

Background

Urinary tract infections (UTI) are the most common severe bacterial infections in infants. Young infants are at higher risk of both severe and invasive bacterial infections, such as meningitis. A minority of children with UTI have been reported to have co-existing meningitis. There is currently no consensus on which infants should undergo a lumbar puncture when a UTI is suspected in the emergency department (ED).

Review questions

1. In young infants with a UTI what is the risk of co-existing meningitis?
2. In young infants with UTI which are the clinical variables of low/high risk of co-existing meningitis?

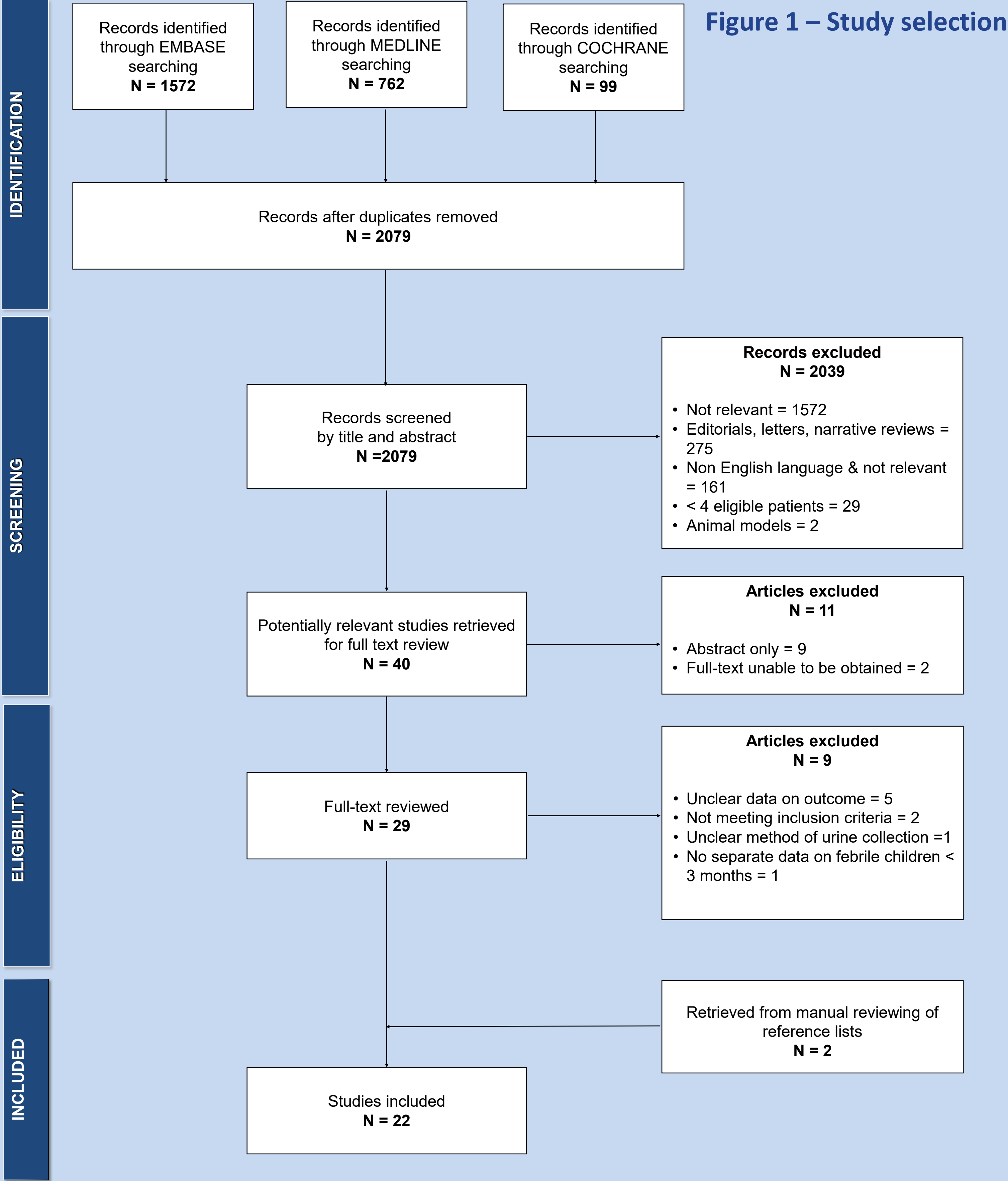
Patients & Methods

| | |
|--------------------------|---|
| Design | Systematic review |
| Database searched | Embase, Medline, the Cochrane Library |
| Study selection | Inclusion criteria <ul style="list-style-type: none">•young infants (< 3 months of age) with UTI•suspected UTI in the ED or confirmed UTI•urine dipstick or culture collected by sterile method (bladder catheterization or suprapubic aspiration) Exclusion criteria <ul style="list-style-type: none">•young infants with sterile pleiocytosis•young infants who did not undergo lumbar puncture•unclear or not sterile method of urine collection•no separate data on febrile infants < 3 months |
| Study quality assessment | National Institute of Health Quality Assessment (NIHA) |
| Outcome measures | Primary: frequency of bacterial meningitis in the study population Secondary: identification of low/high risk criteria of co-existing meningitis |

Results

We screened 2,085 articles and identified 22 eligible studies (Figure 1).

Overall the selected studies included 4,730 infants with suspected or confirmed UTI who successfully underwent a lumbar puncture. A bacterial meningitis was finally diagnosed in 26 of these children (Table 1).



| First author, year of publication | Study design | | Age range | Eligible patients [#] | N. of patients with confirmed meningitis | | | Primary outcome (%) ^{##} |
