



SPS RECOMMENDED BUNDLES

To jump to a specific bundle, simply click on the link below:

[Adverse Drug Events](#)

[Obstetrical Adverse Events](#)

[Readmissions](#)

[Ventilator-Associated Pneumonia](#)

[Venous Thromboembolism](#)

SPS Recommended Bundle

Table of Contents

Hospital Acquired Condition: [ADE](#)

- I. Background**
- II. Bundle Elements - Overview**
- III. Bundle Elements – Evidence**
- IV. Bundle Elements – Standards of Care**
- V. Measurement- Bundle Reliability**
- VI. Spotlight Tools**
- VII. References**
- VIII. Revision History**

I. Background

ADE (Adverse Drug Events) is the 8th largest contributor to harm caused across the SPS network. These events include levels 6-9 or F-I. In 2011, approximately 15 children were harmed each month across the Phase I SPS hospitals. The team formed in May of 2012 to develop strategies consistent with high reliability concepts to reduce harm caused by ADEs.

II. Bundle Strategies - Overview

Develop Delivery System Intervention Bundle

1. Identifying High Harm Events
2. Review and catalog last 20 F & higher / 6-9 (NCC MERP Scale) ADE Events
3. Identify which medication delivery system the failure occurred
 - a. Ordering
 - b. Pharmacy
 - c. Administration
 - d. Monitoring
4. Determine top 1-2 factors that are common across those events (ie. Phase, Drug, Location, Failure mode, etc.)
5. Develop & Report 2-3 interventions (Hospital Specific Bundle)
6. Track impact on Hospital's 6-9 events

III. Bundle Elements – Evidence

Grade of body evidence: LOW

IV. Bundle Elements – Standards of Care
To be developed at future data

Bundle Element	Standards of Care
Identifying High Harm Events	
Review and catalog last 20 F & higher / 6-9 (NCC MERP Scale) ADE Events	
Identify which medication delivery system the failure occurred	
Determine top 1-2 factors that are common across those events	
Develop & Report 2-3 interventions (Hospital Specific Bundle)	
Track impact on Hospital's 6-9 events	

V. Measurement- Bundle Reliability

Measurement	Formula	Recommendations	Reporting Period
Delivery System Intervention Bundle	Number of audits totally compliant with system failure bundle / Number of audits completed* x 100	*Apply formula to your hospital bundle elements.	Monthly

VI. Tools

We have asked hospitals for some of their spotlight tools, and have highlighted a few in this [folder](#). The highlighted categories are: Bundle Measure Methodology, PDSAs and Interventions, Risk Assessment, Training, and Failure Analysis.

Please click [here](#) to view the SHINE report.

VII. References

1. Franceschi, A., M. Tuccori, et al. (2004). "Drug therapeutic failures in emergency department patients. A university hospital experience." *Pharmacol Res* 49(1): 85-91.
2. Gandhi, T. K., S. B. Bartel, et al. (2005). "Medication safety in the ambulatory chemotherapy setting." *Cancer* 104(11): 2477-2483.
3. Kane-Gill, S. L., J. Jacobi, et al. (2010). "Adverse drug events in intensive care units: Risk factors, impact, and the role of team care." *Critical Care Medicine* 38(6 SUPPL.): S83-S89.
4. Tham, E., H. M. Calmes, et al. (2011). "Sustaining and spreading the reduction of adverse drug events in a multicenter collaborative." *Pediatrics* 128(2): e438-445.
5. Zandieh, S. O., D. A. Goldmann, et al. (2008). "Risk factors in preventable adverse drug events in pediatric outpatients." *Pediatr* 152(2): 225-231.
6. Unpublished, non-peer-reviewed consensus documents – CHCA, CDC

VII. Revision History

I. Version	Primary Author(s)	Description of Version	Date Completed
Version 1	Katie Hilbert	Initial Draft	7-Nov-2012
Version 2.0	Jason Bailey	Addition of sections III, IV & V	5 Feb 2013

SPS Recommended Bundle

Table of Contents

Hospital Acquired Condition: [OB-AE](#)

- I. Background**
- II. Bundle Elements - Overview**
- III. Bundle Elements – Evidence**
- IV. Bundle Elements – Standards of Care**
- V. Measurement- Bundle Reliability**
- VI. Spotlight Tools**
- VII. References**
- VIII. Revision History**

I. Background

OB-AE is the 9th largest contributor to harm caused across the SPS network. In 2011, approximately 9 events occurred each month across the Phase I SPS hospitals participating in this HAC. The team formed in May of 2012 to develop strategies consistent with high reliability concepts to reduce harm caused by OB-AEs.

