Implementing High Flow Nasal Cannula Therapy in Acute Care Settings–This May Get Heated!

Sonal Kalburgi, DO, MSHS  
Medical Director of Holy Cross Hospital, Children’s National Health System

Tina Halley, MD  
4Main Medical Unit Director, Children’s National Health System

Matthew Sharron, MD  
Pediatric Critical Care Attending, Children’s National Health System

Irini Kolaitis, MD  
Seasonal Hospitalist Program Site Leader, Lurie Children’s Hospital

Nicole Rochester, MD  
Former Medical Director of Holy Cross Hospital, Children’s National Health System

Vineeta Mittal, MD, MBA  
Associate Professor of Pediatrics, UTSW Medical Center and Children's Health System

Saturday, July 22, 2017, 4:15 - 5:30 pm

Disclosure

We have no relevant financial relationships with the manufacturers of any commercial products and/or provider of commercial services discussed in this CME activity.

We do not intend to discuss an unapproved/investigative use of a commercial product/device in this presentation.
Learning Objectives

• Review fundamental high flow nasal cannula (HFNC) concepts and current evidence on its use for pediatric respiratory support.
• Develop an approach to implement HFNC in pediatric wards in both university-affiliated and community hospital settings.
• Build an approach to address common challenges with implementing HFNC outside the intensive care unit.

Session Timeline

4:15 – 4:20 Introduction
4:20 – 4:30 Literature Highlights
4:30 – 4:35 HFNC in Community Hospitals
4:35 – 4:55 HFNC in University Affiliated Hospitals
4:55 – 5:25 Panel Discussion
5:25 – 5:30 Conclusion
HFNC Literature Highlights

Tina Halley, MD
4Main Medical Unit Director, Children’s National Health System
Matthew Sharron, MD
Pediatric Critical Care Attending, Children’s National Health System

High Flow Nasal Cannula

- Delivery system for heated and humidified medical gas mixtures
- This “conditions” gas mixtures leading to less drying of nasal tissues.

Why is humidity important?

Figure 2. A model of how mucosal function varies with the deviation of inspired humidity from core temperature and 100% relative humidity. It illustrates a continuum of mucosal dysfunction with any deviation from optimal humidity. The curve narrows with poor health. The levels of dysfunction may be used to define categories of humidity ranges. MTV, mucociliary transport velocity. BTPS, body temperature atmospheric pressure and saturated with water vapor.


PEEP effect

- High flow nasal cannula does generate some PEEP, but variable
  - Influenced by multiple factors include, tightness of cannula fit in nares, weight, whether mouth is open vs closed.
- In general- younger patients get more PEEP for any given flow rate

Generation of PEEP? Neonatal studies

- Flow rate and weight affected pressure attained, mouth opening did not

Generation of PEEP? Adult studies

- Amount of pharyngeal pressure generated was variable.
- Required 35 Liters/flow to generate up to max of 5 cm H2O PEEP, much less than what is seen in neonates.
- Large variability dependent on whether mouth was open.
CO₂ Washout

- Gas flow rates that exceed inspiratory flow rates cause a “washout” of the nasopharyngeal cavity during late expiratory phase and end expiratory pause in the breathing cycle.
- This “washout” or purge of the anatomic dead space that does not take part in gas exchange removes expiratory gas that is high in CO₂.
- Subsequent breaths will be composed of less re-breathed expiratory gas (high in CO₂, low in oxygen) and more delivered cannula gas.

Anatomic vs Physiologic Dead Space

Dead Space

- **Dead Space** – some of the inspired air fills the conducting respiratory passageways and never contribute to gas exchange in the alveoli.
  - **Anatomical Dead Space** \( V_D \) – volume in conducting zone (~150 ml).
  - **Alveolar Dead Space** – volume of air in alveoli that have ceased to act in gas exchange (due to alveolar collapse or obstruction by mucus, for example).
  - **Total Dead Space** = anatomical dead space plus alveolar dead space.

![Diagram of Dead Space](http://webapps.emory.edu/med-lib/MED_CD/CD/Anesthesiology/content/diagram/201407)
Conditioned Oxygen Mixtures

• Conditioned oxygen mixtures (ie warmed/ humidified) is less likely to induce bronchospasm and decreased lung compliance

• Conditioned oxygen mixtures improve mucociliary function, allows for clearance of secretions and are associated with less atelectasis.

