DDH Care Map
A Tool for System-wide, Integrated Care of Developmental Dyplasia of the Hip

KEVIN G. SHEA, MD
Disclosures

No Personal Financial

Allosource (Non-profit Allograft provider)
◦ Provides Research Support for OCD Study Group
◦ 50k/Year for 3 years Multi-center Prospective Cohort Study

AAOS Committees

POSNA BOD

Consulting for Health Trust
◦ Health Care Data Analytics
◦ Unpaid
Health Care is a Team Sport!

- Pediatrics: John Hanks, Angela Beauchaine, Treasure Valley Pediatrics, Adam Eyre and Magic Valley Med Staff
- Family Practice: Terry Ribbens
- MSK Imaging: Andrew Hill
- Peds Ortho: Chad Price (Director of International Hip Dysplasia Institute in Florida), Buzz Showalter, Jason Robison
- OB/Gyn: Stacy Seyb, John Werdel
- Administration: Katie Apple.
St Lukes Health System - Idaho

- 7 Hospitals
- Children's Hospital within Main Adult Hospital Campus
  - 70 Bed NICU in Boise
  - 60 patient Bed
- Wide Geographic Area – long distances
- Rural Health Centers
Why Focus on DDH?

- Patient Centered
- Standard evaluation process for all DDH patients throughout the system
  - Evaluation
  - Imaging
  - Peds Ortho Referral
- Reduce Variation in testing, referrals, travel from rural areas
- Improve Quality, Value for patients, system, community
- Quarterly Reporting to physicians, care teams, clinics, imaging
Triple Aim of Health Care

- Better Community Health
- Better Quality
- Lower Cost
2014 Evidence Based Clinical Practice Guideline for DDH

- Evidence Based
- Multi-Disciplinarian
- Peer Review
- Public Commentary
- Conflicts of Interest
2014 Evidence Based Clinical Practice Guideline for DDH

- Why does “Evidence Based Guideline” Matter?
- Many Guidelines are based upon highly biased processes
- These are not based upon a standardized, transparent processes
- They do not result in consistent recommendations, not reproducible
- The Institute of Medicine has recognized Major Problems with many guidelines
- IOM has a Guideline for Guidelines
# Institute of Medicine CPG Standards

**AAOS Guidelines vs. Proprietary Guidelines**

<table>
<thead>
<tr>
<th>IOM Standard</th>
<th>AAOS Guidelines</th>
<th>Proprietary Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Establishing transparency</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>2. Management of Conflict of Interest</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
<tr>
<td>3. Guideline development group composition</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
<tr>
<td>4. Clinical practice guideline – systematic review intersection</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
<tr>
<td>5. Establishing evidence foundations for and rating strength of recommendations</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
<tr>
<td>6. Articulation of recommendations</td>
<td>Yes</td>
<td>Not easily available</td>
</tr>
<tr>
<td>7. External review</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
<tr>
<td>8. Updating</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
Participating Review Organizations

- American College of Radiology
- American Academy of Family Physicians
- Academic Pediatric Association
- American Academy of Pediatrics
- Pediatric Orthopaedic Society of North America
- International Hip Dysplasia Institute
This guideline has been endorsed by the following organizations:

American Academy of Pediatrics
Dedicated to the health of all children

POsNA
The Pediatric Orthopaedic Society of North America

SDMS
Society of Diagnostic Medical Sonographers

DETECTION AND NONOPERATIVE MANAGEMENT OF PEDIATRIC DEVELOPMENTAL DYSPLASIA OF THE HIP IN INFANTS UP TO SIX MONTHS OF AGE

EVIDENCE-BASED CLINICAL PRACTICE GUIDELINE
### Clinical Practice Guideline – Language and Strength of Recommendation

