaturation
Riverside County FD

ROS (\%) vs. Time (Q1, Q2, Q3, Q4) for 2014-2018.
Survival to ED Admission

Survival (%)

Colton FD

Pre-ART
Post-ART
UCSD Arrest Survival

Survival-to-Discharge (%)

Current U.S. Benchmark
UCSD Non-ICU Arrest Incidence

Arrest Incidence (per 1000 admissions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Arrest Incidence</th>
</tr>
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<tbody>
<tr>
<td>2006-07</td>
<td>2.75</td>
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<tr>
<td>2007-08</td>
<td>1.5</td>
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<tr>
<td>2008-09</td>
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<td>2009-10</td>
<td>1.3</td>
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<tr>
<td>2010-11</td>
<td>1.2</td>
</tr>
<tr>
<td>2011-12</td>
<td>1.3</td>
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</tbody>
</table>
Survival to Discharge (%)

Geisinger Arrest Survival

2015: 25%
2016: 31%
2017: 38%
Ochsner Arrest Incidence

- Pre-ART
- Post-ART

<table>
<thead>
<tr>
<th>Month</th>
<th>Non-ICU Arrests (#)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep/Oct</td>
<td>18</td>
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<tr>
<td>Nov/Dec</td>
<td>14</td>
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<tr>
<td>Jan/Feb</td>
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<tr>
<td>Mar/Apr</td>
<td>50</td>
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<tr>
<td>May/Jun</td>
<td>14</td>
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<tr>
<td>Jul/Aug</td>
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An ART Movement

![Graph showing survival rates in various settings: Inpatient, ED, Air, Ground EMS, Pre-ART and Post-ART.]