HFNC Outcomes

• ICU Utilization
  – Instituting a HFNC guideline outside the ICU may be associated with increased use of HFNC without a change in length of stay, or ICU transfer rate
  – Patients who will require ICU admission can be identified in 1st hour of admission by HR and RR changes.
**HFNC Outcomes**

- **Predictors of HFNC Failure**
  - High Fio2 needs, prior intubation, and cardiac co-morbidities are associated with HFNC failure
  - Hypercarbia and lesser degree of tachypnea at onset of HFNC along with no change after HFNC initiation may be associated with HFNC failure

- **Decreasing Intubation Rates**
  - Early use of HFNC in the ED may reduce intubation rates
  - HFNC outside the ICU may result in a trend toward decreasing intubation
  - HFNC use in the ICU reduces the need for intubation
HFNC in Community Hospitals

Nicole Rochester, MD
Former Medical Director of Holy Cross Hospital, Children’s National Health System

Phase I: Preparation

• Review literature
• Review current practice (Listserv, protocols from other institutions)
• Engage stakeholders
  – Pediatric Hospitalist group
  – Pediatric residents
  – Respiratory Therapy
  – Nursing (including leadership)
  – Neonatology
  – Pediatric Emergency Dept.
  – CNMC Pediatric ICU
Phase I: Preparation

- Develop protocol
- Vet protocol with stakeholders
- Finalize protocol
- Challenges
  - Determining inclusion/exclusion criteria
  - No evidence for flow rates
  - Equipment needs
  - Training/Nurse staffing

Phase II: Implementation

- Review of protocol and feedback from stakeholders
- In-service (hospitalists, pediatric residents, nurses, respiratory therapy)
- Go-live!
- Challenges
  - Training (new residents q8 weeks, nursing, RT)
  - Pressure to admit excluded patients
  - Low volume
Phase III: Study

- Email Medical Director with concerns/problems
- Chart review
- Debrief at monthly physician group meetings
- Select Metrics
  - Total cases
  - Demographics
  - LOS
  - Transfer to ICU
  - Readmissions

HFNC in University Affiliated Settings

Sonal Kalburgi, DO, MSHS  
Medical Director of Holy Cross Hospital, Children’s National Health System

Irini Kolaitis, MD  
Medical Director Seasonal Hospitalist Program, Lurie Children’s Hospital

Vineeta Mittal, MD, MBA  
Associate Professor of Pediatrics, UTSW Medical Center and Children’s Health System
Can you implement HFNC outside the ICU?

What’s going to tip the scale at your institution?
Project Timeline

<table>
<thead>
<tr>
<th>Month</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>July – Sept 2015</td>
<td>COE Team Formed</td>
</tr>
<tr>
<td>Oct – Dec 2015</td>
<td>Financial data analysis</td>
</tr>
<tr>
<td></td>
<td>IRB completed, Chart Review tool developed</td>
</tr>
<tr>
<td>Jan – March 2016</td>
<td>Chart Review and Data Analysis conducted</td>
</tr>
<tr>
<td></td>
<td>Lit Review, Draft Protocol Developed</td>
</tr>
<tr>
<td>March – July 2016</td>
<td>Clinical Decision Support Tools Developed</td>
</tr>
<tr>
<td></td>
<td>ICU Chief and MUD Approval</td>
</tr>
<tr>
<td></td>
<td>Hospitalist Division Chief Approval</td>
</tr>
<tr>
<td></td>
<td>Requested Pulm Feedback</td>
</tr>
<tr>
<td>Aug 2016</td>
<td>Staff Training/Education Plan Developed</td>
</tr>
<tr>
<td></td>
<td>Finalize ROI Analysis</td>
</tr>
<tr>
<td>Sept 2016</td>
<td>HFNC Orderset Submitted</td>
</tr>
<tr>
<td></td>
<td>Cerner Documentation submitted</td>
</tr>
<tr>
<td></td>
<td>ICU Faculty Presentation 9/14</td>
</tr>
<tr>
<td>Oct 2016</td>
<td>Nursing Practice Council</td>
</tr>
<tr>
<td></td>
<td>Revise IRB</td>
</tr>
<tr>
<td>Nov - Dec 2016</td>
<td>Med Exec Cmte Presentation</td>
</tr>
<tr>
<td></td>
<td>Conduct Staff Education – Physician, RN, RT</td>
</tr>
<tr>
<td>Jan 2017</td>
<td>Planned Go-Live</td>
</tr>
</tbody>
</table>

Learn from our mistakes!

