Characterizing The Surgeon Learning Curve In Minimally Invasive Spine Surgery: Does The Evidence Account For User Experience? A Systematic Literature Review

Chris Ferry, MS, M3
Cooper Medical School of Rowan University
Cooper University Hospital
Camden, NJ USA
MIS in Spine: Prevalence & Publication

• By 2020, one-half of all instrumented spinal procedures will be performed in MIS fashion\(^1\)
  • One-sixth in 2010

• Publication on the topic of spine MIS from 2000-2015 was over 11 times that of the volume before 2000\(^2\)

MIS in Spine: Surgeon 'Learning Curve' Assessment

• Numerous populations focus on the 'learning curve' associated with adopting these procedures

• However, it is not well substantiated whether these reports adequately characterize surgeon baseline experience/training

• Without characterization of surgeon experience, the context is insufficient for effective extrapolation
Study Objective

Perform a systematic literature review to aggregate all evidence assessing procedural learning curve in spine MIS and to determine whether adequate efforts have been made to capture and understand the role of user (surgeon) experience.
Study Design

- **Database:** PubMed (MEDLINE)
- **Literature Review Guidelines:** PRISMA and the Cochrane Handbook
- Search outcomes included any English (language) articles with titles, abstracts resulting from the search criteria: spine AND learning curve.
- Study exclusion criteria consisted of:
  - Full study article not available in English and/or
  - Articles not assessing a cumulative procedure (i.e. screw placement only)
  - Learning curves for non-instrumented spinal surgery techniques and/or
  - Learning curves for non-MIS (defined within article) or robotic-assisted techniques and/or
  - Pre-clinical research and/or
  - Case report and/or
  - Systematic review, meta-analysis, or commentary article
- Inclusion articles were summarized in a tabulated format, including: first author, publication year, pertinent MIS technique, case number, and statement of user experience.
Results: Article Demographics

• Initial search yield: 447 articles; 13 met final inclusion
• Procedures Assessed:
  • TLIF – 9
  • MIDLF/cortical screws – 2
  • OLIF – 1
  • LLIF – 1
• Total number of cases examined in each study (range): 22 to 124
  • Mean Case #: 71 (SD 34.6)
Results:
Article Breakdown

• Provided a statement acknowledging whom the performing surgeon(s) was and/or attempted a statement of their experience: 11/13; 85%

• Attempted a summary statement of surgeon experience which acknowledged at least one of the following metrics:
  • years in practice: 5/13; 38%
  • years or number of cases performed using the a traditional (open approach)/gold-standard technique: 6/13; 46%
  • specification of residency/fellowship training: 3/13; 23%
  • use/non-use of cadaveric or course/lab training: 2/13; 15%
  • design of operating team: 1/13; 8%

• No article (0%) assessed the learning as a function of multiple surgeons

• No articles (0%) incorporated experience as a quantitative variable in their analysis.
Conclusion

• While many robust learning curve analyses exist with regards to outcome metrics, few provide detailed background on surgeon experience/training prior to adoption and implementation.

• Future efforts to establish a validated methodology in characterizing surgeon experience/training would be valuable.