Contents lists available at ScienceDirect

Journal of Clinical Anesthesia

journal homepage: www.elsevier.com/locate/jclinane

Correspondence

A systematic review and meta-analysis of post-operative urinary retention with anaesthetic and analgesic modalities

To the Editor

Post-operative urinary retention (POUR) is defined as the inability to void with a full bladder following surgery [1]. Complications include delirium, pain, prolonged hospital admission, and long-term altered bladder contractility [2]. POUR is readily managed with catheterisation, but this can be emotionally traumatic and is associated with morbidity including urinary tract infection, trauma, and blockage [3,4]. This procedure may be difficult in patients with underlying urological pathology, who are at increased baseline risk of POUR [5].

We aimed to review and analyse current evidence regarding POUR rate with several anaesthetic and analgesic modalities, to enable informed decision-making regarding appropriate perioperative management around urinary retention. We utilised systematic review and meta-analytic methodology, in line with the PRISMA framework [6], and registered prospectively with the PROSPERO database (ID CRD42018111566).

Five databases were searched with no time restriction. Terms were formulated to identify articles that reported urinary retention in adult patients with various anaesthetic and analgesic modalities. Studies included were peer-reviewed original randomised-controlled trials (RCTs) or observational studies (OS). Studies that included obstetric or trauma surgery, patients at extremes of body mass index, or multimodal pain management regimes were excluded. In many included studies, urinary retention was not a primary outcome measure.

The search yielded 1533 results excluding duplicates. Studies were screened before full text review and comparison to inclusion and exclusion criteria. 44 studies were finally included.

Data was extracted using a proforma. Level of evidence was assessed using Oxford Centre for Evidence-based Medicine (OCEM) criteria [7]. Risk of bias was assessed using the Cochrane Risk of Bias tool (RoB 2) for RCTs [8], and the RTI Item Bank for OS [9].

POUR rate was calculated for each study. Summary POUR rate with 95% confidence intervals (CI) and I^2 were synthesised for each modality using random effects meta-analysis. If POUR rate was zero (as in studies with local and spinal anaesthesia and nerve or plexus blocks), studies were excluded from further analysis as standard error could not be calculated. Confidence intervals crossing zero and negative I^2 values were truncated to zero [10]. Forest plots were constructed. Funnel plots were created to visually assess risk of publication bias.

There were 17 OS and 27 RCTs, including a total of 5991 patients. 66% (n = 29) were OCEM level 1b as good quality RCTs. 23% (n = 10) were level 2b, as retrospective cohort studies or chart reviews. 11% (n = 5) were level 3b, as case control studies.

70% (n = 31) had some concerns for bias and 30% (n = 13) were high risk. No studies were considered low risk of bias. Risk of publication bias was low as assessed visually through funnel plot (Fig. 2). Diagnostic criteria for urinary retention was reported in 41% (n = 18) of studies, and not reported in 59% (n = 26).

The breakdown of surgical specialties was as follows:

- Orthopedic, n = 17
- General Surgery, n = 10
- Cardiothoracic, n = 6
- Colorectal, n = 5
- Spinal, n = 4
- Urology, n = 1
- Mixed, n = 1

The POUR rates per modality are summarised below in descending order (displayed graphically in Fig. 1):

- Patient-controlled analgesia (30%, CI 23–38, studies = 4, participants = 210, I^2 = 0.0).
- Spinal anaesthesia (24%, CI 15–34, studies = 22, participants = 1498, I^2 = 0.0).
- Epidural anaesthesia (18%, CI 10–26, studies = 16, participants = 753, I^2 = 0.0).
- General anaesthesia (13%, CI 7.8–18, studies = 14, participants = 1291, I^2 = 19).
- Nerve or plexus blocks (6.6%, CI 3.0–10, studies = 9, participants = 481, I^2 = 24).
- Local anaesthesia (6.3%, CI 2.4–10, studies = 9, participants = 747, I^2 = 37).

There was no significant difference between general, epidural and spinal anaesthesia. The lowest risk peri-operative modality was nerve or plexus block (significant when compared with epidural and spinal anaesthesia). This is biologically plausible due to the physiology of regional blocks.

There was no significant difference between nerve or plexus block and local anaesthesia. Opioid patient-controlled analgesia had the highest summary POUR rate of post-operative analgesia, and overall. Overlapping confidence intervals with epidural and spinal anaesthesia limits conclusions, perhaps due to patient or study design factors, or risk of type II error due to underpowered studies. Further high-quality research is needed for future meta-analysis to accurately estimate the rate of POUR with this modality.

https://doi.org/10.1016/j.jclinane.2021.110280
Received 5 March 2021; Received in revised form 10 March 2021; Accepted 12 March 2021
0952-8180/© 2021

