

# ESPR 2022 MSK Taskforce

Ultrasound Screening for DDH: A Systematic Review

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No Disclosures

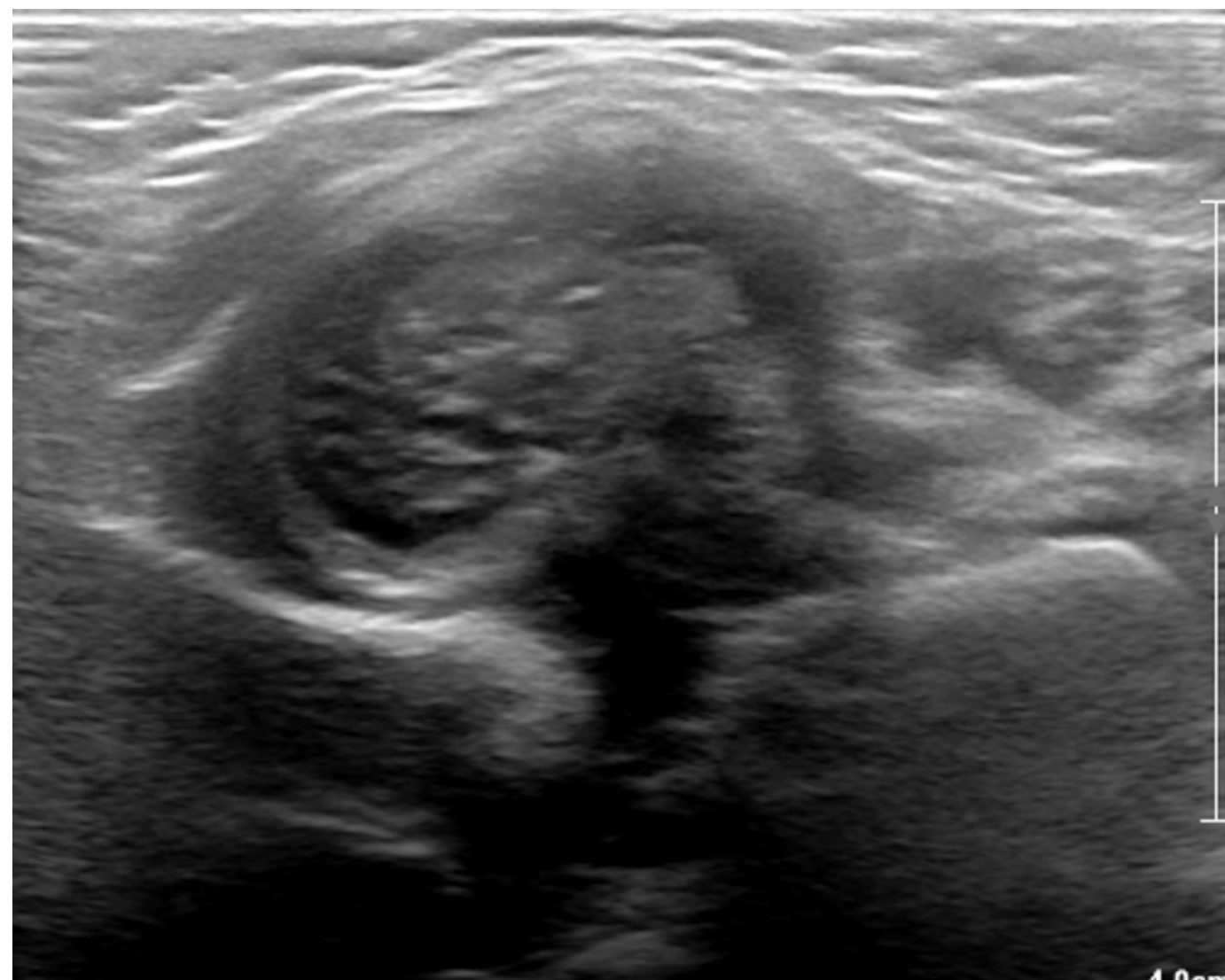
# Background

- DDH occurs in 1 to 4/1,000 births
  - Method used/definition
- Untreated leads to leg length discrepancy, limp, premature osteoarthritis
- Risk factors
- Screening to detect early and prevent late complications
- Different national screening programmes
  - Universal (U)
  - Selective (S)
- Prevalence of late DDH varies from 0.13 to 0.65/1,000 births



# Aim

- Systematic review and meta-analysis to answer the question:
  - “What is the effect of selective ultrasound screening on the incidence of late presentation of developmental hip dysplasia (DDH)?”