#### Star Rating

<table>
<thead>
<tr>
<th>Strength</th>
<th>Overall Strength of Evidence</th>
<th>Description of Evidence Strength</th>
<th>Strength Visual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>Strong</td>
<td>Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.</td>
<td>![5 stars]</td>
</tr>
<tr>
<td>Moderate</td>
<td>Moderate</td>
<td>Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.</td>
<td>![4 stars]</td>
</tr>
<tr>
<td>Limited</td>
<td>Low Strength Evidence or Conflicting Evidence</td>
<td>Evidence from one or more “Low” strength studies with consistent findings or evidence from a single “Moderate” strength study for recommending for against the intervention or diagnostic or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.</td>
<td>![3 stars]</td>
</tr>
<tr>
<td>Consensus*</td>
<td>No Evidence</td>
<td>There is no supporting evidence. In the absence of reliable evidence, the work group is making a recommendation based on their clinical opinion. Consensus recommendations can only be created when not establishing a recommendation could have catastrophic consequences.</td>
<td>![1 star]</td>
</tr>
</tbody>
</table>
Clinical Practice Guideline –
Strength of Recommendation

Star Rating

Two and Three Star Recommendations used to develop the DDH Care Map
Guideline Recommendations used in Care Map for
- Imaging (X-ray, Ultrasound)
- Historical Risk Factors
- Treatment of Hip Instability/Dislocation
- Bracing
- Timing for Evaluation
For More Information on...

• Clinical Practice Guidelines
• Appropriate Use Criteria
• Checklists
• Education/CME

Go to: www.orthoguidelines.org
Detection and Nonoperative Management of Pediatric Developmental Dysplasia of the Hip in Infants up to Six Months of Age
Found on the Website...

- orthoguidelines.org

- Summary for all recommendations with strength of recommendation/Star Ratings

- Entire Guideline can be downloaded
Getting from a Guideline to a Care Map

- Guideline demonstrates that we have limited or moderate strength evidence.
- Many fields in medicine rely on evidence with some limitations, clinical experience, physician judgment.
- Guideline questions are generated by expert clinicians – pediatricians, family practitioners, MSK/imaging experts, pediatric ortho surgeons, OB/Gyn.
Getting from a Guideline to a Care Map

- The Guideline is to be used to develop a Care Map, integrating the best evidence we have available with clinical experience
- Input from clinicians on the care map is critical
- Care Map will change with time, depending on input from clinicians, and development of new evidence
- Care Map provides a consistent experience for patients throughout the health care system
SCAMP – Boston Childrens Hospital

- Standardized Care Assessment Management Plans
- Practice evidence-based medicine
- Create a feedback loop that will allow medicine to quickly evolve along with research, technology and other new information
- Address many of the concerns about the limitation of clinical evidence and clinical practice guidelines.

HTTP://WWW.CHILDRENSHOSPITAL.ORG/RESEARCH-AND-INNOVATION/INNOVATION-INSIDER/INNOVATION-MYTH-BUSTERS
SCAMP – Boston Children's Hospital

Standardized Care Assessment Management Plans
  ◦ address many of the concerns about the limitation of clinical evidence and clinical practice guidelines.

The group of clinicians develop a SCAMP
  ◦ To manage a problem
  ◦ Reduce variation
  ◦ Include clinician feedback on the program.
  ◦ Variation from Care Map is evaluated, and in some cases, variation can improve a process.

Clinician involvement and feedback are critical for the development, implementation, and improvement/evolution on the Care Map
DDH Care Map Development Team

- Pediatrics: John Hanks, Angela Beauchaine,
- Family Practice: Terry Ribbens
- MSK Imaging: Andrew Hill
- Peds Ortho: Chad Price (Director of International Hip Dysplasia Institute in Florida), Buzz Showalter, Jason Robison
- OB/Gyn: Stacy Seyb, John Werdel
- Administration: Katie Apple.