Correspondence

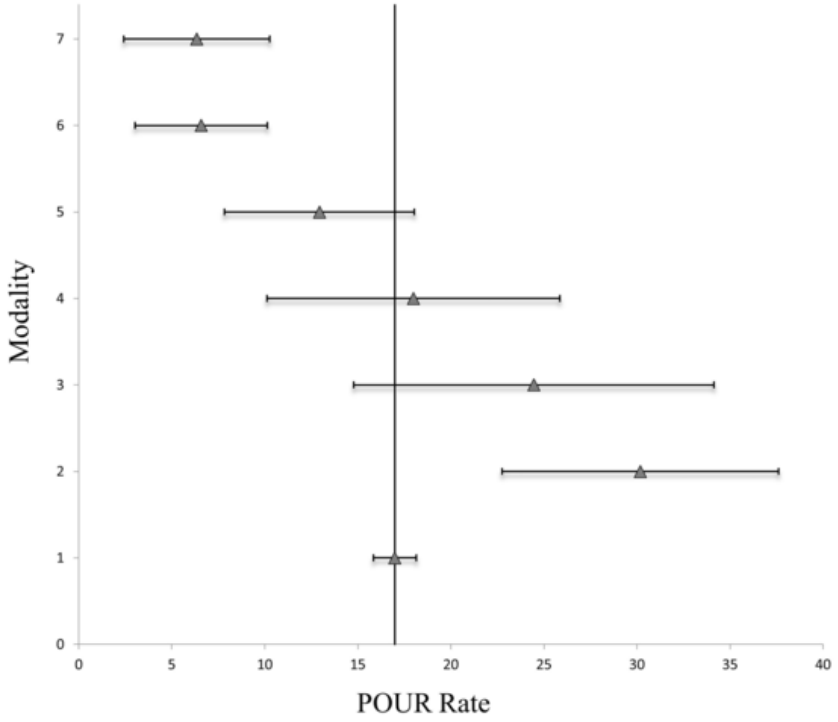

Fig. 1. Forest plot demonstrating Summary POUR rate for each modality.
Key: 1 - Total POUR (17%, 95% confidence intervals 16% - 18%); 2 - Patient-controlled analgesia; 3 - Spinal anaesthesia; 4 - Epidural anaesthesia; 5 - General anaesthesia; 6 - Nerve or plexus block; 7 - Local anaesthesia.

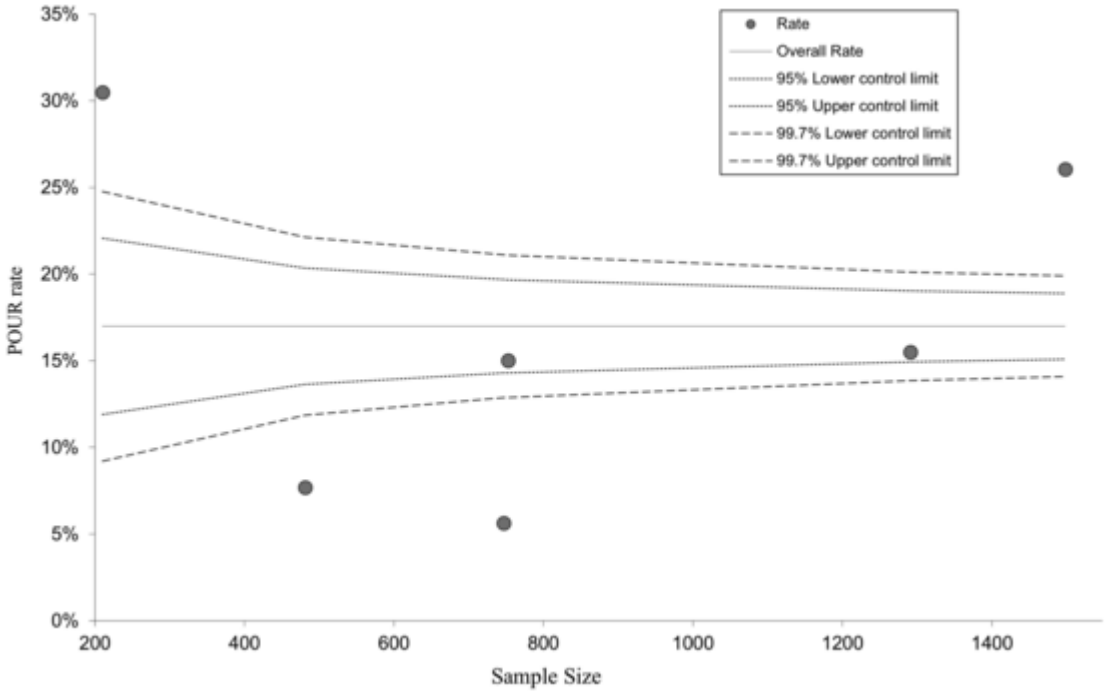

Fig. 2. Funnel plot comparing sample size with summary POUR rate for each modality.

Multiple specialties were included to maximise external validity and facilitate use in clinical practice. However, this means individual studies included are less homogenous and thus susceptible to confounding factors. Variability of POUR with different specialties was beyond the scope of this investigation.