# Materials & Methods

PROSPERO: CRD42021241957

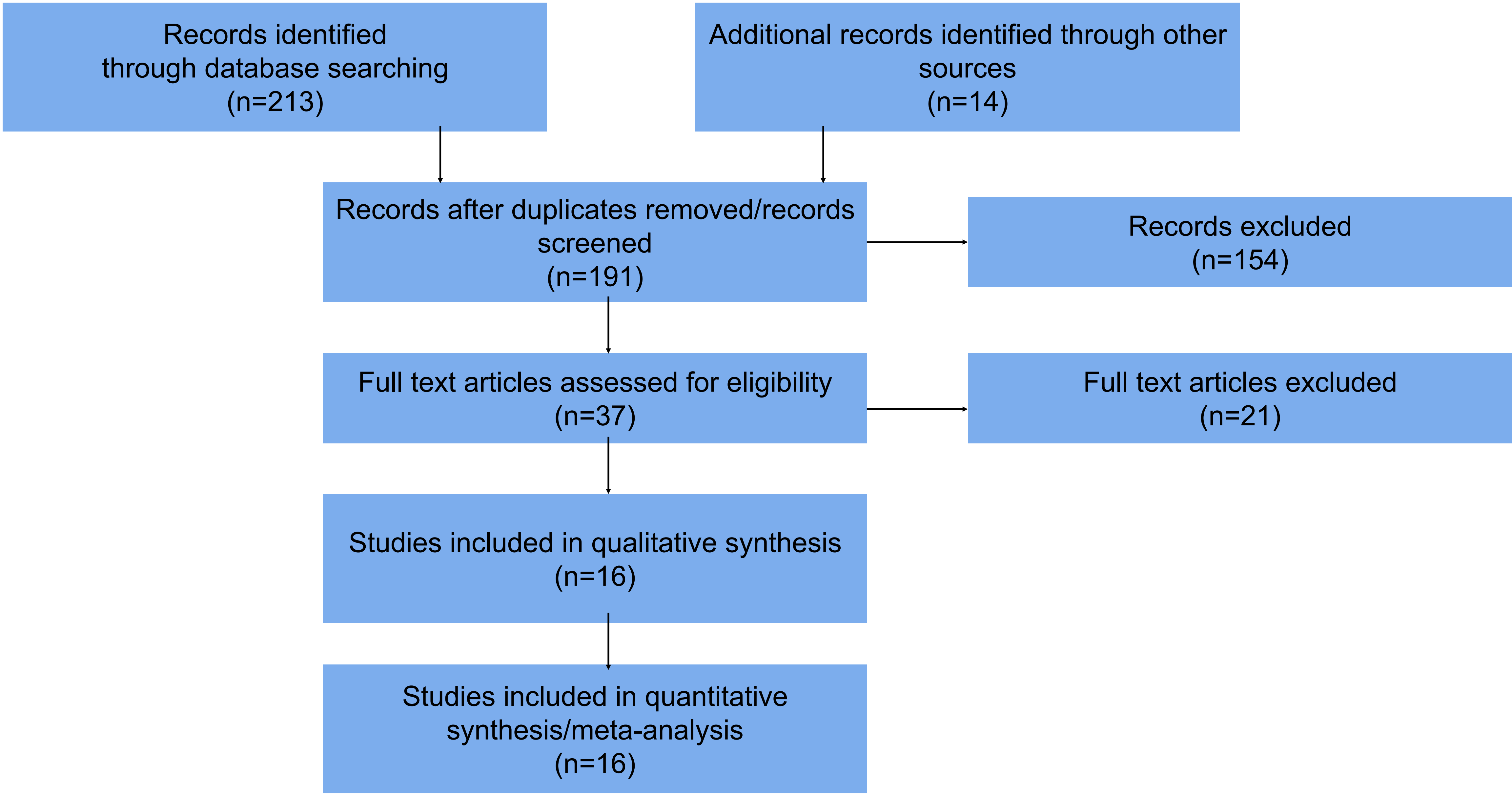
- Systematic search of Medline and EMBASE (Jan 1950 - Feb 2021)
- Independent data extraction
  - 6 researchers
- Consensus meeting x2
  - LL, KR, ACO
- Quality assessment of papers
  - CASP tool for cohort studies and RCT
    - 3 reviewers per paper

# PICO

- Population: Newborns before leaving hospital (up to 6 weeks of age)
- Intervention: Selective ultrasound screening (+/- clinical screening)
- Comparator: Universal ultrasound screening (+/- clinical screening)
- Outcome: Incidence of late DDH presentation
  - “Late” as defined by authors, but  $\geq 4$  weeks of age

