Short report

Epididymitis rates in Australian hospitals 2009–2018: ecological analysis

Jane L Goller 1, Alysha M De Livera, Basil Donovan, Christopher K Fairley, Nicola Low, Jane S Hocking

ABSTRACT

Objectives To investigate rates of acute epididymitis diagnosed in Australian hospital settings.

Methods Yearly hospital admission and emergency department (ED) rates of epididymitis as primary diagnoses were calculated for 15–44-year-old men for three states (Victoria, New South Wales, Queensland) from 2009 to 2014 using population denominators. Zero inflated Poisson regression models were used to analyse variation in rates by year, age, and residential area. Additionally, we investigated national epididymitis admission trends from 2009 to 2018 using generalised linear models.

Results Between 2009 and 2014, there was a total of 7375 admissions and 17,281 ED presentations for which epididymitis was the main reason for care. Most epididymitis diagnoses (94.0% in admissions, 99.7% in EDs) were without abscess, and 2.5% of admissions were for chlamydial epididymitis. Almost a quarter (23.3%) of epididymitis diagnosed in EDs resulted in hospital admission. In 2014, the epididymitis rate per 100,000 men was 38.7 in admissions and 91.9 in EDs. Comparing 2014 with 2009, the overall epididymitis diagnosis rate increased in admissions by 32% (adjusted incident rate ratio (aIRR) 1.32, 95% CI 1.20 to 1.44) and in ED attendances by 40% (aIRR 1.40, 95% CI 1.31 to 1.49). By age, the highest rates were among men 35–44 years in admissions and men 15–24 years in EDs. National admission rates of epididymitis during 2009–2018 showed a similar pattern.

Conclusion Rates of epididymitis diagnosis in hospital admission and ED presentations increased. Different age-related rates in these settings suggest a different aetiology or differential severity by age group.

To cite: Goller JL, De Livera AM, Donovan B, et al. Sex Transm Infect 2021;97:387–390.
Epidemiology

We prepared two datasets comprising (a) all admissions and (b) all ED attendances with a principal epididymitis diagnosis and population per postcode.

Additionally, to provide more recent and national rates, for men aged 15–44, we obtained the annual ERP and aggregated yearly hospital separations data with a primary epididymitis diagnosis for all Australia during 2009–2018. ED data nationally were not publicly available for this period.

Data were analysed using Stata 16 (Stata, College Station, Texas, USA). We examined variation in rates by year, age-group, remoteness and SES using univariable and multivariable zero-inflated Poisson regression models. We included residential area measures to assess whether rates differed between areas of different affluence or remoteness. Using likelihood ratio tests, we investigated interactions between residential area and age-group and reported them if statistically and clinically meaningful. National trends in epididymitis admission rates were examined using generalised linear models. We report incidence rate ratios (IRR) with 95% CI.

RESULTS

Between 2009 and 2014 across Victoria, NSW and Queensland, epididymitis was the main diagnosis in 7375 admissions (94.0% without abscess, 3.3% with abscess, 2.5% with chlamydia, 0.2% with gonorrhoea) and 17 281 ED presentations (99.7% without abscess) (online supplementary table 1). In EDs, 23.3% of epididymitis diagnoses resulted in hospital admission (20.4%, 95% CI 18.8 to 22.1 in 2009; 28.4%, 95% CI 26.9 to 29.9 in 2014). Epididymitis diagnosis rates per 100 000 men increased between 2009 and 2014; in admissions from 28.3 to 38.7 and EDs from 64.8 to 91.9 (figure 1A). In multivariable analysis (table 1), the

![Figure 1](image-url)  
**Figure 1** (A) Hospital admission and emergency department rates of epididymitis per 100 000 men (in Victoria, NSW and Queensland) by age group, 2009–2014 and (B) Australian admission rates of epididymitis per 100 000 men by age group, 2009–2018.

### Table 1  Number of epididymitis cases and factors associated with epididymitis rates in Australian hospitals (Victoria, NSW, Queensland), 2009–2014*