- Start at the top
  - Understand your Org chart
  - Secure leadership commitment
- Review recent safety events/RCAs to get a pulse
- What is the data these leaders want to see?
- Build rapport in small groups
  - Identify allies and adversaries
  - Are you asking me or telling me to do this?
- Talk with your Financial Departments
  - but don’t lead with this
Lurie Children’s Hospital: Developing a new model of inpatient care

- FY 2015-16 Goals
  - Investigate the desirability and feasibility of a new model of inpatient care for medical patients to address high-census issues & increased need for attending physician presence on acute care floors

- Process
  - Discussed with multiple peer institutions and local multidisciplinary team assembled
  - Census data & finances analyzed
  - Explored multiple models of care (Intermediate Care, Third General Medicine Team, Subspecialty collaboration, etc.)
  - *Seasonal 24/7 Hospitalist Service proposal accepted Jan 2016*

Background: Inpatient Challenges

| Volume Surges in ED/UC/Inpatient/ICUs | • ICU and IP Overflow and ED Surges  
  • Surges → Require Moonlighting → Places New Providers in New Roles |
|--------------------------------------|---------------------------------------------------------------------|
| Higher Demands for ICU Level Care    | • Quaternary Care Center; Growing Referrals; High Surgical Volumes  
  • Growth in Population of Medically Complex Children |
| Changing landscape of inpatient vs. outpatient medicine | • Increasing need for inpatient “generalist” coordinating care |
| Inpatient Cohorting is Diagnosis Based vs. Acuity Based | • Acute Care Units Have Become Highly Specialized  
  • No existing system for cohorting higher acuity patients |
| Service Sizes Highly Variable       | • Extended Rounding; Delays Discharges |
Background: Intermediate Care

- Definitions
  - Published 2004 AAP Guidelines...Varies in Practice
  - “Care for the sickest general ward patients and the most stable ICU patients”
  - Medical >>> Post-Surgical
  - Non-invasive monitoring (i.e. no arterial lines, CVPs)
  - Greater Intensity of Nursing Care than IP

- Intensive (ICU) vs. Intermediate Care (IMCU)
  - Over 300 Pediatric Intensive Care Units in the U.S.
  - Relatively Few Children’s Hospitals with Intermediate Care Units
  - Only one of the U.S. News Top 10 Children's Hospitals (Boston)
  - Hospitals with Pediatric IMCUs
    - Boston Children’s, Vanderbilt, Penn State Hershey, Baystate, Loma Linda, Inova Fairfax, Dayton Children's, University of Tennessee, Medical University of South Carolina

Developing an Intermediate Care Unit

- Define Patient Population
  - Sicker general ward patients and selected “PICU patients”

- Develop Admission/Exclusion Criteria
  - Use comparable institutions as a model (e.g., Boston & Vanderbilt IMCU)
  - Consider Site Visit to comparable institution

- Reevaluate PICU/Inpatient Distinctions
  - Need to address the existing dogmas before unit is opened:
    - Nebulizations: 20mg/hr cont. albuterol, cont. albuterol <1 yo patient; FiO2 >50%
    - Respiratory Support: HFNC/BiPAP, BiPAP titrations (failed PSG)
    - Intense Nursing: Ingestions (frequent RN assessments or q1hr accuchecks)
Developing an Intermediate Care Unit

• Define Unit & Work Flow Model
  - 4-10 bed closed unit
  - 24/7 HBM physician coverage (+/- residents)
  - Strict admission/exclusion criteria
  - Flexible & Expedited Transfers to/from PICU
  - Daily IMCU/PICU bed huddle

• Define RN and RT Staffing
  - Nurse to patient ratio: 2:1 to 3:1 (based on acuity)
  - Dedicated RT

• Recruit, educate, and train staff (MDs, RNs, RTs)
  - HBM Faculty: PICU service prior to joining IMCU faculty
  - RN/RT: In-service in HFNC/NiPPV; on-boarding with PICU RN/RT

Metrics for Evaluating Success

• Bounce back to ICU rate

• CAT call/floor CODE event rate

• Rate of denials and surgical cancellations during peak census

• Length of stay by unit, service, and diagnosis

• Level of care assignments and impact on revenue

• Family and staff satisfaction
Preliminary Needs Assessment: CY 2013

<table>
<thead>
<tr>
<th>IMCU Patient Search</th>
<th>Admits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total 2013 Admits</td>
<td>12,470</td>
</tr>
<tr>
<td>FILTERED OUT: Ventilators, Mannitol</td>
<td>10,989</td>
</tr>
</tbody>
</table>

SELECTED SERVICES:
- Visited PICU
- DC SERVICE: GM, PICU, Endo, Genetics, ID, MOU, Neuro, Pulm, ENT

