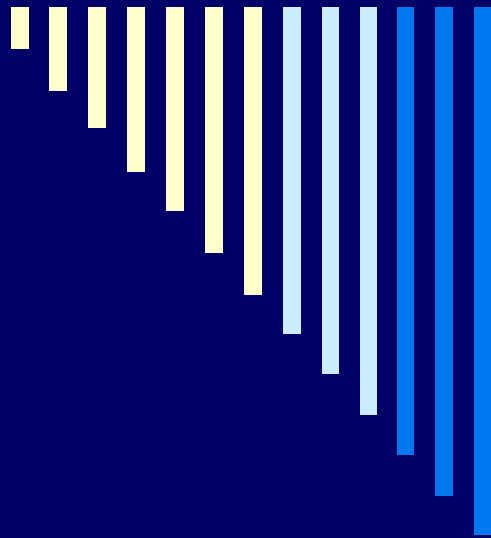# Emergency Severity Index
for Pediatric Triage

Anna Waller, ScD
Debbie Travers, PhD, RN
Jessica Katznelson, MD

March 25, 2010
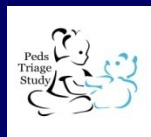
Emergency Severity Index
for Pediatric Triage

Moderator:

Jaclynn Haymon

Program Manager, Children's National Medical Center

9pm, Saturday night, ED triage

- 6 week old female, febrile, tachycardic, tachypneic and fussy

- 3 yr old male, Hemophilia A, fell 1hr ago, struck head, no LOC, now vomiting

- 5 year old male, known asthmatic, audibly wheezing, alert and interactive

- 14 yr old female, fell while skateboarding. Visibly deformed left forearm

Peds Triage Study

Key Questions

- Who gets seen first?
- Who goes next?
- How do we decide?

- Need a system to sort patients that is
  - Fast
  - Accurate
  - Easy to use

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Peds Triage Study

Outline of Presentation

- History of ED Triage and Current Status
- ESI and Pediatric Triage
- Our Research: Pediatric ESI Study
  - Overview
  - Methods
  - Results
  - Dissemination
- Q&A

History of ED Triage and Current Status

ESI and Pediatric Triage

Jessica Katznelson, MD

Triage

- From the French verb *trier* = to sort
- WWII battlefield concept
    - Large numbers of casualties
    - Improvements in medical care
    - System needed to sort injured soldiers
        - Salvageable from unsalvageable
        - Immediate v delayed care
    - Goal: best utilization of limited resources

More History

- 1960's: increase in number of ED patients
- Inability to care for everyone at once
- Method needed to sort patients based on acuity
- Military triage system adopted
- Adapted and refined over time

Emergency Department Triage

- Defined set of criteria used to rapidly assess patients
- Goal of triage:
  - Identify those who need immediate medical attention
  - Determine how long everyone else can safely wait
- Criteria generally based on a combination of
  - Chief complaint
  - Vital signs
  - Age
  - How the patient looks (i.e. level of distress)

Triage Systems

- Multiple systems exist
- 3 level triage
  - Emergent
  - Urgent
  - Non urgent
- 5 level triage
  - Patients needing immediate attention (1)
  - Patients who can safely wait several hours (5)
- No national standards in United States

Peds Triage Study

Triage in the United States

- Each hospital chooses its own system
- Each hospital does its own training
- 3 and 5 level systems currently used
- ACEP and ENA have recommended a uniform 5 level system
  - No single system has been formally endorsed
  - Concerns over adequacy of pediatric criteria

Emergency Severity Index

- Developed in the 1990s
  - ED physicians and nurses
- 5 level system
- Sorts patients by
  - Acuity
  - Expected ED resource utilization
- Contains pediatric criteria
- Validated in multiple adult studies
- Minimal research into use with children

Why this study?

- No five level triage system well validated in the pediatric population

- ESI shown to work well in multi-age and adult studies

- If validated in children, the ESI would be a powerful tool for ED triage from neonates to geriatric patients
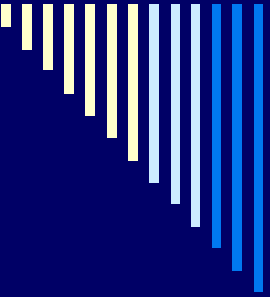
Questions to be answered

- Is the ESI a valid triage tool in the pediatric population?