II. Bundle Elements - Overview

Team-based interventions

EFM certification and achieving a common language for EFM interpretation
Simulation of low frequency, high risk events
Obstetric Rapid Response Team

Process of care interventions

1. Induction/Augmentation of labor
2. Tocolysis Protocols
3. Elective induction of labor- eliminating preventable preterm birth

III. Bundle Elements – Evidence

Bundle Element	Level of Evidence (Muir Gray)	Evidence Cited (Author(s), Publication, Year, Pages)
Team-based interventions		
1. EFM certification and achieving a common language for EFM interpretation		
2. Simulation of low frequency, high risk events		
3. Obstetric Rapid Response Team		
Process of care interventions		
1. Induction/Augmentation of labor		

Bundle Element	Level of Evidence (Muir Gray)	Evidence Cited (Author(s), Publication, Year, Pages)
2. Tocolysis Protocols		
3. Elective induction of labor- eliminating preventable preterm birth		

Muir Gray Classification Levels

Level 1 – meta-analysis of a series of randomized controlled trials

Level 2 – at least one well designed randomized controlled trial

Level 3 – at least one controlled study without randomization

Level 4 – non-experimental descriptive studies

Level 5 – reports or opinions from respected authorities

IV. Bundle Elements – Standards of Care

Bundle Element	Standards of Care
Team-based interventions	
1. EFM certification and achieving a common language for EFM interpretation	
2. Simulation of low frequency, high risk events	Hemorrhage, shoulder dystocia, Eclampsia, & Cord Prolapse
3. Obstetric Rapid Response Team	
Process of care interventions	
2. Induction/Augmentation of labor	Protocols for the use of Pitocin and misoprostil; Protocols for the management of uterine hyperstimulation
2. Tocolysis Protocols	
3. Elective induction of labor- eliminating preventable preterm birth	Gestational age > 39 weeks; Prevention policy and process in place for <39 weeks (EED); Reassuring fetal status; Pelvic assessment

The below sections will be completed in future versions

V. Measurement- Bundle Reliability

VI. Spotlight Tools

We have asked hospitals for some of their spotlight tools, and have highlighted a few in this [folder](#). The highlighted categories are: Bundle Measure Methodology, PDSAs and Interventions, Risk Assessment, Training, and Failure Analysis. Please click [here](#) to view the SHINE report.

VII. References

VIII. Revision History

I. Version	Primary Author(s)	Description of Version	Date Completed
Version 1	Katie Hilbert	Initial Draft	9- Nov - 2012

SPS Recommended Bundle

Table of Contents

Hospital Acquired Condition: [Readmissions](#)

- I. Background**
- II. Bundle Elements - Overview**
- III. Bundle Elements – Evidence**
- IV. Bundle Elements – Recommended Approaches**
- V. Measurement- Bundle Reliability**
- VI. Spotlight Tools**
- VII. References**
- VIII. Revision History**

I. Background

The Readmissions Reduction team was formed in May, 2012 to determine key strategies for reducing readmissions. Readmissions have become the focus of quality improvement efforts in both adult and pediatric medicine.¹⁻⁷ Payers, regulatory bodies and government all are encouraging hospitals to reduce readmissions. Typically, pediatric readmission rates have been much lower than those in adults.^{1,6,7} It is also not clear the extent to which readmissions are preventable in pediatric patients. One recent study using a 15-day readmission standard suggested that about 20% of pediatric readmissions were preventable.⁷ Our preliminary analysis of the hospital data in preparation for this quality improvement effort to reduce readmissions found that at least that many readmissions (using a 7-day readmission standard) were potentially preventable (unpublished data). Therefore, we set our goal for the Collaborative at a 20% reduction in readmissions at 7 days after the initial discharge.

