

**VALIDATION OF THE “STEP-BY-STEP” APPROACH
IN THE MANAGEMENT OF YOUNG FEBRILE INFANTS**

Collected by

Dr. Khanh T. Huynh

Definition

“STEP BY STEP” Algorithm

- developed by a European group of pediatric emergency physicians
- identify a **low risk** group of infants who could be safely managed as outpatients **without lumbar puncture** nor **empirical antibiotic treatment.**

Aim

- Prospectively validate the Step-by-Step approach/2016
- Compare it with the Rochester/ 1994 criteria and the Lab-score/ 10 years ago

Study design and Prospective study

Who?

Infants ≤ 90 days with fever without source

Where?

11 European pediatric emergency departments

When?

2012-2014

| | Sensitivity and Predictive Value for ruling out IBI | Number of infants misclassified |
|--------------|-----------------------------------------------------|---------------------------------|
| Step by Step | ??? and ??? | ??? |
| Rochester | 81.6% and 98.3% | 16 |
| Lab-score | 59.8% and 98.1% | 35 |

Data Collection

Subjects: patient on arrival at the PED, relevant medical history, results of laboratory tests, diagnosis, treatment, and site of care (managed as outpatient or admitted).

Collect:

1. Age
2. Sex
3. Duration and Degree and Fever
4. General Appearance

Figure 1

Approach evaluates:

- General appearance of the infant
- Age
- Urinalysis
- Blood biomarkers: PCT, CRP, ANC