The IHDI BOD believes the Care Map is an appropriate tool to help clinicians provide optimal care for DDH.
DDH Care Map Implementation Team-First Phase

- Design, input from clinicians on Care Map
- Design Patient Flow
  - How does a patient/family flow through this
- Indications for examination, imaging, peds ortho referral
- Patient Simulations, ie Beta Testing
  - Error, conflict, logic conflict detection
DDH Care Map Implementation Team-
Second Phase

• Many Clinicians using the Care Map
  • Input from clinicians is strongly encouraged
• The Care Map will be better with your input.
• The Care Map is not static – it can be modified by the clinicians
  • provide better care
  • include newer clinical evidence/studies when appropriate
  • adapt to needs of families and patients
It all starts with the Hip Examination

- Tests for instability, laxity
- Abnormal movement/restricted movement
- Differences in length of femur
DDH Evaluation Training Video

- Available on International Hip Dysplasia Institute Website
- Reliable and Valid
- Viewers retain knowledge and skill of examination at 1 month and 1 year
- Available on SumTotal, SLHS Educational Website after July 2016
Positive Risk Factors Include:
- Breech Position
- Family History
*Positive Risk Factors Include*
- Breech Position
- Family History

**Abnormal Hip Exam**

- **Dislocatable**
- **Dislocated**

Diagram:
- Routine Well Baby Exam for Hip Stability
- Abnormal Hip Exam
- Dislocatable but not Dislocated: Barlow (+)
- ≧ 4 Weeks Old
- ≦ 4 Weeks Old
- DDH Trained Staff Not Available
- Wait Until Baby is 16 Weeks Old
- Travel to Trained Staff
- DDH Trained Staff Available
- Ultrasound
  - Abnormal Findings
  - Normal Findings
- AP Pelvis X-Ray
  - Abnormal Findings
  - Normal Findings
- Continue Routine DDH Well Baby Exams
- Refer to Peds Ortho Specialist
- Obviously Dislocated: Ortolani (+)
*Positive Risk Factors Include
  • Breech Position
  • Family History

**Routine Clinic Hip Exams**

- Continue Up to 18 months per follow-up Routine
- Continue/Repeat exam if complaints of limp, gait asymmetry, even after walking age
Normal Hip Exam

Positive Risk Factors

- Breech
- Family History
Outcome Metrics

• Opportunities for Improvement
• Monitor Progress
• Reports

“If you can’t measure it, you can’t improve it”
Outcome Metrics

- Primary Care
- Radiology
- Orthopedics
Outcome Metrics – Primary Care

- Number of Pelvis Radiographs under 4 months post due date (should be a low number)

- Number of ultrasounds over 4-5 months post due date (low number)

- Primary Care Providers that receive validated DDH examination training (80 at 1 year, 95% at 2 years, through the International Hip Dysplasia Institute (IHDI) website

International Hip Dysplasia Institute Website

• Visit the website for additional resources
• Training Video

DDH Examination

Developmental Dysplasia of the Hip

Education Module

International Hip Dysplasia Institute Website

Handouts in Clinics

Integrate into Epic

http://hipdysplasia.org/diagnosis-and-referral-pathway/
Outcome Metrics

Radiology

◦ Ability to obtain same-day hip ultrasounds on patients travelling long distances to Boise. (100%)
◦ Ensure that hip radiographs are interpreted by appropriately trained DDH MSK Radiology staff and/or pediatric orthopedic surgeons within the health system (100%)
◦ Ensure that hip radiographs are positioned properly where obturator foramen are equally open within the health system (90%)
Outcome Metrics

Orthopedics
- Number of patients seen in peds ortho clinic with missed dislocations and residual dysplasia cases requiring treatment
Where Can I find the Care Map?

Email summary to all SLHS clinicians

Distribution to Clinic Managers – katie apple

International Hip Dysplasia Institute Website
  ◦ http://hipdysplasia.org/diagnosis-and-referral-pathway/

Clinical Decision Support
  ◦ http://inside.slrmc.org/forms/CDS/CDS.php
Where Can I find the DDH Exam Training Video?