II. Bundle Elements - Overview

We found that preventability could not be determined merely from administrative data. An individual review of the medical record was required. This review enabled us to eliminate planned readmissions from consideration and determine a true 7-day rate of readmissions. Record review also enabled us to identify the responsible attending physician and to assess the discharge process.

Retrospective: After Readmissions Bundle:

- Review every readmission for preventability
- Identify groups of patients with high-readmission risk
- Provide feedback to clinicians/care team on their readmissions
- Family Interview to assess effective discharge communication

Prospective: Standardized Discharge Bundle

1. Standardized Discharge Bundle

III. Bundle Elements – Evidence

Bundle Element	Level of Evidence (Muir Gray)	Evidence Cited (Author(s), Publication, Year, Pages)
Retrospective		
1. Review every readmission for preventability	Level 4	<ul style="list-style-type: none"> • Hain, et al. Pediatrics, 2012;131:e171. • Gay, et al. Pediatrics 2011;127:e1505. • Halfon, et al. Med Care 2006;44:972. • Bisset, et al. J R Coll Surg Edinb 1998;43:257.
2. Identify groups of patients with high-readmission risk	Level 4	<ul style="list-style-type: none"> • Berry, et al. JAMA 2011;305:682. • Feudtner, et al. Pediatrics 2009;123:286. • McLean, et al. Aust Health Rev 2008;32:537. • Nakayama, et al. J Pediatr Surg 1993;28:19.
3. Provide feedback to clinicians/care team on their readmissions	Level 4	<ul style="list-style-type: none"> • Mugford, et al. BMJ 1991;303:398 • Main. Pediatrics 1999;103:374. • Horbar, et al. BMJ 2004;329:1004. • Stevens, et al. J Eval Clin Pract 2007;13:287.
4. Family Interview to assess effective discharge communication	n/a	*Best Practice from Hospitals
Prospective		
1. Standardized Discharge Bundle	Level 4	<ul style="list-style-type: none"> • Anonymous, Hosp Case Manag 2012;20:70 • Feigenbaum, et al. Med Care 2012;50:599 • VanSuch, et al. Qual Saf Health Care 2006;15:414

Muir Gray Classification Levels

Level 1 – meta-analysis of a series of randomized controlled trials

Level 2 – at least one well designed randomized controlled trial

Level 3 – at least one controlled study without randomization

Level 4 – non-experimental descriptive studies

Level 5 – reports or opinions from respected authorities

IV. Bundle Elements – Recommended Approach

Bundle Element	Recommended Approach
Retrospective – Post Readmissions	
1. Review every readmission for preventability	Only about 20-30% of readmissions are preventable
2. Identify high-risk patients	Select a target high risk population(s)
3. Provide feedback to clinicians/care team on readmit rate	
4. Family Interview to assess effective discharge communication	Develop a script to use for Family interviews. Provide feedback to owners of discharge process/care team. This element may be considered a shorter time frame element to further develop your discharge bundle.
Prospective – Discharge Bundle	
1. Standardized Discharge Bundle	<ol style="list-style-type: none"> 1. Provide contact information for primary clinician 2. Schedule follow-up appointment prior to discharge 3. Teach back & copy of discharge information to family (native language) 4. Printed medication list for family (after reconciliation) with education about medication use and demonstrated competency to administer medications 5. Teach back education on any devices (e.g. gastrostomy, tracheostomy, etc.) with demonstrated competency to manage the device. 6. Parents should have backup contact information, if unable to reach primary clinician. 7. Specialized discharge instructions based on high risk populations needs include assessment of parent readiness for discharge.