SELECTED INTERVENTIONS (Low-End PICU; High-End IP Floor):
- CPAP, BiPAP, HFNC, Continuous Albuterol, Trach Collar

*Does not include patients who remained on an IP floor for their entire stay

---

CY 2013: PICU Respiratory Admissions*

<table>
<thead>
<tr>
<th></th>
<th>Albuterol</th>
<th>HFNC</th>
<th>CPAP</th>
<th>BiPAP</th>
<th>Trach Collar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma</td>
<td>45</td>
<td>20</td>
<td>5</td>
<td>38</td>
<td>0</td>
</tr>
<tr>
<td>Bronchiolitis</td>
<td>8</td>
<td>60</td>
<td>13</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>URI (NOS)</td>
<td>7</td>
<td>10</td>
<td>5</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>3</td>
<td>24</td>
<td>8</td>
<td>33</td>
<td>12</td>
</tr>
<tr>
<td>Anaphylaxis</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>OSA/Tonsils</td>
<td>0</td>
<td>9</td>
<td>22</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>CF</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Tracheitis</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Resp/CLD</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>64</strong></td>
<td><strong>128</strong></td>
<td><strong>56</strong></td>
<td><strong>141</strong></td>
<td><strong>55</strong></td>
</tr>
</tbody>
</table>

*Excluding ventilated patients
CY 2013: PICU Respiratory Admissions

<table>
<thead>
<tr>
<th>Month</th>
<th>Alb &amp; PICU</th>
<th>HFNC</th>
<th>CPAP</th>
<th>BiPAP</th>
<th>Trach Collar</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>19</td>
<td>6</td>
<td>19</td>
<td>5</td>
<td>52</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>15</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>39</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>12</td>
<td>5</td>
<td>10</td>
<td>9</td>
<td>41</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>9</td>
<td>7</td>
<td>10</td>
<td>7</td>
<td>41</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td>9</td>
<td>7</td>
<td>24</td>
<td>6</td>
<td>57</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>7</td>
<td>12</td>
<td>31</td>
</tr>
<tr>
<td>9</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>16</td>
<td>6</td>
<td>48</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>14</td>
<td>5</td>
<td>19</td>
<td>10</td>
<td>52</td>
</tr>
<tr>
<td>11</td>
<td>5</td>
<td>13</td>
<td>4</td>
<td>17</td>
<td>7</td>
<td>46</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>17</td>
<td>5</td>
<td>14</td>
<td>10</td>
<td>49</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>131</td>
<td>60</td>
<td>154</td>
<td>90</td>
<td>499</td>
</tr>
</tbody>
</table>

Avg. LOS (Hours)

|                | 75 | 131 | 109 | 163 | 130 | 122 |

CY 2013-14 IMCU Cohort

IMCU Cohort

Number of Visits

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

PICU (potential IMCU)

| 35  | 29  | 29  | 30  | 42  | 16  | 10  | 18  | 34  | 37  | 30  | 29  | 19  | 33  | 21  | 33  | 69  | 35  | 36  | 47  |
Finances: Seasonal Hospitalist Program

<table>
<thead>
<tr>
<th>Staffing Costs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HBM</td>
<td>$400K (2 FTEs)</td>
</tr>
<tr>
<td>TOTAL COST</td>
<td>$400K</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential Revenue Enhancement / Losses</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Projected contribution margin lost by refusing 1-2 patients per week (24 cases)</td>
<td>- $309K</td>
</tr>
<tr>
<td>Projected revenue loss from moving 1-2 patients out of the PICU per week</td>
<td>- $202K</td>
</tr>
<tr>
<td>Projected revenue from functionally increasing PICU by 1-2 beds per week</td>
<td>+ $300K</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$98K</td>
</tr>
</tbody>
</table>

NOTES:
- Margin per case on Med-Surg patient $12,864
- Net differential between PICU and Med/Surg patients approx. $1,600 per day. Assumed 7 days ALOS
- Assumed 100% backfill of PICU beds.