- SLHS SumTotal for Video, and Test questions
Questions/Comments

Dr. Eyre

1. AAP 2000 Recommendation
### Table 1

Relative and Absolute Risks for Finding a Positive Examination Result at Newborn Screening by Using the Ortolani and Barlow Signs

<table>
<thead>
<tr>
<th>Newborn Characteristics</th>
<th>Relative Risk of a Positive Examination Result</th>
<th>Absolute Risk of a Positive Examination Result per 1000 Newborns With Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>All newborns</td>
<td></td>
<td>11.8</td>
</tr>
<tr>
<td>Boys</td>
<td>1.0</td>
<td>4.1</td>
</tr>
<tr>
<td>Girls</td>
<td>4.6</td>
<td>19</td>
</tr>
<tr>
<td>Positive family history</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td></td>
<td>6.4</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td>Breech presentation</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
<td>133</td>
</tr>
</tbody>
</table>
This Care Map Screens for 2 groups:

• Positive Family history in boys/girls

• Breech Presentation in boys/girls
Questions/Comments

Dr. Eyre

1. Include Risk Factors

2. "Other concerns were related to the problem of requesting patients travel all the way to Boise for their hip ultrasounds and how soon until our Magic Valley radiology techs and radiologists will be trained to do them here.”
Questions/Comments – Ultrasound Training

- In Boise, the technicians do not do the studies.
- The radiologists (Daniels, Fischer) do the entire study, from start to finish, including
  - ROM examination stability tests, image interpretation, reports.
  - This study is too dependent upon training/experience, and it is not possible to provide an adequately trained US technician to do these studies.
  - the technical demands and understanding of the subtleties of the examination are too significant to turn over to an US technician, except in very high volume DDH centers.

- After extensive discussion with Peds Ortho and Radiology, we concluded that it was not possible to provide US services for hip dysplasia outside of Boise,
- I’m available to discuss this in person with you and/or others in MV/WR.
Questions/Comments

Treasure Valley Pediatrics

1. “Include Risk Factors”

2. How long to perform hip exams?
   “video from Australia which you include in the care map recommends continuing the hip exams to an age older than 6 months”

3. 18 months, or resume if complaints of limp, gait asymmetry, etc.
Treasure Valley Pediatrics

1. False Negative anecdotal reports

This can occur, even with consistent serial examinations by experienced providers.

Even in setting of normal exams from all providers - NP, PA, FP, Peds, Peds Ortho - there is still a false negative exam rate. It is low, probably less than 2-3 %, but not zero.
Questions/Comments

OB/Gyn Presentation/Discussion

1. Does short term breech matter?
2. Is breech in later stages more important?
3. What if fetus has been turned prior to delivery?
4. Do males with breech have lower risk or DDH?

Answers to these questions not entirely clear in the literature.

Tracking these factors will be difficult, and we have recommended that all breech cases be screened with ultrasound.
Next Steps

Handouts in Clinics

PDF Handout on laptops/desktops

Integrate into EPIC – Future?

Posting on Website

- SLHS
  - IHDI – International Hip Dysplasia Institute
    - Care Map
    - Training Video

“Beta” Testing

Feedback over next year
Questions?

Thank you for your time!
Thank You

Feedback Greatly appreciated

Development Team: Chad Price, Andrew Hill, John Hanks, Terry Ribbens, Peter Cannamela, Angela Beauchaine, Stacey Seyb, John Werdel

Critical Early Feedback: Treasure Valley Pediatric, Adam Eyre, Buzz Showalter, Jeff Shilt, Jason Robison, Kit Song, Tony Herring
DETECTION AND NONOPERATIVE MANAGEMENT OF PEDIATRIC DEVELOPMENTAL DYSPLASIA OF THE HIP IN INFANTS UP TO SIX MONTHS OF AGE

EVIDENCE-BASED CLINICAL PRACTICE GUIDELINE
UNIVERSAL ULTRASOUND SCREENING

Moderate evidence supports not performing universal ultrasound screening of newborn infants.

Strength of Recommendation: Moderate

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention. A Moderate recommendation means that the benefits exceed the potential harm (or that the potential harm clearly exceeds the benefits in the case of a negative recommendation), but the quality/applicability of the supporting evidence is not as strong.
EVALUATION OF INFANTS WITH RISK FACTORS FOR DDH

Moderate evidence supports performing an imaging study before 6 months of age in infants with one or more of the following risk factors: breech presentation, family history, or history of clinical instability.