# Eligibility Criteria

- Original retrospective/prospective diagnostic accuracy study
- **EXCLUDE:**
  - Study populations with underlying congenital disorders
  - Results for U and S not presented separately





Studies included in qualitative synthesis  
(n=16)

# Results

## Demographics

- 1986 - 2014
- 14 cohort, 2 RCTs
- Total population ?
  - > 500,000 (495 to 107,440)
- Total screened ?
  - > 125,048 (406 to 20,344)
- 3 universal, 10 selective, 3 both universal and selective arms

Studies included in qualitative synthesis  
(n=16)

# Results

## Clinical Screening

- Age range 0 to 7 days
  - 1 paper “time to diagnosis”: 19 to 84 weeks
  - Not available in [11 out of 16](#) papers
- Method
  - Ortolani/Barlow = 9
  - Not available in [7 out of 16](#) papers

Studies included in qualitative synthesis  
(n=16)

# Results

## Ultrasound Screening

- Age range 0 to 6 weeks
  - 1 paper “time to diagnosis”: 19 to 84 weeks
  - Not available in [10 out of 16](#) papers
- Method
  - Graf/modified Graf (Rosendahl) = 8
  - Clarke = 3
  - Harke = 2
  - Terjesen = 1
  - Not available in [2 out of 16](#) papers

Studies included in qualitative synthesis  
(n=16)

# Results

## Risk Factors for DDH

- Abnormal/equivocal clinical findings
- Positive family history
- Breech
- Foot deformities
- Oligohydramnios
- Clicking hip
- Sacral dimple
- Multiple pregnancy
- Decreased abduction
- Sacral dimple
- “Various”
- “Others”

6 out of 10 studies using selective screening did NOT document number of patients within each category

Studies included in qualitative synthesis  
(n=16)

# Results

## Follow-Up

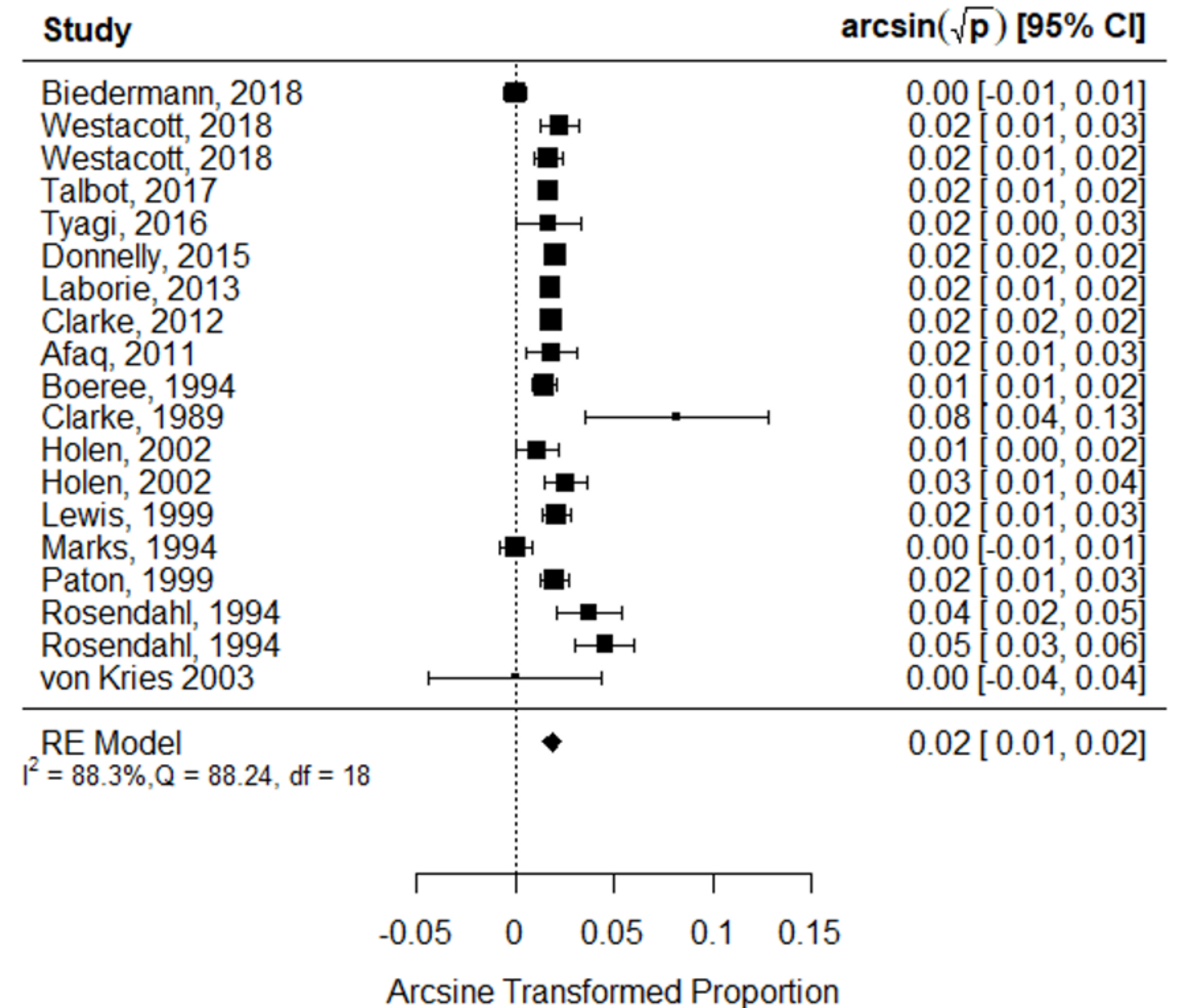
- Duration of follow-up
  - > 6 months to 5.5 years (5 years most commonly in 4)
  - 22 weeks; minimum of 2 years; > 27 months; > 4.5 years; 58 months
  - Not clear in [3 out of 16 papers](#)
- Definition of “late”
  - > 3 months/12 weeks/90 days = 6
  - > 1 month; > 2 months; > 6 months; > 12 months
  - Not given in [7 out of 16 papers](#)

