Management of epididymo-orchitis in primary care:

results from a large UK primary care database

Amanda Nicholson, Greta Rait, Tarita Murray-Thomas, Gwenda Hughes, Catherine H Mercer and Jackie Cassell

ABSTRACT

Background

Epididymo-orchitis is a common urological presentation in men but recent incidence data are lacking. Guidelines for management recommend detailed investigation and treatment for sexually transmitted pathogens, such as *Chlamydia trachomatis*. Data from secondary care indicate that these guidelines are poorly followed. It is not known how epididymo-orchitis is managed in UK general practice.

Aim

To estimate the incidence of cases of epididymo-orchitis seen in UK general practice, and to describe their management.

Design of study

Cohort study.

Setting

UK general practices contributing to the General Practice Research Database (GPRD).

Method

Men, aged 15–60 years, consulting with a first episode of epididymo-orchitis between 30 June 2003 and 30 June 2008 were identified. All records within 28 days either side of the diagnosis date were analysed to describe the management of these cases (including location) and to compare this management with guidelines.

Results

A total of 12 615 patients with a first episode of epididymo-orchitis were identified. The incidence was highest in 2004–2005 (25/10 000) and declined in the later years of the study. Fifty-seven per cent (6943) of patients were managed entirely within general practice. Of these, over 92% received an antibiotic, with ciprofloxacin being the most common one prescribed. Only 18% received a prescription for doxycycline. Most men, including those under 35 years, had no investigation recorded and fewer than 3% had a test for chlamydia.

Conclusion

These results indicate low rates of specific testing and treatment for sexually transmitted infections in males who attend general practice with symptoms of epididymo-orchitis. There is a need for further research to understand the pattern of care delivered in general practice.

Keywords

chlamydia; electronic health records; epididymitis; incidence; primary health care.

INTRODUCTION

Acute epididymitis, without or with testicular involvement (here described as epididymo-orchitis), is a common urological condition in men, presenting with unilateral testicular pain and swelling. Recent epidemiological data are lacking, but a previous estimate from UK general practice suggested incidence rates of 40/10 000 person-years,[1] and outpatient data from the US report epididymo-orchitis as the fifth most common urological diagnosis between the ages of 18 and 50 years.[2]

Existing guidelines are based on a clinical consensus that in men under 35 years, epididymo-orchitis is most commonly caused by a sexually transmitted pathogen such as *Chlamydia trachomatis* or *Neisseria gonorrhoeae*.[3–7] In older men, the infection is more likely to be due to non-sexually transmitted enteric Gram-

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negative organisms.[8] The extent of idiopathic or sterile cases is unclear, as some of the literature predates the identification of *C. trachomatis*, but no infection is identified in a sizeable proportion (46%) of cases.[9] Novel organisms, such as *Mycoplasma genitalium*, which are not included in testing regimes, may be involved in such cases. The data underlying this conventional divide at 35 years may, however, be questioned, as they are based on small studies in selected populations.[3–7] Guidelines from the US and UK suggest a detailed testing schedule, involving *C. trachomatis*, *N. gonorrhoeae*, urethral swabs or first-void urine culture, and midstream urinalysis (MSU), followed by antibiotics as indicated by history, with doxycycline for likely *C. trachomatis* infections, ceftriaxone/ciprofloxacin followed by doxycycline for *N. gonorrhoeae* infections, and ofloxacin/ciprofloxacin for enteric organisms.[8,10]

Effective treatment and management of epididymo-orchitis is important for clinical and public health reasons. There are clinical concerns about long-term sequelae including infertility, prostatitis, and strictures.[11–14] Cases related to sexually transmitted infection (STI) present opportunities to screen for infection and to offer treatment, and for partner notification, which should not be missed. The National Strategy for Sexual Health and HIV has, since 2001, recommended a greater role for primary care providers in the care of STIs.[15]

The sparse literature on the management of epididymo-orchitis raises concerns. A survey of UK urologists indicated low compliance with guidelines,[16] whereas a survey of genitourinary medicine (GUM) departments reported near-complete adherence.[9] Data from a US university hospital also suggest low rates of testing for STIs.[17] Although some cases of epididymo-orchitis may present to GUM clinics or direct to an emergency department, most men will attend their GP first. Simms *et al* reported high attendance rates for epididymo-orchitis in UK primary care.[1] No studies describing GP management of epididymo-orchitis were identified. There is a need for updated descriptive data using real-time patient records to record the incidence of the disorder and to describe management and hence to inform continuing education.

The current study aimed to estimate the incidence of epididymo-orchitis in primary care between 2003 and 2008. It also aimed to describe the management of patients with this condition, within the practice and beyond, and to assess its adequacy in relation to existing guidelines, including associations between management and various patient and practice factors.