- Are there things about the tool that need to be improved or changed for pediatric patients?

- Can we create a standardized training program to teach triage nurses how to appropriately implement the ESI in the pediatric population?

Pediatric ESI Study Overview Methods Results - Reliability

Anna Waller, ScD

Targeted Issues Grant: Pediatric ESI Study

- Funded by the Health Resources and Services Administration (HRSA)
  - Emergency Medical Services for Children (EMSC)
  - EMS
    - Broadly defined as entire spectrum of care from prehospital to rehabilitation
- March 1, 2005- Feb 29, 2008
- Seven participating EDs in 3 states

Pediatric ESI Study

- UNC-Chapel Hill Department of Emergency Medicine, Coordinating Center – Chapel Hill, NC
  - Anna Waller, ScD – PI
  - Debbie Travers, PhD, RN
  - Jessica Katznelson, MD
- WakeMed – Raleigh, NC
  - Douglas Trocinski, MD
- Primary Children's - Salt Lake City, UT
  - Nancy Mecham, MSN
- Lehigh Valley Hospital and Health Network (3 hospitals) - Lehigh Valley, PA
  - Alexander Rosenau, DO
  - Valerie Rupp, RN
- York Hospital – York, PA
  - David Eitel, MD
- Susan Hohenhaus, RN - Consultant

Pediatric ESI Study

- Phase 1
  - March 2005- August 2006
  - Baseline reliability & validity testing, ESI

- Phase 2
  - Sept 2006- June 2007
  - Pediatric ESI educational intervention

- Phase 3
  - July 2007- Aug 2008
  - Repeat reliability & validity testing, ESI

Pediatric ESI Study - Phase 1

- Reliability
  - 10 case studies (222 nurses)
  - 40 case studies (170 nurses)
  - Double triages (498 patients)

- Validity
  - Patient outcome data by ESI level (1173 patients)

Pediatric ESI Study - Phase 2

- Create pediatric ESI resources
  - Based on Phase 1 results

- Based on input from
  - Phase 1 reliability and validity results
  - Pediatric ESI Study Team
  - Pediatric ESI Study Advisory Group

Results- Reliability

- Case studies
  - Parts 1 and 2

- Double triages

Case Studies- Part 1

- Prospective evaluation of inter-rater reliability of ESI

- 10 case studies
  - Adult & pediatric patients

- 8 EDs in 4 states
  - Academic & community, general & peds EDs

- All nurses attended ESI update
  - Summer 2005

Case Studies- Part 1

- Response rate-
  - 60% (222 of 367 triage nurses)

- Pediatric cases (3)
  - κ – 0.55 (moderate)

- Adult cases (7)
  - κ – 0.72 (good)

- Conclusions
  - Pediatric cases often mis-triaged (over & under)

Case Studies- Part 1

- Pediatric case
  - 3 wk old female, mom c/o baby is fussy
  - Child currently awake, alert
  - Denies problems w/feeding.
  - Wetting diapers per norm

HR	170
RR	44
Sp02	98%
Temp	38.6

- Answer
  - ESI 2 (high risk: fever in neonate)

- Nurses' ratings
  - ESI-1 (8%), ESI 2 (69%), ESI 3 (10%), ESI 4 (7%), ESI 5 (6%)

Case Studies- Part 2

- Prospective evaluation of inter-rater reliability of ESI

- 40 case studies
  - Pediatric patients

- 7 EDs in 3 states
  - Academic & community, general & peds EDs

- All nurses attended ESI update
  - Summer 2005

Case Studies- Part 2

- Response rate- 57% (170 of 298 triage nurses)

- Overall κ – 0.77 (good)
  - Trauma cases – κ – 0.78 (95% CI 0.77-0.80)
  - Medical cases – κ – 0.73 (95% CI 0.72-0.75)

- Conclusions
  - Good reliability- case studies are effective way to assess nurse usage of ESI for pediatrics

  - Need for improved education re: medical patient triage

Double Triages

- Prospective evaluation of inter-rater reliability of ESI

- 100 actual patients/hospital system (5)
  - Compared research nurse rating to triage nurse rating
  - No more than 10 patients per nurse
  - Decisions of >100 different triage nurses