Studies included in quantitative synthesis/meta-analysis  
(n=19)

# Results

Number of “Late” Cases: [Overall](#)

- Minimal risk of publication bias
- Heterogeneity ( $I^2$ )=88.3% (high)
- Rate of late presentation is **significant**
  - 0.34 per 1,000
  - 95%CI=0.19 to 0.53
  - $P$ -value<0.001

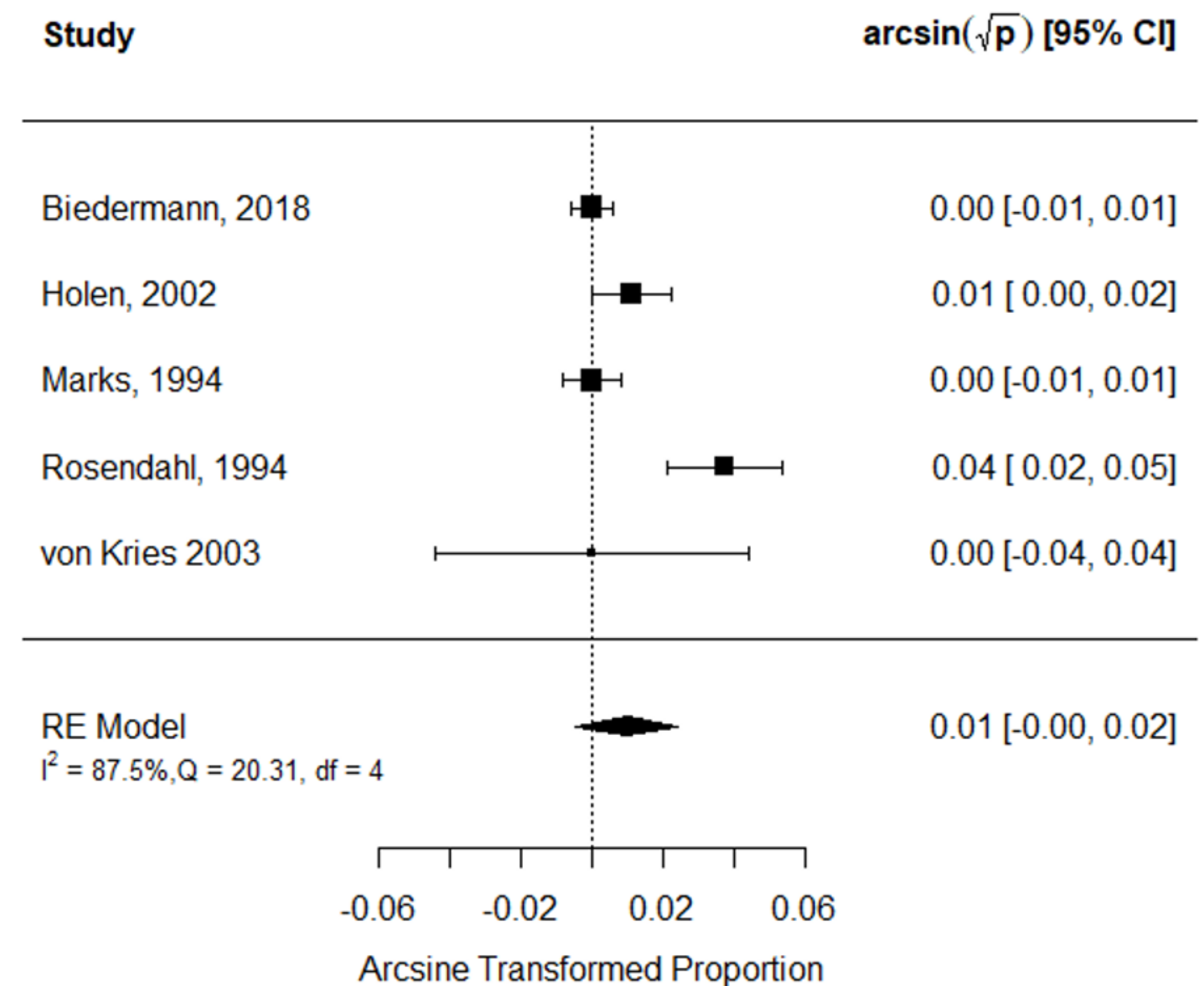


Studies included in quantitative synthesis/meta-analysis (n=5)

# Results

Number of “Late” Cases: [Universal](#)

- Heterogeneity ( $I^2$ )=87.5% (high)
- Rate of late presentation is **insignificant**
  - 0.10 per 1,000
  - 95%CI=0.28 to 0.59
  - $P$ -value=0.175