|-----------------------------------|--------------|---|-----------|--------------------------------|--|-------|-------|-----------------------------------|
| | | | | | <1 m | 1-2 m | 0-3 m | |
| Bonadio, 2014 | R | S | <1 m | 100 | 0 | | | 0 |
| Wallace, 2017 | R | S | <1 m | 186 | 2 | | | 0.01 |
| Magin, 2007 | R | S | <1 m | 75 | 0 | | | 0 |
| Wang, 1995 | R | S | <2 m | 51 | 1 | | | 0.02 |
| Shah, 2008 | P | M | <2 m | 82 | 1 | | | 0.01 |
| Lin, 2000 | R | S | <2 m | 162 | 0 | 0 | | 0 |
| Thompson, 2017 | R | M | < 2 m | 1737 | 7 | 2 | 9 | 0.05 |
| Paquette, 2011 | R | S | 1-3 m | 57 | | | 1 | 0.02 |
| Bonsu, 2007 | R | S | < 3 m | 245 | | | 1 | 0 |
| Dayan, 2004 | R | S | < 3 m | 125 | | | 1 | 0.01 |
| Goldman, 2003 | R | S | <3 m | 143 | | | 0 | 0 |
| Siriogiannopoulos, 2001 | P | S | <3 m | 117 | | | 0 | 0 |
| Velasco, 2015** | P | M | < 3 m | 195 | | | 3 | 0.02 |
| Velasco, 2017** | P | M | <3 m | 95 | | | 2 | 0.02 |
| Vuillerman, 2007 | R | S | <3 m | 75 | | | 1 | 0.01 |
| Meehan, 2008 | R | S | <3 m | 158 | | | 0 | 0 |
| Nosrati, 2014 | R | S | <3 m | 43 | | | 0 | 0 |
| Penalba, 2012 | R | S | <3 m | 230 | 1 | | | 0.01 |
| Doby, 2013 | R | S | <3 m | 162 | | | 0 | 0 |
| Yam, 2009 | R | S | <6 m | 79 | | | 0 | 0 |
| Adler Felice, 2003 | R | S | < 6 m | 209 | | 1 | | 0.01 |
| Tebruegge, 2011 | R | S | 0-16 y | 467 | 2 | | | 0 |

Table 1 – Included studies

[#] Patients with suspected UTI who successfully underwent LP

^{##}**Primary outcome** = percentage of patients with bacterial meningitis

^{**} **Secondary outcome** = only two studies reported on low risk criteria of co-existing meningitis, which were: well-appearing infants, > 21 days of age, procalcitonin ≤ 0.5 ng/ml, C reactive protein ≤ 20 mg/L. No studies reported on high-risk criteria.

R = retrospective / P = prospective; M = multicentre / S = single centre

Conclusion & perspectives

The co-existence of bacterial meningitis in young infants with a suspected UTI is rare. While it appears safe to avoid lumbar puncture in infants meeting low risk criteria, a case by case assessment should be made in patients not meeting low risk criteria.