V. Measurement- Bundle Reliability

Measurement	Formula	Recommendations	Reporting Period
Retrospective	Number of audits totally compliant with retrospective bundle / Number of audits completed* x 100	*If you aren't using the SPS recommended bundle, apply formula to your hospital bundle elements.	Monthly
Prospective	Number of audits totally compliant with discharge bundle / Number of audits completed* x 100	*If you aren't using the SPS recommended bundle, apply formula to your hospital bundle elements.	Monthly
Final Bundle Reliability for reporting to SPS	(Number of audits totally compliant with retrospective bundle + Number of audits totally compliant with prospective bundle)/Total Number of retrospective & prospective (e.g. discharge bundle) bundles X 100	To date, this is the only number required to submit to SPS. Recommend that you measure maintenance and insertion bundles separately at your hospitals.	Monthly

The below sections will be completed in future versions.

VI. Tools

We have asked hospitals for some of their spotlight tools, and have highlighted a few in this [folder](#). The highlighted categories are: Bundle Measure Methodology, PDSAs and Interventions, Risk Assessment, Training, and Failure Analysis. Please click [here](#) to view the SHINE report.

VI. References

1. Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. *N Engl J Med.* 2009;360(14):1418–1428
2. Ashton CM, Del Junco DJ, Soucek J, Wray NP, Mansyur CL. The association between the quality of inpatient care and early readmission: a meta-analysis of the evidence. *Med Care.* 1997;35(10):1044–1059
3. Berry JG, Hall DE, Kuo DZ, Cohen E, Agrawal R, Feudtner C, Hall M, Kueser J, Kaplan W, Neff J: Hospital utilization and characteristics of patients experiencing recurrent readmissions within children's hospitals. *JAMA* 2011, 305(7):682-690.
4. Bloomberg GR, Trinkaus KM, Fisher EB, Jr., Musick JR, Strunk RC: Hospital readmissions for childhood asthma: a 10-year metropolitan study. *Am J Respir Crit Care Med* 2003, 167(8):1068-1076.
5. Feudtner C, Levin JE, Srivastava R, Goodman DM, Slonim AD, Sharma V, Shah SS, Pati S, Fargason C, Jr., Hall M: How well can hospital readmission be predicted in a cohort of hospitalized children? A retrospective, multicenter study. *Pediatrics* 2009, 123(1):286-293.
6. Gay JC, Hain PD, Grantham JA, Saville BR: Epidemiology of 15-Day Readmissions to a Children's Hospital. *Pediatrics* 2011, 127(6):e1505-1512.
7. Hain PD, Gay JC, Berutti, TW, Whitney GM, Wang W, and Saville BR: Preventability of early readmissions at a children's hospital. *Pediatrics* 2012, 131(1):e171-e181.

VIII. Revision History

I. Version	Primary Author(s)	Description of Version	Date Completed
Version 1	Katie Hilbert	Initial Draft	9- Nov - 2012
Version 2	Rob Payne, MD Sharyl Wooton, MS	Added in additional bundle details, references, and recommended approaches.	29- Jan -2012

SPS Recommended Bundle

Table of Contents

Hospital Acquired Condition: VAP

- I. Background**
- II. Bundle Elements - Overview**
- III. Bundle Elements – Evidence**
- IV. Bundle Elements – Recommended Approaches**
- V. Measurement- Bundle Reliability**
- VI. Spotlight Tools**
- VII. References**
- VIII. Revision History**

I. Background

VAP (ventilator-associated pneumonia) is the 7th largest contributor to harm caused across the SPS network. In 2011, approximately 14 children were harmed each month across the Phase I SPS hospitals. The team formed in May of 2012 to develop strategies consistent with high reliability concepts to reduce harm caused by VAPs.

II. Bundle Elements - Overview

Elevate the HOB 30-45 degrees, or reverse Trendelenberg for infants in isolettes

Oral Hygiene at least every 12 hours

Change ventilator circuit and/or in-line suction when visibly soiled. Drain ventilator circuit before repositioning patient.