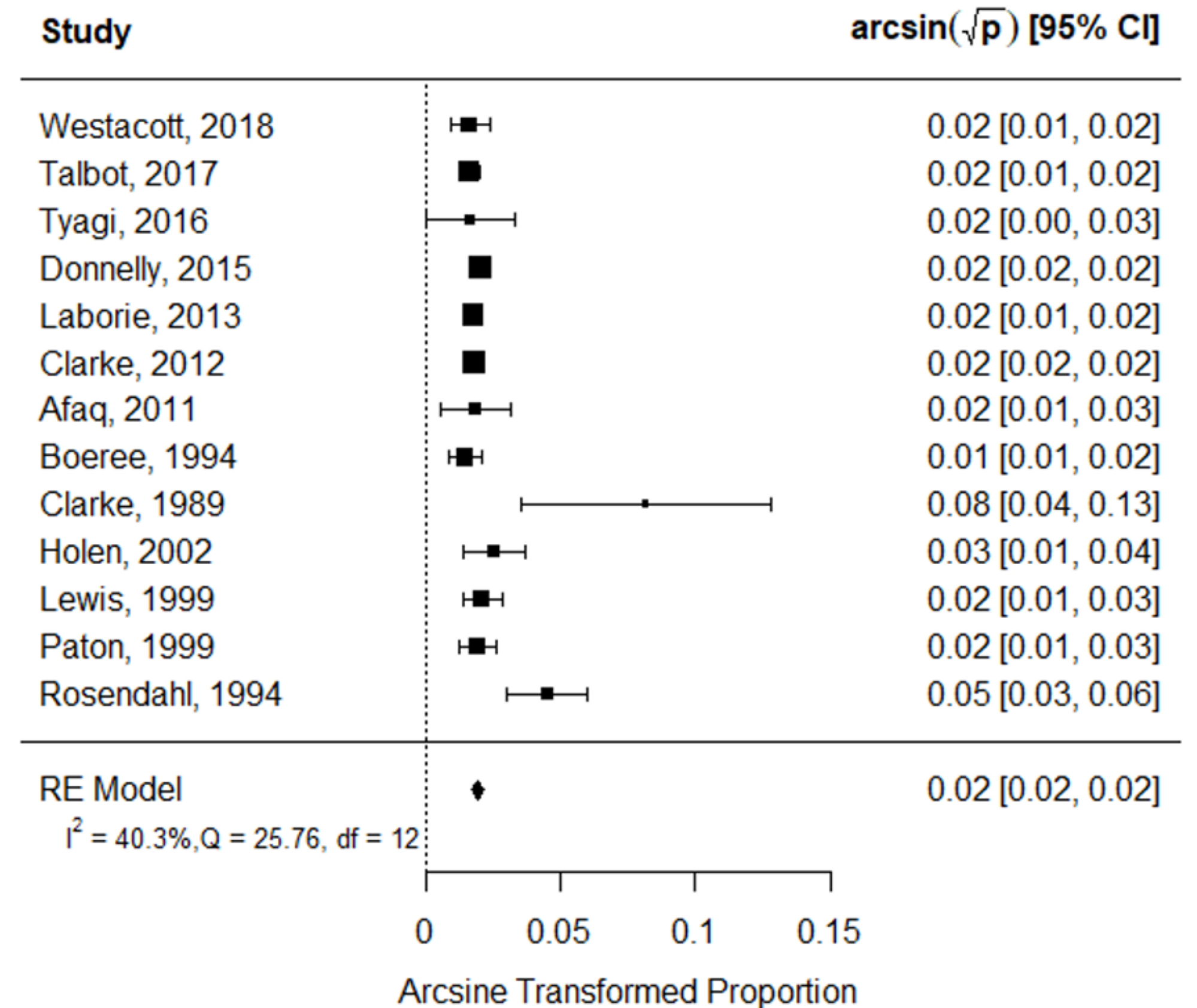


Studies included in quantitative synthesis/meta-analysis (n=13)

# Results

Number of “Late” Cases: [Selective](#)

- Heterogeneity ( $I^2$ ) = 40.3% (low)
- Rate of late presentation is **significant**
  - 0.37 per 1,000
  - 95%CI = 0.28 to 0.46
  - $P$ -value < 0.001





Studies included in quantitative  