- July 2005- February 2006

Peds Triage Study

Double Triages

- N=497 actual patients

- Overall κ = 0.57 (95% CI .52-.62)

- Under-triages
  - ESI 1
  - Procedural sedation
- Over-triages
  - ESI 5
  - Patient w/report of pain >=7 as ESI 2
- Mis-triages (both over and under)
  - Very young (<1) patients
  - Respiratory patients
  - Rash patients
  - Medical (not trauma) patients

Pediatric ESI Study Results – Validity Dissemination

Debbie Travers, PhD, RN

Results- Validity

- Prospective study of ESI validity
  - Compared ESI levels to outcomes
    - Inpatient admission
    - ED length of stay
    - ED resource utilization

Validity Cohort

- Enrolled 1173 patients
  - Jan-Mar 2006, June-Aug 2006

	Winter 06	Summer 06	All
	N	N	N
ESI Level			
1	93	101	194
2	131	119	250
3	127	108	235
4	139	117	256
5	121	117	238
All	611	562	1173

Validity Cohort

- Age groups

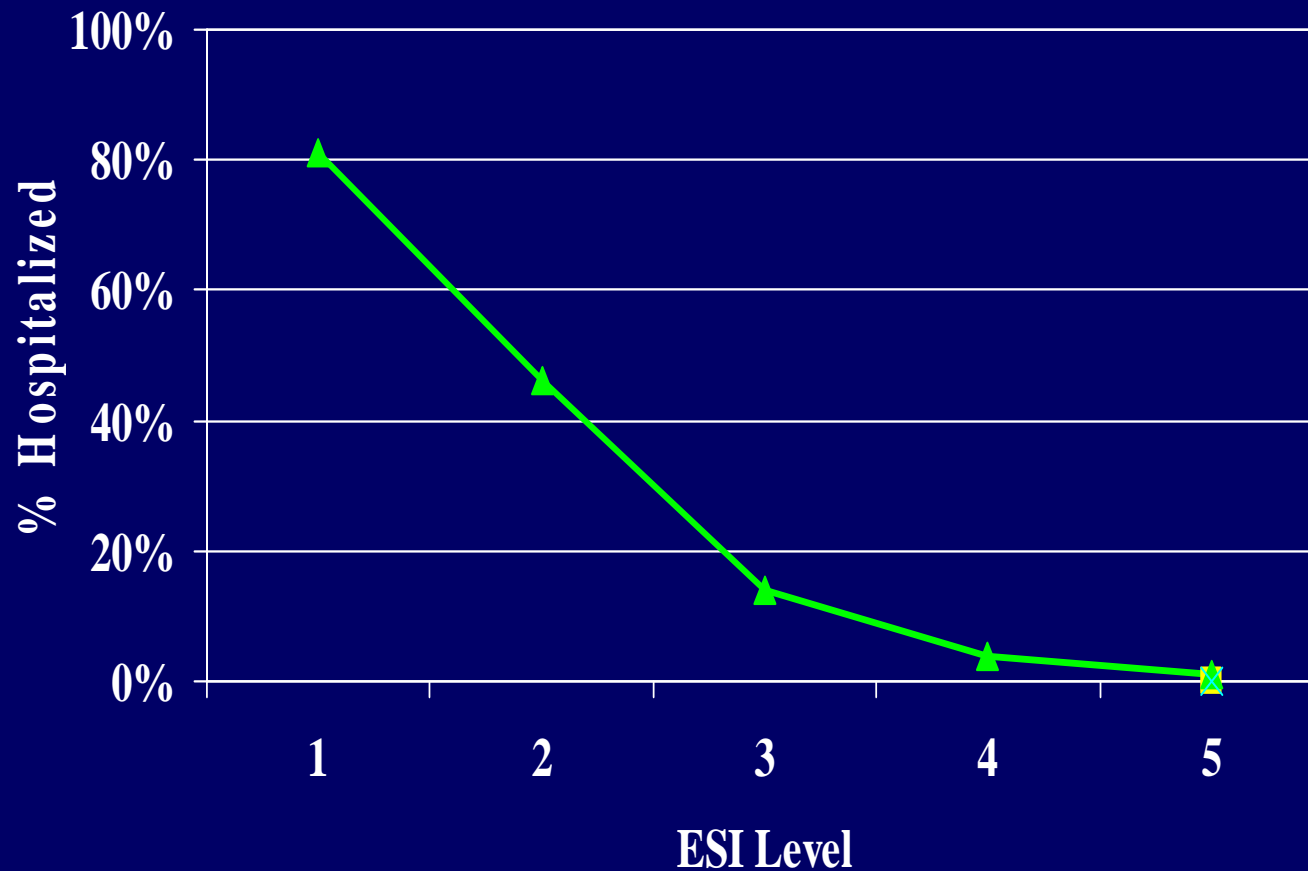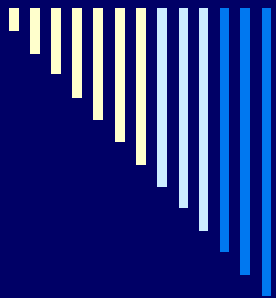|	Winter 06	Summer 06	All
	N	N	N
Age group			
< 1 year	80	88	168
1-4 year	177	162	339
5-9 year	92	88	180
10+	260	223	483
All	609	561	1170