Daily discussion on readiness to extubate

III. Bundle Elements – Evidence

Bundle Element	Level of Evidence (Muir Gray)	Evidence Cited (Author(s), Publication, Year, Pages)
1. Elevate the HOB 30-45 degrees, or reverse Trendelenberg for infants in isolettes	2	Drakulovic MB, Torres A, Bauer TT, Nicolas JM, Nogue S and Ferrer M. Supine body position as a risk factor for nosocomial pneumonia in mechanically ventilated patients: a randomized trial. <i>Lancet</i> 1999;354:1851-8
2. Oral Hygiene at least every 12 hours	1	Chan EY, Ruest A, Meade MO, Cook DJ. Oral decontamination for prevention of pneumonia in mechanically ventilated adults: systematic review and meta-analysis. <i>BMJ</i> 2007; 334:889.
3. Change ventilator circuit and/or in line suction when visibly soiled. Drain ventilator circuit before repositioning patient.	2	Long MN, Wickstrom G, Grimes A, Benton CF, Belcher B, Stamm AM. Prospective, randomized study of ventilator-associated pneumonia in patients with one versus three ventilator circuit changes per week. <i>Infect Control Hosp Epidemiol</i> 1996;17:14--19 Kollef MH, Shapiro D, Fraser VJ, et al. Mechanical ventilation with or without 7-day circuit changes: a randomized controlled trial. <i>Ann Intern Med</i> 1995;123:168--74
4. Daily discussion on readiness to extubate	3	Marellich GP, Murin S, Battistella F, Inciardi J, Vierra T and Roby M. Protocol weaning of mechanical ventilation in medical and surgical

Bundle Element	Level of Evidence (Muir Gray)	Evidence Cited (Author(s), Publication, Year, Pages)
		<p>patients by respiratory care practitioners and nurses: effect on weaning time and incidence of ventilator-associated pneumonia. <i>Chest</i> 2000;118:459-67</p> <p>Nourdine K, Combes P, Carton MJ, Beuret P, Cannamela A, Ducreux JC. Does noninvasive ventilation reduce the ICU nosocomial infection risk? A prospective clinical survey. <i>Intensive Care Med</i> 1999; 25:567-573.</p>

Muir Gray Classification Levels

Level 1 – meta-analysis of a series of randomized controlled trials

Level 2 – at least one well designed randomized controlled trial

Level 3 – at least one controlled study without randomization

Level 4 – non-experimental descriptive studies

Level 5 – reports or opinions from respected authorities

IV. Bundle Elements – Recommended Approaches

Bundle Element	Recommended Approaches
1. Elevate the HOB 30-45 degrees, or reverse Trendelenberg for infants in isolettes	Keep the head of the bed elevated to 30-45 degrees for all ventilated patients beyond infancy, and use a visual measuring device (e.g. protractor painted on bedside) to ensure the angle is correct.
2. Oral Hygiene at least every 12	Brushing teeth and gums with a soft bristle toothbrush and product for plaque removal, or use a gauze and sterile water for patients without teeth. Perform oral care (moistening mouth and lips, removal of oropharyngeal secretions) at least every 4 hours or as needed with ETT suctioning or before repositioning patient.
3. Change ventilator circuit and/or in line suction when visibly soiled. Drain ventilator circuit before repositioning patient.	
4. Daily discussion on readiness to extubate	Every day the care team should actively discuss whether the patient still needs to be intubated and what steps are necessary to move towards extubation.

V. Measurement- Bundle Reliability

Measurement	Formula	Recommendations	Reporting Period
Reliability of VAP Bundle	Number of audits totally compliant with bundle / Number of audits completed* x 100	*If you aren't using the SPS recommended bundle, apply formula to your hospital bundle elements.	Monthly

VI. Spotlight Tools

We have asked hospitals for some of their spotlight tools, and have highlighted a few in this [folder](#). The highlighted categories are: Bundle Measure Methodology, PDSAs and Interventions, Risk Assessment, Training, and Failure Analysis. Please click [here](#) to view the SHINE report.