|                | Admission                          | Emergency department |
|----------------|------------------------------------|----------------------|
|                | Cases Univariable | Multivariable       | Cases Univariable | Multivariable       |
| N              | IRR (95% CI)          | aIRR (95% CI)       | N              | IRR (95% CI)          | aIRR (95% CI)       |
| Overall        | 7375  | 17 281                             |
| Age group in years |                  |                      |                |                    |
| 15–24          | 2208  | 0.83 (0.78 to 0.89) | 0.82 (0.77 to 0.87) | 6205  | 1.20 (1.14 to 1.25) | 1.18 (1.13 to 1.23) |
| 25–34          | 2510  | 0.91 (0.86 to 0.97) | 0.91 (0.85 to 0.97) | 5915  | 1.10 (1.05 to 1.15) | 1.10 (1.05 to 1.15) |
| 35–44          | 2657  | 1.0                               | 1.0             | 5161  | 1.0                               | 1.0                  |
| Area of residence |                |                      |                |                    |
| Metropolitan   | 5429  | 1.0                               | 1.0             | 12 101 | 1.0                               | 1.0                  |
| Inner regional | 1331  | 1.11 (1.01 to 1.21) | 1.04 (0.95 to 1.13) | 3748  | 1.38 (1.30 to 1.47) | 1.30 (1.22 to 1.37) |
| Outer regional/remote | 615 | 1.18 (0.99 to 1.39) | 1.10 (0.93 to 1.30) | 1432  | 1.43 (1.30 to 1.58) | 1.35 (1.22 to 1.49) |
| SES            |                |                      |                |                    |
| Deciles of increasing disadvantage | 1.06 | (1.05 to 1.07) | 1.06 (1.05 to 1.07) | 1.06 | (1.05 to 1.06) | 1.05 (1.04 to 1.05) |
| Year           |                |                      |                |                    |
| 2009           | 1014  | 1.0                               | 1.0             | 2323  | 1.0                               | 1.0                  |
| 2010           | 1143  | 1.11 (1.00 to 1.22) | 1.10 (1.00 to 1.21) | 2393  | 1.02 (0.95 to 1.09) | 1.02 (0.96 to 1.10) |
| 2011           | 1247  | 1.20 (1.09 to 1.32) | 1.19 (1.08 to 1.31) | 2719  | 1.14 (1.07 to 1.22) | 1.14 (1.07 to 1.22) |
| 2012           | 1259  | 1.18 (1.07 to 1.30) | 1.17 (1.07 to 1.29) | 3065  | 1.25 (1.17 to 1.33) | 1.26 (1.18 to 1.35) |
| 2013           | 1251  | 1.16 (1.05 to 1.27) | 1.16 (1.06 to 1.27) | 3314  | 1.36 (1.27 to 1.46) | 1.37 (1.28 to 1.46) |
| 2014           | 1461  | 1.32 (1.21 to 1.45) | 1.32 (1.20 to 1.44) | 3467  | 1.38 (1.29 to 1.47) | 1.40 (1.31 to 1.49) |

*Zero inflated Poisson regression models.
aIRR, adjusted incident rate ratio; NSW, New South Wales; SES, socioeconomic status.
overall epididymitis rate was higher in 2014 than 2009 in admissions (aIRR 1.32, 95% CI 1.20 to 1.44) and EDs (aIRR 1.40, 95% CI 1.31 to 1.49). Men 35–44 years experienced the highest admission rates. ED rates were highest for men 15–24 years.

Nationally across Australia between 2009 and 2018, epididymitis was the main diagnosis in 17299 hospital admissions. During the 2009–2014 period of our state-based analysis, there were 9459 epididymitis admissions nationally of which 78% were across Victoria, NSW and Queensland and the corresponding population for the three states was 77% of the national ERP. Nationally, the epididymitis admission rate per 100,000 men increased by 3% yearly from 30.9 in 2009 to 38.5 in 2018 (figure 1B) (IRR 1.03, 95% CI 1.03 to 1.04, p<0.01) and increased across all age groups.

DISCUSSION
This study found for men aged 15–44 years that epididymitis diagnosis rates in hospital admissions and ED attendances in the three most populous Australian states increased by up to 40% between 2009 and 2014. Epididymitis was managed more frequently in ED, where rates were up to 2.5 times those in admissions. Admission rates were highest for older men. ED rates were highest for younger men and in non-metropolitan areas. We found a similar pattern for epididymitis admission rates nationally.

This study applied the same methodology used in our analysis of female STI-related morbidity; therefore, we consider the strengths and limitations to be similar. Notably, this study was strengthened by including ED data to provide new knowledge about epididymitis in Australia. Further, our analysis at postcode level allowed comparison of population rates between areas with different socioeconomic characteristics. An important limitation was this study only considered epididymitis managed in hospitals. An Australian study estimated that 14,700 general practice consultations for epididymitis among men aged 15–34 occurred annually during 1998–2003. Primary care data are needed for a more complete picture, but are not routinely available. Further, our ED data did not represent all ED presentations for epididymitis within the three states. We minimised variability in ED rates by restricting our analysis to EDs providing data for all study years and with high completeness.

Only a handful of studies have investigated epididymitis trends and few if any in the last decade. We found for men aged 15–44 that national epididymitis admission rates per 100,000 increased from 31 in 2009 to 39 in 2018. This contrasts with unchanging admission rates reported for same aged men in Australia (1992–2001) (~35 per 100,000 in 2001) and New Zealand (1998–2008) (~45 per 100,000 in 2008). Our ED rates showed a similar pattern to our admission rates, increasing by 40% during 2009–2014, although overall ED rates were substantially higher than admission rates. We also found that 23% of epididymitis diagnoses in ED were admitted to hospital. This is substantially higher than for Australian general practice during 1998–2003 when <2% epididymitis consultations resulted in hospital referral, although 72% of these encounters were for men >35 years. In the UK, a comprehensive analysis of general practice data reported declining epididymitis incidence between 2004 and 2008 for men aged 15–60 with 57% of cases managed completely in general practice. Notably, only 3% of men under 35 years were chlamydia tested.