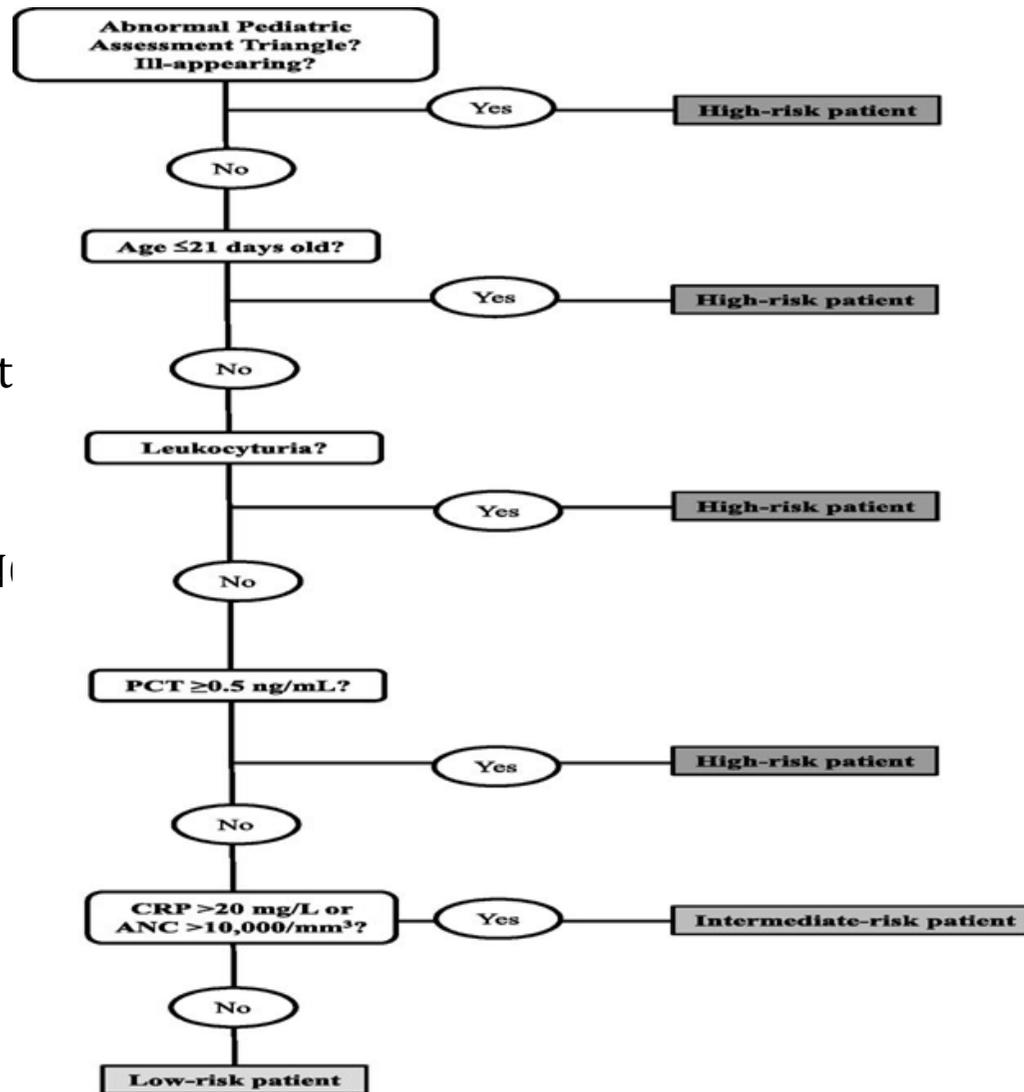


Figure 2:
**Included
&
excluded
patients**

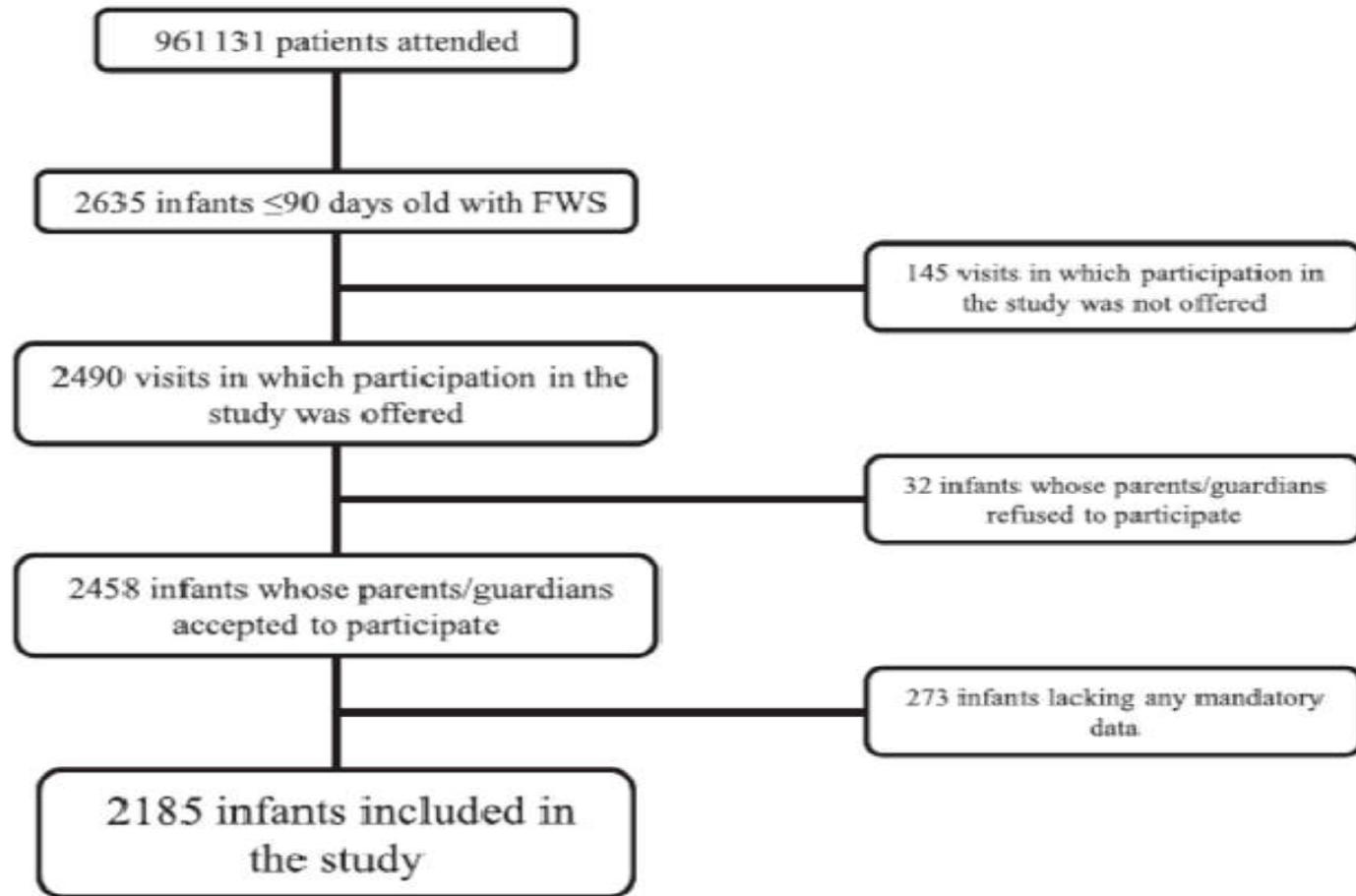


FIGURE 2
Flow diagram to indicate the included and excluded patients.