VII. References

1. Classen D, Arias KM, Podgorny K, Anderson DJ, Burstin H, Calfee DP, Dubberke ER, Fraser V, Gerding DN, Griffin FA, Gross P, Kaye KS, Lo E, Marschall J, Mermel LA, Nicolle L, Pegues DA, Perl TM, Saint S, Salgado CD, Weinstein RA, Wise R and Yokoe DS. Strategies to prevent ventilator-associated pneumonia in acute care hospitals. *Infect Control Hosp Epidemiol* 2008;29 Suppl 1:S31-40.
2. For ATS/IDSA guideline, see Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. *Am J Respir Crit Care Med* 2005;171:388-416
3. For recent study in pediatrics using a similar bundle, see Bigham MT, Amato R, Bondurant P, Fridriksson J, Krawczeski CD, Raake J, Ryckman S, Schwartz S, Shaw J, Wells D and Brill R. Ventilator-associated pneumonia in the pediatric intensive care unit: characterizing the problem and implementing a sustainable solution. *J Pediatr* 2009;154:582-587

VIII. Revision History

I. Version	Primary Author(s)	Description of Version	Date Completed
Version 1	Katie Hilbert	Initial Draft	9- Nov - 2012
Version 2	Greg Priebe, Sharyl Wooton	Evidence, Reliability, and Standards of Care.	29 – Jan -2012

SPS Recommended Bundle

Table of Contents

Hospital Acquired Condition: [VTE](#)

- I. Background**
- II. Bundle Elements – Overview**
- III. Bundle Elements – Evidence**
- IV. Bundle Elements – Standards of Care**
- V. Measurement – Bundle Reliability**
- VI. Tools**
- VII. References**
- VIII. Revision History**

I. Background

VTE (Venous thromboembolism) is the 2nd largest contributor to harm caused across the SPS network. In 2011, approximately 50 children were harmed each month across the Phase I SPS hospitals. The team formed in May of 2012 to develop strategies consistent with high reliability concepts to reduce harm caused by VTEs.

II. Bundle Elements – Overview

- 1. Screening for the risk of VTE**
- 2. VTE Decision-making component of Bundle**

III. Bundle Elements – Evidence

IV. Risk Factor for Pediatric VTE

- Prior VTE (1)
- Intensive Care Unit stay (1, 2)
- Mechanical Ventilation (2)
- System Infection (1, 2, 3, 5, 6)
- Central Venous Catheterization (1, 3-5, 7, 8)
- Parenteral nutrition (7)
- Deep sedation (7)
- Neuromuscular blockade (7)
- Inotropic support (7)
- Recombinant fVIIa administration (7)
- Immobilization > 72 hours (3)
- Estrogen-containing contraceptive (3)
- Malignancy (1, 4-6, 8)
- Neurologic disability (4)
- Cardiac disease (4)
- Nephrotic syndrome (4, 8)
- Autoimmune disease (4)

V. Bundle Elements – Standards of Care

Bundle Element	Standards of Care
Identify	
Pharmacy Records	This system would be highly sensitive for identifying patients but not specific, i.e. lots of patients on anticoagulants who do not have a VTE nor are on it for VTE prophylaxis. The issue is who would sift through all that data to decide which patients were on anticoagulation for VTE.
ICD-9 Codes	Highly insensitive. Should not be used unless there is no alternative.
Hem/Onc Consult	Very sensitive and specific but only if a Hematology consult was mandated by the institution. In those institution's that do mandate a consult and that have a good method for collecting this data, it is an excellent method. It would not be applicable to institutions that do not require a consult from hematology for VTE patients.
EMR Trigger	An EMR trigger linked to an element in the EMR (a note, the MAR, a radiological test) would be an outstanding way to identify patients, however only if such a trigger can be developed and only if the trigger would then link to a database or to someone who would collect the data.
Radiological Records	This method could be highly specific and sensitive if the VTE diagnosis could be flagged and then go to a database or to notify a data manager to enter the data in a database.
Mitigate	
Mechanical prophylaxis	Compression boot, Compression stocking (knee-high), early ambulation
Pharmacologic prophylaxis	Low-dose unfractionated heparin, low-dose low molecular weight heparin, (warfarin and aspirin less common). I would add fondaparinux to this as well though there is no data but there isn't any really for the other drugs either.