So, what might contribute to the epididymitis rates observed in this study? Our finding that over three-quarters of epididymitis cases in EDs were managed without admission and that different age groups experienced higher rates in admissions and ED suggests a different aetiology for these settings or differing severity for each aetiology by age group. Admission data are likely to reflect clinically severe epididymitis; potential causes include chlamydia and gonorrhoea, 1 uro-pathogens or enteric pathogens transmitted via insertive anal intercourse. 2 Recent Australian surveillance data show substantial increases in chlamydia and gonorrhoea diagnosis for men with same sex and female partners and an increasing proportion of gay and bisexual men reporting condomless anal intercourse with casual partners. 3 The latter period of our national analysis also coincided with increasing pre-exposure prophylaxis use by non-HIV-positive men. 3 These factors could contribute to increases in severe epididymitis requiring inpatient management, although the extent is unknown.

Over three-quarters of epididymitis in EDs were managed without admission. Potentially, many non-admitted cases were suitable for primary care management. It is possible that factors restricting primary care access contributed to our finding of increased ED rates. A chlamydia testing intervention in Australian general practice (2010–2015) reported a low epididymitis incidence 4 and Australian gay and bisexual men have reported preferences to attend specialist rather than mainstream primary care for sexual healthcare. 5 Limited availability of sexual health services or general practice workforce shortages, particularly in non-metropolitan areas, 6 could limit appointment availability and timely access to general practice thereby prompting men with epididymitis to attend ED instead.

In conclusion, we found increasing epididymitis rates in hospital admissions and EDs, with epididymitis managed more frequently in EDs. Different age-related patterns suggest a different aetiology in these settings. These results could reflect changing sexual practices, increasing STI transmission and/or limited access to general practice, though primary care data are needed to better understand healthcare usage and the epidemiology of male STI-related morbidity.

Handling editor Sevgi O Aral
Twitter Nicola Low @nicolaolow

Acknowledgements Australian Chlamydia Control Effectiveness Pilot (ACCEPt) investigators and project team; Victorian Government, Department of Health and Human Services; NSW Government, NSW Ministry of Health; Queensland Government, Department of Health; Government of South Australia, SA Health.

Contributors JLG collected, cleaned and analysed the data, contributed to the analysis plan and drafted and revised the manuscript. AMDL provided statistical advice and contributed to the manuscript draft and revisions. JSH, CKF, BD and NL contributed to the interpretation of results and contributed to the manuscript draft and revisions. All authors approved the final submitted version of the manuscript.

Funding These data are being analysed as part of the Australian Chlamydia Control Effectiveness Pilot (ACCEPt) study funded by the Australian Government Department of Health and the National Health and Medical Research Council.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval The Royal Australian College of General Practitioners National Research and Evaluation Ethics Committee approved the study (NREEC09.019).

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information.

ORCID iDs
Jane L Goller http://orcid.org/0000-0001-5580-360X
Nicola Low http://orcid.org/0000-0002-4725-0475
REFERENCES

1. Trojan TH, Lishnak TS, Epididymitis HD. And orchitis: an overview. Am Fam Physician 2009;79:583–7.
2. Workowski KA, Bolan GA, Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines, 2015. MMWR Recomm Rep 2015;64:1-137.
3. The Kirby Institute. HIV, viral hepatitis and sexually transmissible infections in Australia. annual surveillance report 2018. Sydney NSW: The University of New South Wales, 2018.
4. Ali H, Cameron E, Drovandi CC, et al. A new approach to estimating trends in Chlamydia incidence. Sex Transm Infect 2015;91:513–9.
5. Chen MY, Fairley CK, Donovan B. Discordance between trends in Chlamydia notifications and hospital admission rates for Chlamydia related diseases in New South Wales, Australia. Sex Transm Infect 2005;81:318–22.
6. Chen MY, Pan Y, Britt H, et al. Trends in clinical encounters for pelvic inflammatory disease and epididymitis in a national sample of Australian general practices. Int J STD AIDS 2006;17:384–6.
7. Goller JL, De Livera AM, Guy RJ, et al. Rates of pelvic inflammatory disease and ectopic pregnancy in Australia, 2009-2014: ecological analysis of hospital data. Sex Transm Infect 2018;94:534–41.
8. Hocking JS, Temple-Smith M, Guy R, et al. Population effectiveness of opportunistic Chlamydia testing in primary care in Australia: a cluster-randomised controlled trial. Lancet 2018;392:1413–22.
9. Morgan J, Colomne C, Bell A. Trends of reported chlamydia infections and related complications in New Zealand, 1998 - 2008. Sex Health 2011;8:412–8.
10. Nicholson A, Rait G, Murray-Thomas T, et al. Management of epididymo-orchitis in primary care: results from a large UK primary care database. British Journal of General Practice 2010;60:e407–22.
11. Koh CS, Kang M, Usherwood T. ‘I demand to be treated as the person I am’: experiences of accessing primary health care for Australian adults who identify as gay, lesbian, bisexual, transgender or queer. Sex Health 2014;11:258–64.
12. Harris MF, Davies PGP, Fanaian M, et al. Access to same day, next day and after-hours appointments: the views of Australian general practitioners. Australian Health Review 2012;36:325–30.