Seasonal Hospitalist Program

MISSION AND CARE MODEL

The Seasonal Hospitalist Program (SHoP) is an ~8 patient service (with 24/7 in-house hospitalist coverage) designed to address peak census issues and increased demand for access to ICU level care by promoting the safe and efficient care for two patient populations: lower-acuity/observation & higher-acuity/intermediate patients.
Seasonal Hospitalist Program: Overview

<table>
<thead>
<tr>
<th>Seasonal Hospitalist Program Data - March 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Number of Admissions</strong></td>
</tr>
<tr>
<td><strong>SHoP Lower-Acuity Admissions</strong></td>
</tr>
<tr>
<td><strong>SHoP Higher-Acuity Admissions</strong></td>
</tr>
<tr>
<td>PICU &quot;Step-Down&quot;</td>
</tr>
<tr>
<td>Vapotherm Admissions</td>
</tr>
<tr>
<td>PICU Bounce Backs</td>
</tr>
<tr>
<td>Floor &quot;Step-Up&quot;</td>
</tr>
<tr>
<td><strong>Transfer to ICU</strong></td>
</tr>
</tbody>
</table>

**Additional Data**
- Average discharge from unit time** | 14:53
- Average transfer from PICU to SHoP time | 15:05
- **44% of discharges before 14:00**

**Census Implications**
- Number of PICU RED ZONE (census =>38) **days avoided since SHoP Go-Live** | 17
- Number of PICU RED ZONE (census =>38) **nights avoided since SHoP Go-Live** | 21

Seasonal Hospitalist Program: Highlights

- Early AM discharges/transfers facilitated by 24/7 attending
- Higher-Acuity Patients quickly transitioned to floor level acuity
- Variable interpretation of “Higher-Acuity”
- “SHoP Unit” cohorting promotes safe care of High-Acuity patients
- Patients on HFNC can be safely taken care of outside of the PICU
- Twice daily huddles help with floor throughput and safety
- Multi-disciplinary teamwork is critical to the success of new initiatives
VINEETA MITTAL, MD MBA
ASSOCIATE PROFESSOR OF PEDIATRICS
UTSW MEDICAL CENTER AND CHILDREN'S HEALTH SYSTE, DALLAS, TX

HFNC in University Affiliated Hospitals: Building Your Team Without Losing Your Mind!
Results: Trends in HFNC Use in Hospitalized Children

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wards</td>
<td>13%</td>
<td>24%</td>
<td>40%</td>
<td>50%</td>
<td>52%</td>
<td>69%</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Results: Trends in HFNC Use Pediatric Wards and PICU

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wards</td>
<td>Baseline</td>
<td>5%</td>
<td>12%</td>
<td>27%</td>
<td>36%</td>
<td>42%</td>
<td>60%</td>
</tr>
<tr>
<td>PICU</td>
<td>82%</td>
<td>85%</td>
<td>91%</td>
<td>92%</td>
<td>83%</td>
<td>98%</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Results: HFNC Use and Intubation Rate

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PICU &amp; ward</td>
<td>13%</td>
<td>24%</td>
<td>40%</td>
<td>50%</td>
<td>52%</td>
<td>69%</td>
<td>0.004</td>
</tr>
<tr>
<td>Intubation rate</td>
<td>14%</td>
<td>8%</td>
<td>2%</td>
<td>3%</td>
<td>2%</td>
<td>2%</td>
<td>&lt;0.0003</td>
</tr>
</tbody>
</table>
Panel Discussion

Sonal Kalburgi, DO, MSHS
Medical Director of Holy Cross Hospital, Children’s National Health System

Tina Halley, MD
4Main Medical Unit Director, Children’s National Health System

Matt Sharron, MD
Pediatric Critical Care Attending, Children’s National Health System

Irini Kolaitis, MD
Instructor of Pediatrics, Northwestern University Feinberg School of Medicine, Lurie Children’s Hospital

Nicole Rochester, MD
Former Medical Director of Holy Cross Hospital, Children’s National Health System

Vineeta Mittal, MD, MBA
Associate Professor of Pediatrics, UTSW Medical Center and Children’s Health System

Take Home Points
Questions/Comments?

Contact Info

Sonal Kalburgi, DO, MSHS  skalburg@cnmc.org
Medical Director of Holy Cross Hospital, Children’s National Health System

Tina Halley, MD  thalley@childrensnational.org
4Main Medical Unit Director, Children’s National Health System

Matthew Sharron, MD  msharron@childrensnational.org
Pediatric Critical Care Attending, Children’s National Health System

Irini Kolaitis, MD  ikolaitis@luriechildrens.org
Seasonal Hospitalist Program Site Leader, Lurie Children’s Hospital

Nicole Rochester, MD  rochen@holycrosshealth.org
Former Medical Director of Holy Cross Hospital, Children’s National Health System

Vineeta Mittal, MD, MBA  vineeta.mittal@childrens.com
Associate Professor of Pediatrics, UTSW Medical Center and Children’s Health System