Strength of Recommendation: Moderate

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention. A Moderate recommendation means that the benefits exceed the potential harm (or that the potential harm clearly exceeds the benefits in the case of a negative recommendation), but the quality/applicability of the supporting evidence is not as strong.
IMAGING OF THE UNSTABLE HIP

Limited evidence supports that the practitioner might obtain an ultrasound in infants less than 6 weeks of age with a positive instability examination to guide the decision to initiate brace treatment.

Strength of Recommendation: Limited 🟢🟦

Description: Evidence from one or more “Low” strength studies with consistent findings, or evidence from a single Moderate quality study recommending for or against the intervention or diagnostic. A Limited recommendation means that the quality of the supporting evidence is unconvincing, or that well-conducted studies show little clear advantage to one approach over another.
IMAGING OF THE INFANT HIP

Limited evidence supports the use of an AP pelvis radiograph instead of an ultrasound to assess DDH in infants beginning at 4 months of age.

**Strength of Recommendation: Limited ★★★★

Description: Evidence from one or more “Low” strength studies with consistent findings, or evidence from a single Moderate quality study recommending for or against the intervention or diagnostic. A **Limited** recommendation means that the quality of the supporting evidence is unconvincing, or that well-conducted studies show little clear advantage to one approach over another.
Follow-Up Recommendation

SURVEILLANCE AFTER NORMAL INFANT HIP EXAM

Limited evidence supports that a practitioner re-examine infants previously screened as having a normal hip examination on subsequent visits prior to 6 months of age.

Strength of Recommendation: Limited

Description: Evidence from one or more “Low” strength studies with consistent findings, or evidence from a single Moderate quality study recommending for or against the intervention or diagnostic. A Limited recommendation means that the quality of the supporting evidence is unconvincing, or that well-conducted studies show little clear advantage to one approach over another.
STABLE HIP WITH ULTRASOUND IMAGING ABNORMALITIES

Limited evidence supports observation without a brace for infants with a clinically stable hip with morphologic ultrasound imaging abnormalities.

Strength of Recommendation: Limited ⭐⭐⭐⭐

Description: Evidence from one or more “Low” strength studies with consistent findings, or evidence from a single Moderate quality study recommending for or against the intervention or diagnostic. A Limited recommendation means that the quality of the supporting evidence is unconvincing, or that well-conducted studies show little clear advantage to one approach over another.
TREATMENT OF CLINICAL INSTABILITY

Limited evidence supports either immediate or delayed (2-9 weeks) brace treatment for hips with a positive instability exam.

Strength of Recommendation: Limited ★★★★

Description: Evidence from one or more “Low” strength studies with consistent findings, or evidence from a single Moderate quality study recommending for or against the intervention or diagnostic. A Limited recommendation means that the quality of the supporting evidence is unconvincing, or that well-conducted studies show little clear advantage to one approach over another.
Bracing Recommendation

TYPE OF BRACE FOR THE UNSTABLE HIP

Limited evidence supports use of the von Rosen splint over Pavlik, Craig, or Frejka splints for initial treatment of an unstable hip.

Strength of Recommendation: Limited

Description: Evidence from one or more “Low” strength studies with consistent findings, or evidence from a single Moderate quality study recommending for or against the intervention or diagnostic. A Limited recommendation means that the quality of the supporting evidence is unconvincing, or that well-conducted studies show little clear advantage to one approach over another.
Follow-Up Recommendation II

**MONITORING OF PATIENTS DURING BRACE TREATMENT**

Limited evidence supports that the practitioner perform serial physical examinations and periodic imaging assessments (ultrasound or radiograph based on age) during management for unstable infant hips.

**Strength of Recommendation: Limited ★★★

Description: Evidence from one or more “Low” strength studies with consistent findings, or evidence from a single Moderate quality study recommending for or against the intervention or diagnostic. A **Limited** recommendation means that the quality of the supporting evidence is unconvincing, or that well-conducted studies show little clear advantage to one approach over another.