Table 1: Clinical Characteristics

TABLE 1 Epidemiologic and Clinical Characteristics, Complementary Tests, and Management of Patients

| | |
|--------------------------------------------------------------------------------------------------|------------------|
| Age (median and interquartile range), d | 47 (29–65) |
| ≤21 d old, % | 16.7 |
| Sex (boy), % | 59.5 |
| Duration of fever (median and interquartile range), h ^a | 5 (2–12) |
| Highest temperature measured at home (median and interquartile range), °C ^b | 38.5 (38–38.8) |
| Temperature upon arrival to the PED (median and interquartile range), °C ^c | 38.1 (37.8–38.5) |
| Previously healthy, % | 85.9 |
| Classified as well appearing, % | 87.7 |
| PCT, CRP, WBC count, urine dipstick, urine culture collected by sterile method, blood culture, % | 100 |
| Lumbar puncture performed, % | 27.4 |
| Flu test, % | 12.5 |
| Antibiotic treatment, % | 49.0 |
| Admitted, % | 58.5 |
| Pediatric/neonatal ICU | 1.6 |

^a Evolution time was available in 2103 patients.

^b Highest temperature measured at home was recorded in 2019 patients.

^c Temperature upon arrival to the PED was recorded in 2174 patients.

Table 2: Bacterial Infections Diagnosed

TABLE 2 Bacterial Infections Diagnosed

| | |
|------------------------------------------------------------|-------------|
| IBIs | 87 (3.9%) |
| Bacterial sepsis | 26 |
| Bacteremic UTI | 25 |
| Occult bacteremia | 24 |
| Bacterial meningitis | 10 |
| Cellulitis-adenitis syndrome with bacteremia | 1 |
| Septic arthritis | 1 |
| Non-IBI | 417 (19.1%) |
| UTI | 409 |
| Bacterial gastroenteritis | 5 |
| Cellulitis-adenitis syndrome with negative cultures | 1 |
| Omphalitis with negative cultures | 1 |
| Myositis with negative cultures | 1 |
| Possible bacterial infections | 98 (4.5%) |
| Possible UTI (positive urine culture without leukocyturia) | 88 |
| Pneumonia with negative cultures | 7 |
| Acute otitis media with negative cultures | 3 |