How this fits in

Epididymo-orchitis is a common urological presentation in general practice, which is often related to sexually transmitted infection in younger men. Guidelines for management exist but it is not known how these are followed by GPs. The results of this study, from an anonymised database of primary care electronic records, indicate investigation and treatment that does not address sexually transmitted infection in the majority of men. Further research is required to understand why GPs are not following recommended practice.

METHOD

Target population

The General Practice Research Database (GPRD) is an electronic database of anonymised longitudinal patient records from general practice.[18] Established in 1987, it is a UK-wide dataset covering 5.5% of the population, with data from 460 practices, and is broadly representative of the UK population. There are 3.5 million currently active patients. Records are derived from the GP computer system (VISION) and contain complete prescribing and coded diagnostic and clinical information held in different record tables (Figure 1).

Many laboratory results are now imported directly into the system, and letters received from hospitals will be logged with either full text included or the diagnoses coded. Patient-level data include age and sex and, in 200 of 460 practices (approximately 40%), a Townsend deprivation index score based on the postcode of the patient. Practice-level data include a deprivation index score based on the postcode of the practice and the NHS region in which the practice is based.

Study population

The study period was from 30 June 2003 to 30 June 2008 and the source population was all permanently registered male patients in practices meeting GPRD quality standards. The study population consisted of all men with a first coded diagnosis of epididymo-orchitis within the study period, who were aged 15–60 years at the time of diagnosis. Code lists used for the definition of cases are listed in Appendix 1. Men with a coded diagnosis relating to vasectomy, sterilisation, or instrumentation of the urinary tract 60 days before to 28 days after the date of the epididymo-orchitis code were excluded, as they might have an obvious precipitating cause and hence their management might reasonably not follow guidelines. Men over 60 years were excluded because previous work has found a large proportion of catheter-associated infections in this age group.[19] Similarly, the vast majority of boys under 15 years will not be sexually active and hence will have low *C. trachomatis* positivity. Appropriate management for these cases could reasonably not follow recommended guidelines and so they were not included in the study.

If multiple diagnostic codes for epididymo-orchitis were recorded for an individual, the date of the first diagnostic code was used as the index date. Analyses

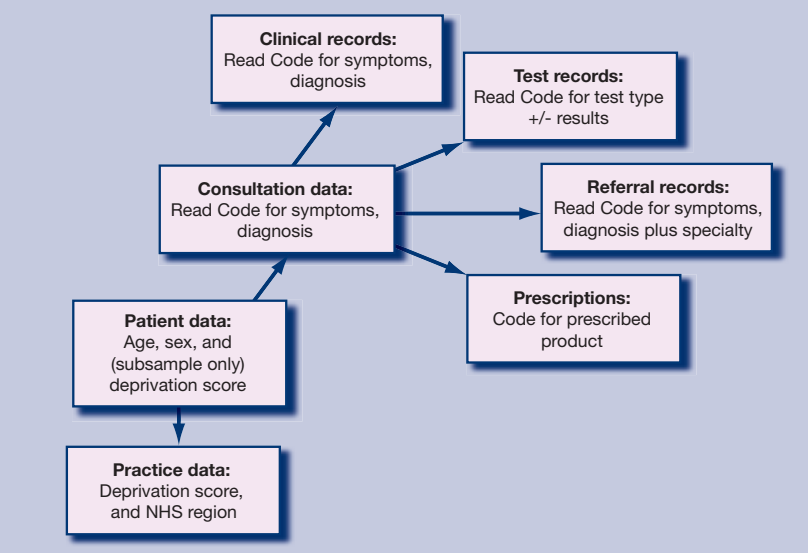


Figure 1. Structure of GPRD database.

were restricted to records in the period 28 days before and after the index date. Cases where the index date was within 28 days of the start or end of the registration at the practice were excluded from descriptions of management.

Description of management

Testing. A specific chlamydia test was considered to have been carried out if the record contained either a code for a test (for example, 'chlamydia antigen test') or a diagnosis of genital *C. trachomatis* infection (for example, 'chlamydial epididymitis' or 'chlamydial infection of the lower genitourinary tract'). Codes were identified for tests for *N. gonorrhoeae*. Non-specific microbial tests were considered to have been carried out if there was a code for either appropriate swab (for example, 'urethral swab') or a test such as microscopy, culture and sensitivities with no location given. Codes for bacterial urine testing, including dipstick tests and MSU, were also identified.

Treatment. Variables based on prescription records were created for antibiotic treatments:

- antibiotics recommended for epididymo-orchitis: ofloxacin, doxycycline, ceftriaxone, ciprofloxacin;[8,10] code lists were drawn up using drug substance name, and included all formulations except for inappropriate topical preparations;
- antibiotics suitable for treatment of urinary tract infections (UTIs); code lists included all cephalosporins (*British National Formulary* (*BNF*) chapter heading 050102) and amoxicillin, trimethoprim, and nitrofurantoin; and
- all antibiotics: based on *BNF* heading 0501.