synthesis/meta-analysis  
(n=19)

# Results

Late Presentation: [Universal Vs Selective Screening](#)

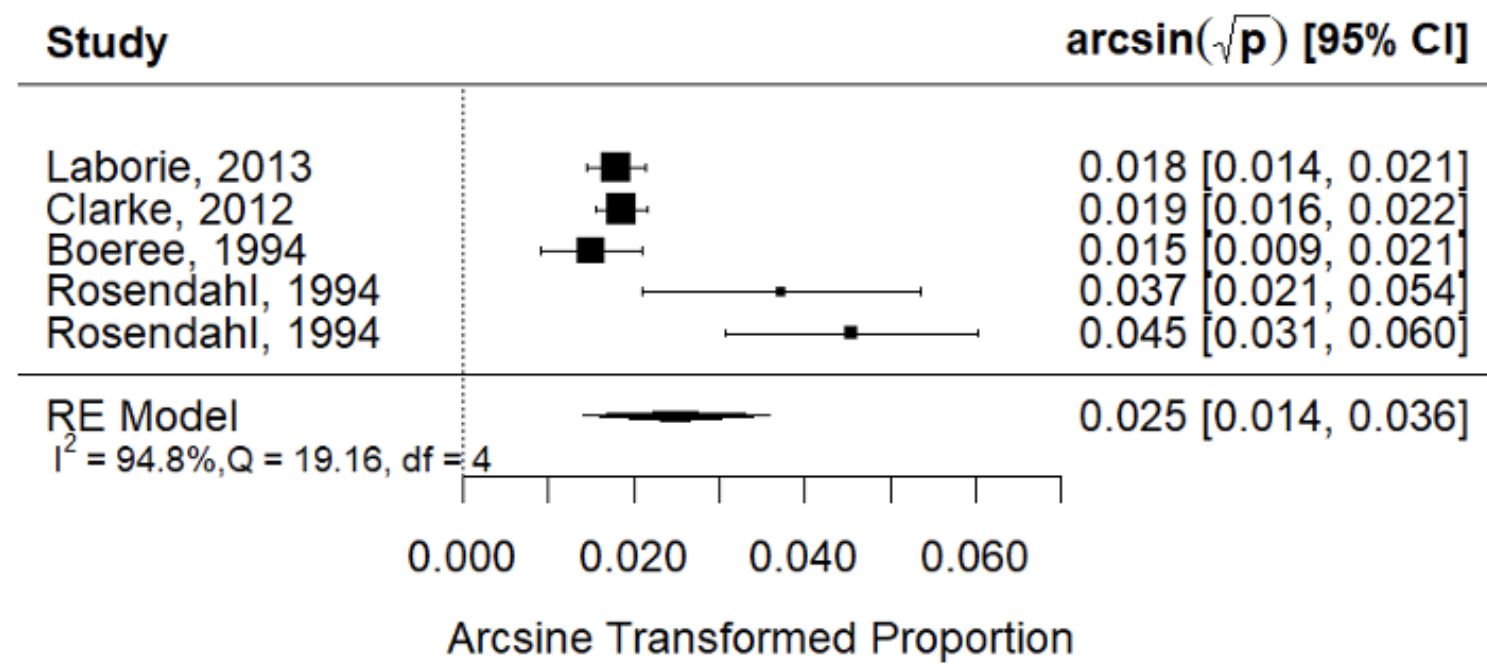
- Universal = 0.1 per 1,000 (0.28 to 0.59)
- Selective = 0.37 per 1,000 (0.28 to 0.46)
- Using the moderation effect, the difference between U & S per 1000
  - =0.00057
  - Which is **INSIGNIFICANT** ( $P$ -value=0.213)