VI. Measurement – Bundle Reliability

Measurement	Formula	Recommendations	Reporting Period
Screening for the risk of VTE	<p>Numerator: Total # of pts. screened for VTE</p> <p>Denominator: Total # of at risk pts.*</p> <p>*At risk pts. are defined as:</p> <ul style="list-style-type: none"> a. All patients ≥ 18 yrs old b. All <i>Periop</i> patients ≥ 14 yrs old c. All <i>ICU</i> patients (Exclude Neonatal) <p>The above at risk pts. at their admission &/or transfer to a different level of care</p> <p>Follow up screening should occur every 24-48hrs</p>		Monthly
VTE Decision-Making component of Bundle	<p>Numerator: Evidence of active decision making</p> <p>Denominator: Patients screened at moderate to high risk</p> <p>2.) Numerator: Active Decision about anticoagulation</p> <p>Denominator: Children with Acute VTE</p>		Monthly

VII. Spotlight Tools

We have asked hospitals for some of their spotlight tools, and have highlighted a few in this [folder](#). The highlighted categories are: Bundle Measure Methodology, PDSAs and Interventions, Risk Assessment, Training, and Failure Analysis. Please click [here](#) to view the SHINE report.

VIII. References

1. Sandoval JA, Sheehan MP, Stonerock CE, Shafique S, Rescorla FJ, Dalsing MC. Incidence, risk factors, and treatment patterns for deep venous thrombosis in hospitalized children: an increasing population at risk. *Journal of vascular surgery : official publication, the Society for Vascular Surgery [and] International Society for Cardiovascular Surgery, North American Chapter*. 2008;47(4):837-43. Epub 2008/02/26. doi: 10.1016/j.jvs.2007.11.054. PubMed PMID: 18295440.
2. Branchford B MP, Bajaj L, Manco-Johnson M, Wang M, Goldenberg. Risk factors for in-hospital venous thromboembolism in children: a case-control study employing diagnostic validation. *Haematologica*. 2011. Epub december 1, 2011.
3. Sharathkumar AA, Mahajerin A, Heidt L, Doerfer K, Heiny M, Vik T, et al. Risk-prediction tool for identifying hospitalized children with a predisposition for development of venous thromboembolism: Peds-Clot clinical Decision Rule. *J Thromb Haemost*. 2012;10(7):1326-34. Epub 2012/05/16. doi: 10.1111/j.1538-7836.2012.04779.x. PubMed PMID: 22583578.
4. Wright JM, Watts RG. Venous thromboembolism in pediatric patients: epidemiologic data from a pediatric tertiary care center in Alabama. *J Pediatr Hematol Oncol*. 2011;33(4):261-4. Epub 2011/04/26. doi: 10.1097/MPH.0b013e3182134111. PubMed PMID: 21516021.
5. Oschman A, Kuhn RJ. Venous thromboembolism in the pediatric population. *Orthopedics*. 2010;33(3):180-4. Epub 2010/03/09. doi: 10.3928/01477447-20100129-23. PubMed PMID: 20205367.
6. Anderson FA, Jr., Spencer FA. Risk factors for venous thromboembolism. *Circulation*. 2003;107(23 Suppl 1):I9-16. Epub 2003/06/20. doi: 10.1161/01.CIR.0000078469.07362.E6. PubMed PMID: 12814980.
7. Hanson SJ, Punzalan RC, Greenup RA, Liu H, Sato TT, Havens PL. Incidence and risk factors for venous thromboembolism in critically ill children after trauma. *The Journal of trauma*. 2010;68(1):52-6. Epub 2010/01/13. doi: 10.1097/TA.0b013e3181a74652. PubMed PMID: 20065757.
8. Spentzouris G, Scriven RJ, Lee TK, Labropoulos N. Pediatric venous thromboembolism in relation to adults. *Journal of vascular surgery : official publication, the Society for Vascular Surgery [and] International Society for Cardiovascular Surgery, North American Chapter*. 2012;55(6):1785-93. Epub 2011/09/29. doi: 10.1016/j.jvs.2011.07.047. PubMed PMID: 21944920.

IX. Revision History

I. Version	Primary Author(s)	Description of Version	Date Completed
Version 1	Katie Hilbert	Initial Draft	9- Nov - 2012
V2.0	Jason Bailey	Addition of section III, IV & V	4 Feb 2013