Dosage and duration of use were not assessed.

Location of care. It was considered that a patient had received care for epididymo-orchitis in another healthcare setting if either of the following conditions were met:

- a diagnostic code for the condition or a suggestive symptom code (for example, 'testicular swelling') within the referral record; or
- a code anywhere in the records indicating care elsewhere (for example, 'referral to emergency department', 'seen in GUM clinic'). This category also included less specific terms such as 'discharge summary' or 'letter from specialist'.

If there was no evidence of care elsewhere and there was some evidence of any treatment or testing within the practice, the case was considered to have been managed within the practice only. Men with no evidence of either any management in practice or care elsewhere (that is, where the record had just a diagnostic code) were considered a separate group, due to concerns about completeness of recording, particularly related to care elsewhere. Analyses of management were restricted to males who were managed within the practice only. It did not seem appropriate to assess quality of care if important parts of the care may have been delivered outside the practice and hence not necessarily recorded there.

Statistical analysis

Data were prepared using Stata (version 10; Statacorp LP, Texas). Calendar years were defined as mid-years from 30 June, so that year 2003 covered 30 June 2003 to 29 June 2004, and so on. Incidence rates were calculated in specific age groups and event years by dividing the number of cases by the appropriate denominator. Age-standardised rates for all ages combined were then obtained by applying these rates to the European standard population. Differences in incidence rates over time and age groups were assessed using Poisson regression. Analyses of management calculated the proportion of patients with various management markers across years and age groups. Logistic regression models investigated factors associated with optimal management.

A series of sensitivity analyses were performed, extending the window for analysis of management from 28 to 42, 60, and 90 days either side of the index date, to assess whether relevant data were being missed by using the 28-day window. Men with diagnostic codes for orchitis only, with no mention of epididymal involvement, were also excluded as appropriate management of viral orchitis would differ.

RESULTS

Target population and incidence

Figure 2 summarises the identification and exclusion of

cases. A total of 12 615 males with first diagnosis of epididymo-orchitis were included in incidence analyses; median age was 37 years (interquartile range 28–46 years). Age-standardised incidence of epididymo-orchitis was highest in 2004 (28/10 000 male person-years) and then declined progressively to 21/10 000 male person-years in 2007 (*P*<0.001) (Figure 3). This decline was greatest in younger age groups (*P*-value for interaction term for age less than 35 years with event year = 0.09). Incidence in males over 45 years was stable during the study period at approximately 20/10 000 person-years.

Management of cases

Analyses of management included 12 270 males, of which 4955 were aged under 35 years (Table 1); 57% of men (6943) were managed entirely within the practice, and 26% (3141) had evidence of receiving care elsewhere; 18% of cases (2186) had no evidence either of management within practice or care elsewhere. Of the 6943 cases managed by primary care (Table 2), 92% received an antibiotic prescription; 56% received an antibiotic recommended for epididymo-orchitis, 18% received doxycycline, and 29% received an antibiotic indicated for a UTI but not for epididymo-orchitis. Recorded investigations were uncommon, with fewer than 3% of men having a *C. trachomatis* test recorded and only 12% having had any microbial investigation for urethritis. Testing for *N. gonorrhoeae* was extremely unusual. Urinalysis, including MSU, was the most common form of testing (22%) but the majority of men had no test or result coded.

There was some evidence that men under 35 years were managed differently from older men, although the differences were small. Younger men were more likely to have no evidence of any management (19.2% versus 16.8%, *P*<0.001) and, correspondingly, were less likely to be managed only within the GP practice (55.2% versus 57.7%, *P* = 0.003). Of those managed by GPs, younger men were more likely to be prescribed doxycycline and have a *C. trachomatis* or microbial test than older men, and less likely to be treated or investigated for a UTI.

The proportion of patients managed within general practice was stable across the study period but there was a fall in the proportion of cases with no evidence of management in both age bands, and this was matched by an increase in the proportion with evidence of care elsewhere (Table 1). When trends in treatment and investigation over the study period were examined (not shown in tables), the use of ciprofloxacin increased over time, rising from 31% to 44% in both age bands (*P*<0.001), but there was no evidence of an increase in