Studies included in quantitative synthesis/meta-analysis (n=11)

# Results

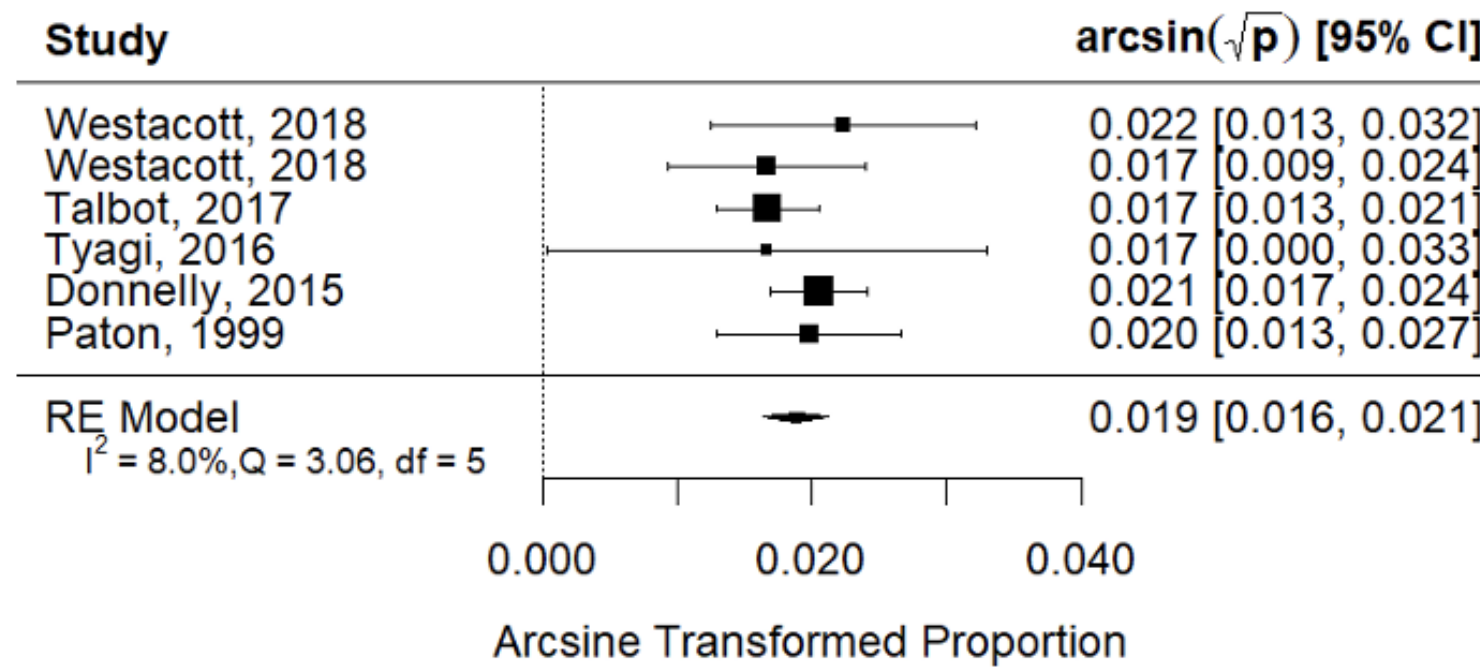
Definition of “Late”: [Within 3 months Vs After 3 months](#)