Patient Outcomes

- ESI level strongly correlated with outcomes:

    - Inpatient admission

    - ED resource utilization
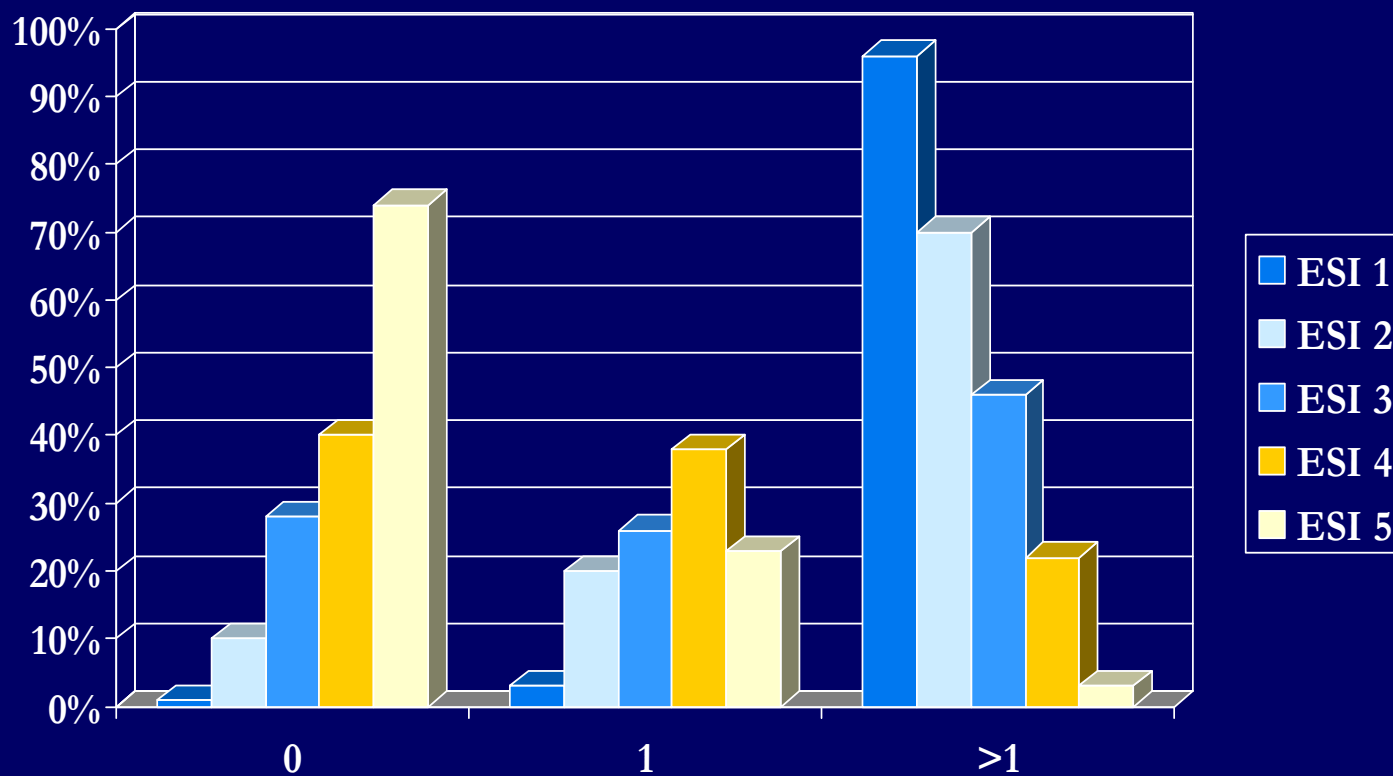
Inpatient Admission
by ESI Level
Overall admission rate: 27% (natl rate: 13%)