Only 41% of studies reported diagnostic criteria for POUR. Reported criteria were heterogenous, consistent with previous literature describing a lack of standardisation [1]. This supported our choice of random-effects meta-analysis, and decision to include studies that reported at least two modalities to improve standardisation. Work must be done to determine standardised diagnostic and reporting guidelines for POUR, to improve the comparability of future evidence strengthen future meta-analysis. Standardising POUR diagnosis would also confer a clinical benefit, allowing improved training, identification and management regarding this condition. There was also insufficient data regarding intravenous fluid regimes with each modality, and bladder overdis-

Correspondence

tension is a large risk factor for POUR [2]. Future studies should focus on recording volumes of fluid administered to allow for this confounding factor and increase the validity of any conclusions drawn.

POUR is a major cause of morbidity associated with many surgical procedures. This meta-analysis provides evidence for the rate of POUR associated with several anaesthetic and analgesic modalities and highlights patient-controlled analgesia and spinal anaesthetic as the interventions with the highest associated risk. This should inform selection of appropriate anaesthesia for surgical patients, depending on their risk of urinary retention. High risk patients include those with diabetes mellitus, pre-existing urinary symptoms, or female sex [5]. Where technical aspects of the procedure preclude certain choices, we may use heightened vigilance to actively identify POUR and treat it promptly. The expected result will be reduced morbidity and cost of healthcare and improved patient experience. This review has also highlighted the importance of establishing standardised guidelines for diagnosing and reporting the condition, and focussed data collection regarding fluid administration, to improve future evidence on the epidemiology of POUR and elevate the quality of future meta-analyses.

External funding

None received.

Declaration of Competing Interest

None to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jclinane.2021.110280.

References

[1] Baldini G, Bagry H, Aprikian A, Carli F Postoperative urinary retention: anesthetic and perioperative considerations. Anesthesiology. 2009;110(5):1139–57.
[2] Tammela T, Kontturi M, Lukkarinen O Postoperative urinary retention. I. Incidence and predisposing factors. Scand J Urol Nephrol 1986;20(3):197–201.
[3] Johansson RM, Malmvall BE, Andersson-Gare B, Larsson B, Erlandsson I, Sund-Levander M, et al. Guidelines for preventing urinary retention and bladder damage during hospital care. J Clin Nurs 2013;22(3–4):347–55.
[4] Lowthian PT The dangers of long-term catheter drainage. Br J Nurs 1998;7(7):366–8 370, 372 passim.
[5] Toyonaga T, Matsushima M, Sogawa N, Jiang SF, Matsumara N, Shimojima Y, et al. Postoperative urinary retention after surgery for benign anorectal disease: potential risk factors and strategy for prevention. Int J Colorectal Dis 2006;21(7):676–82.
[6] Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med 2009;6(7):e1000097.
[7] Oxford Centre for Evidence-Based Medicine Levels of Evidence Working Group The Oxford levels of evidence 2 Available from https://www.cebm.net/index.aspx?o=5653 2011 (Accessed 12/12/20)
[8] RoB2 Development Group In: JPT H, Savović J, Page MJ, JAC S, editors. Revised cochrane risk-of-bias tool for randomized trials (RoB 2); 2019 Available from https://sites.google.com/site/riskofbiastool/welcome/rob-2-0-tool/current-version-of-rob-2?authuser=0 (Accessed 12/12/20).
[9] Viswanathan M, Berkman ND Development of the RTI item Bank on risk of Bias and precision of observational studies. Rockville, Maryland: Agency for Healthcare Research and Quality; 2011 Available from https://www.ncbi.nlm.nih.gov/books/NBK82258/ (Accessed 12/12/19).
[10] Higgins PT, Thompson SG, Deeks JJ, Altman D Measuring inconsistency in meta-analyses. BMJ. 2003;327(7414):557–60.

Louis Dwyer-Hemmings MBBS [a, 1, *], Alexander Hampson MBBS [b], Cassandra Fairhead MBBS [c], Stephen Moss MBBS [d], Venkat Prasad FRCA [e], Shanmugasundaram Gowrie-Mohan FRCA [e], Nikhil Vasdev FRCS [b, f]

[a] *Institute of Medical and Biomedical Education, St George's (University of London), London, UK*
[b] *East and North Hertfordshire NHS Trust, Department of Urology, Lister Hospital, Stevenage, UK*
[c] *Guy's and St Thomas' NHS Foundation Trust, St Thomas' Hospital, London, UK*
[d] *Milton Keynes University Hospital NHS Foundation Trust, Department of Anaesthesia and Critical Care, Milton Keynes University Hospital, Milton Keynes, UK*
[e] *East and North Hertfordshire NHS Trust, Department of Anaesthesia, Lister Hospital, Stevenage, UK*
[f] *School of Life and Medical Sciences, University of Hertfordshire, Hatfield, UK*

* Corresponding author.
E-mail address: louisdh@doctors.org.uk (L. Dwyer-Hemmings).
[1] Postal address - Institute of Medical and Biomedical Education, St George's (University of London), Blackshaw Road, SW17 0QT London, UK.