Within 3 months



- Rate=0.62 per 1,000 (95%CI 0.19-1.3)
- $P$ -value<0.01

After 3 months



- Rate=0.35 per 1,000 (95%CI 0.27-0.45)
- $P$ -value<0.01

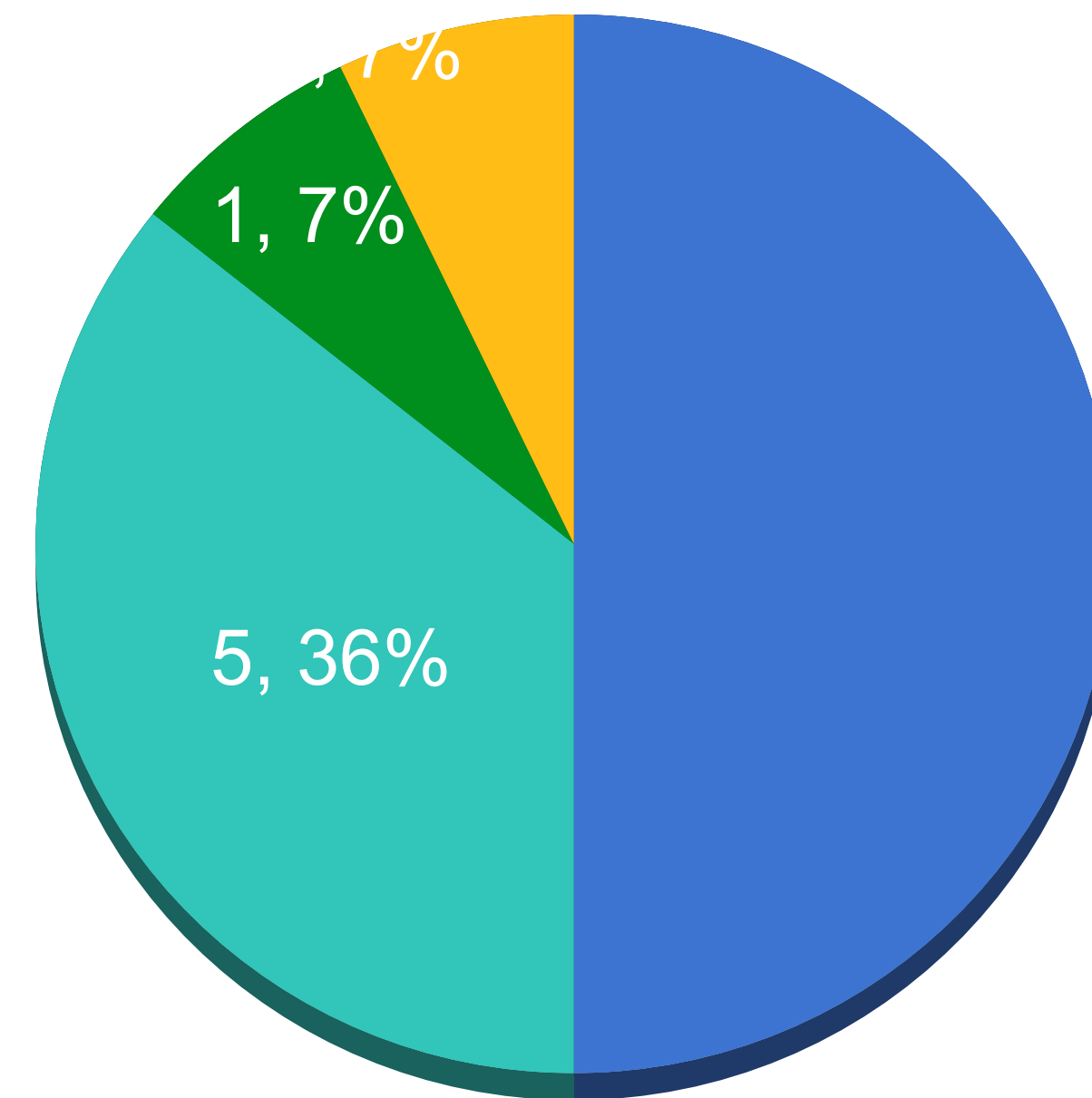
- Difference=0.0056 per 10,000
- $P$ -value=0.272
- **INSIGNIFICANT**

# Results

## Quality Assessment: CASP Tools

- RCT (n = 2)
- 11 CASP criteria
  - 6 out of 11 = 1
  - 4 out of 11 = 1

- Cohort studies (n = 14)
- 12 CASP criteria



■ ≥10

■ 7 to 9

■ 4

■ 3

# Discussion

## Universal Vs Selective Screening

- Trend towards greater rate of late presentation for S compared to U screening
  - Did not reach statistical significance
- Limitations
  - Relatively low numbers of heterogeneous studies performing U screening
  - Varying definitions
  - No cost analyses

# Discussion

## Quality of Papers

- **12 out of 16 papers** of good quality or better based on CASP criteria **BUT**
  - Age range for clinical screening not available in 11 out of 16 papers
  - Method of clinical screening not available in 7 out of 16 papers
  - Age range for ultrasound screening not available in 10 out of 16 papers
  - Variable follow-up period and not clear in 3 out of 16 papers
  - Variable definition of “late” and not given in 7 out of 16 papers

# Conclusion

Based on the results of this systematic review

- Compared to universal ultrasound screening for DDH, selective screening does NOT increase rate of late presentation BUT
- Uniformity in design and reporting of DDH studies is required particularly in relation to
  - Age at clinical and ultrasound screening
  - Method of clinical and ultrasound screening
  - Duration of follow-up
  - Definition of late
- Cost effectiveness analyses