Number of ED Resources Used
by ESI level

Patient Outcomes

- Some pediatric patients are mis-triaged
  - Under-triage (11%)
    - ESI 4 or 5 with >1 resource, or hospitalized
    - <1 year old
    - ESI 2 patients who should be ESI 1

  - Over-triage (16%)
    - ESI 1, 2 or 3 with <2 resources
    - ESI 1 not hospitalized

Phase 1 Study- Conclusions

- First large-scale, multi-site study
  - Of ESI for pediatric triage
- Rigorous methodology
  - Sampling, equal numbers in all 5 ESI levels
- Reliability moderate
- ESI stratified patients into 5 distinct groups
  - For all outcomes (admission, LOS, resources)
- Areas of difficulty for triage nurses
  - Complex medical (rash, fever, respiratory)
  - Infants <1 year old
  - ESI 1 vs 2, 4 vs 5

Take-home Message

- ESI works fairly well for pediatrics
- Room for improvement
  - Addressed with educational interventions

Pediatric ESI Study - Phase 2

- Based on Phase 1 results, we created:
  - An educational module for using the ESI with pediatric ED patients
  - A pediatric chapter as supplement to the ESI Handbook

- Train the trainer session for all study sites
  - These trainers then educated all triage nurses at their study sites prior to Phase 3 data collection

Pediatric ESI Study - Phase 3

- Reliability – repeated Phase 1 methods
  - 25 most effective case studies used (254 nurses)
  - 20 more chosen as teaching cases (360 nurses)
  - Double triages (501 patients)
- Validity – repeated Phase 1 methods
  - Patient outcome data by ESI level (1108 patients)
- Results pending

Project Dissemination Plans

- Journal publications

- Products
  - Completed
    - Pediatric case studies
  - In progress
    - Pediatric chapter to ESI Handbook
    - Online training module

Journal Publications

- Completed
  - Emergency nursing triage education literature review
  - Reliability & validity of the ESI for pediatric triage

- In progress
  - Creation, validation of pediatric case studies
  - Comparison of pediatric triage
    - Before/after educational intervention

Completed Products

- **Pediatric case studies**
  - 25 case studies
  - ESI levels 1-5
  - Uses
    - Teaching ESI for pediatric triage
    - Post-education evaluation
  - Example:

  EMS radios to say they are en route with a 5 year old girl who aspirated a balloon at a birthday party. She is alert but drooling and unable to speak. HR 124 RR 28 sat 99% on blow by oxygen.

Completed Products

- **Pediatric case studies**
  - Example:

    EMS radios to say they are en route with a 5 year old girl who aspirated a balloon at a birthday party. She is alert but drooling and unable to speak. HR 124 RR 28 sat 99% on blow by oxygen.

    ### ESI Level 1. Life-threatening situation.

    - *This girl's airway is not occluded, but could become that way if the balloon is not rapidly removed from her throat.*
    - *You would not want to "do" anything in triage as causing further agitation may cause the child to cry or struggle and the danger of the balloon occluding her airway would be even greater.*
    - *Even if you do not have a bed for this child you would get her to the treatment area immediately.*

Products in Progress

- **Pediatric chapter for ESI Handbook**
  - Will be incorporated into future edition of handbook
  - Content
    - Pediatric assessment
    - ESI level 1, 2 considerations
    - ESI resources
    - Vital signs
    - Special populations

Products in Progress

- **Online Training Module**
  - Funded EMS-C (HRSA)
  - Based on educational program developed for pediatric ESI study

  - Content
    - Pediatric assessment
      - General approach- pediatric assessment triangle
    - Special populations
      - Infants, rash, psychiatric, complex medical
    - ESI 1, 2 considerations
    - Case studies