Figure 3:
Risk factor

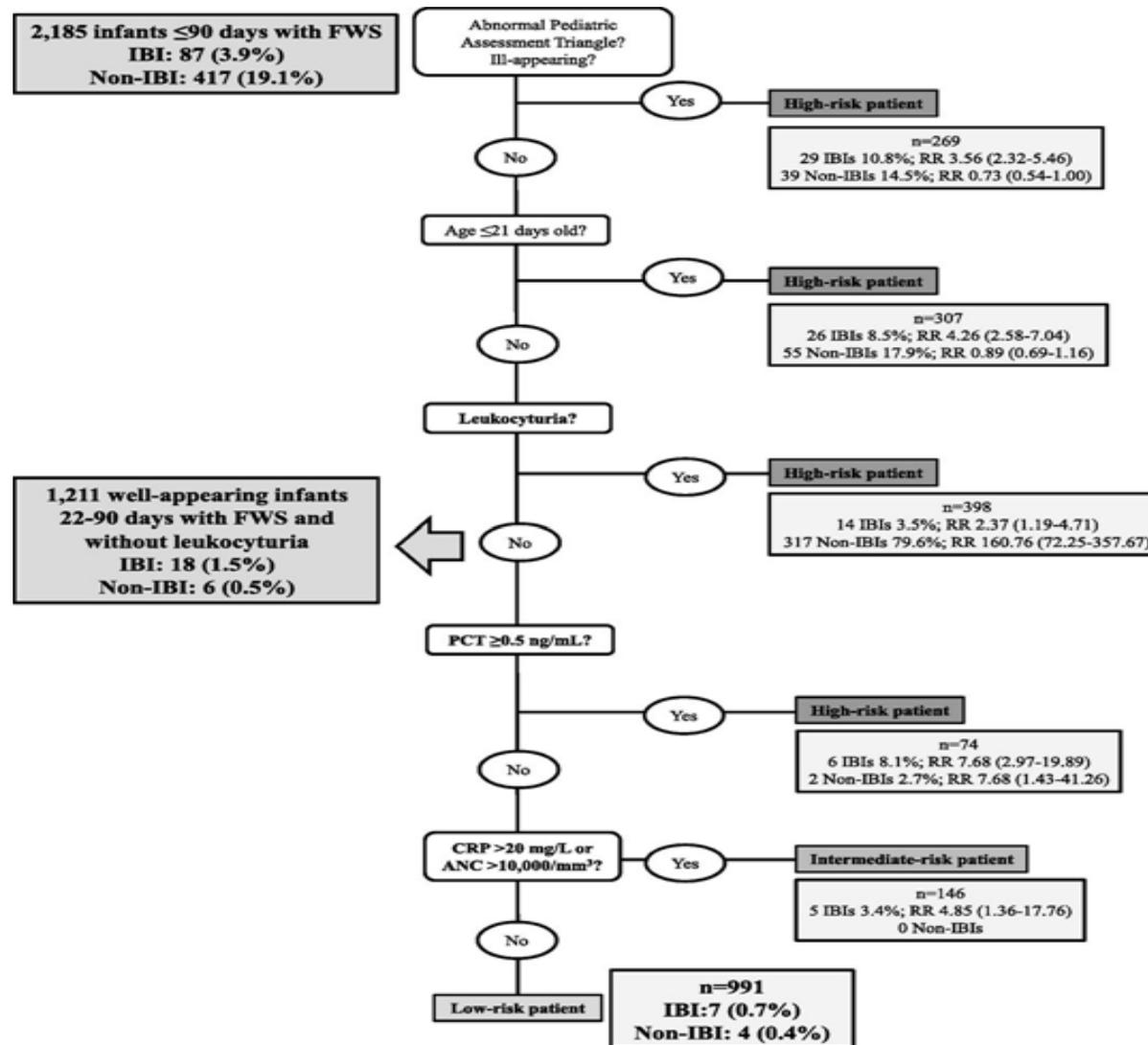


Table 3: Bacterial infection / low risk patients

TABLE 3 Prevalence of Bacterial Infection Among Low Risk patients According to Each Management Protocol

| | Number of Infants Classified As Low Risk Patients, <i>n</i> (%) | Prevalence of Bacterial Infection Among Low Risk Patients | | | |
|--------------------|-----------------------------------------------------------------------|-----------------------------------------------------------|---------------------------------|-----------------------------------|--------------------------------|
| | | SBI | | | Possible BI, (95% CI) |
| | | Overall, %, (95% CI) | IBI, %, (95% CI) | Non-IBI, %, (95% CI) | |
| Rochester criteria | 949 (43.4) | 2.1 (1.2–3.0) <i>n</i> = 20 | 1.6 (0.9–2.5) <i>n</i> = 16 | 0.4 (0–0.8) <i>n</i> = 4 | 5.6 (4.2–7.2) <i>n</i> = 54 |
| Lab-score | 1798 (82.2) | 10.8 (9.4–12.3) <i>n</i> = 195 | 1.9% (1.3–2.6) <i>n</i> = 35 | 8.8% (7.6–10.2) <i>n</i> = 160 | 5.0 (4.0–6.1) <i>n</i> = 91 |
| Step by Step | 991 (45.3) | 1.1 (0.5–1.8) <i>n</i> = 11 | 0.7 (0.2–1.2) <i>n</i> = 7 | 0.4 (0–0.8) <i>n</i> = 4 | 5.1 (3.8–6.5) <i>n</i> = 51 |

Table 4: Results

TABLE 4 Sensitivity, Specificity, PPVs, NPVs and Positive and Negative LR, with 95% CI, of Each Approach for Identifying IBIs

| | Sensitivity, % | Specificity, % | PPV | NPV | Positive LR | Negative LR |
|--------------------|------------------|------------------|------------------|-------------------|------------------|------------------|
| Rochester criteria | 81.6 (72.2–88.4) | 44.5 (42.4–46.6) | 5.7 (4.6–7.2) | 98.3 (97.3–99.0) | 1.47 (1.32–1.64) | 0.41 (0.26–0.65) |
| Lab-score | 59.8 (49.3–69.4) | 84.0 (82.4–85.5) | 13.4 (10.4–17.2) | 98.1 (97.3–98.6) | 3.74 (3.07–4.56) | 0.48 (0.37–0.62) |
| Step by Step | 92.0 (84.3–96.0) | 46.9 (44.8–49.0) | 6.7 (5.4–8.5) | 99.3% (98.5–99.7) | 1.73 (1.61–1.85) | 0.17 (0.08–0.35) |

Conclusions

The Step-by-Step approach:

Highest sensitivity.

Useful tool for the management of the febrile infant in the ED.

However:

Not 100% sensitive , no perfect tool exists

Should use caution especially / infants with very short fever.

Strongly advise for an initial period of close observation and monitoring in the ED, even when all the complementary test values are normal.

Citation

Gomez, Borja, Santiago Mintegi, Silvia Bressant, Liviana Da Dalt, Alain Gervaix, and Laurence Lacroix. "Validation of the "Step-by-Step" Approach in the Management of Young Febrile Infants." *Pediatrics* 138.2 (May2016). *AAP Gateway*. Web. 11 Aug. 2016.

Thanks for your attention