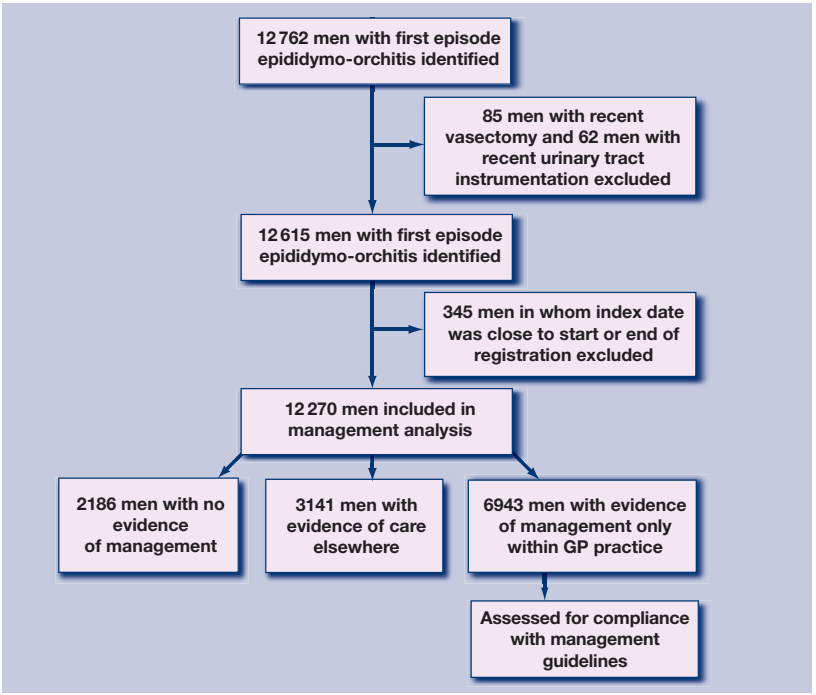
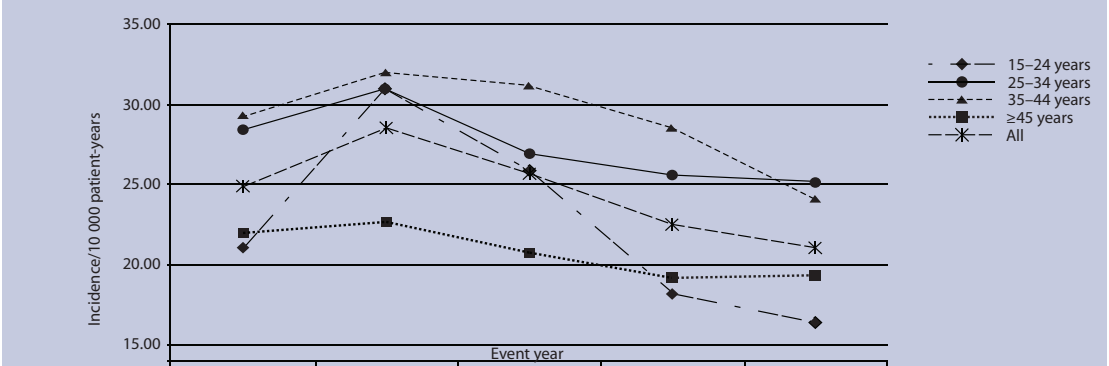


Figure 2. Flow chart of study: patient identification and exclusions.



	2003	2004	2005	2006	2007
15–24 years	21.12	30.95	25.79	18.09	16.28
25–34 years	28.43	30.88	26.85	25.45	24.98
35–44 years	29.32	31.97	31.10	28.44	23.95
≥45 years	21.99	22.63	20.65	19.05	19.17
All	24.90	28.48	25.57	22.40	20.91

Figure 3. Incidence of first episode of epididymo-orchitis in primary care: 2003–2007.

Table 1. Location of management of epididymo-orchitis cases seen in primary care.

	Aged <35 years, *n* (%)				Aged ≥35 years, *n* (%)			
	n	Evidence of care elsewhere	Managed only in practice	No evidence of management	*n*	Evidence of care elsewhere	Managed only in practice	No evidence of management
2003	973	203 (20.9)	551 (56.6)	219 (22.5)	1484	291 (19.6)	889 (59.9)	304 (20.5)
2004	1232	321 (26.1)	642 (52.1)	269 (21.8)	1609	356 (22.1)	954 (59.3)	299 (18.6)
2005	1060	276 (26.0)	584 (55.1)	200 (18.9)	1533	431 (28.1)	852 (55.6)	250 (16.3)
2006	871	230 (26.4)	495 (56.8)	146 (16.8)	1416	388 (27.4)	800 (56.5)	228 (16.1)
2007	819	244 (29.8)	454 (55.4)	121 (14.8)	1273	401 (31.5)	722 (56.7)	150 (11.8)
P-value for trend		<0.001	0.60	<0.001		<0.001	0.02	< 0.001
Total	4955	1274 (25.7)	2726 (55.0)	955 (19.3)	7315	1867 (25.5)	4217 (57.7)	1231 (16.8)

doxycycline prescriptions or *C. trachomatis* testing in either age group during the study period.

Factors associated with optimal management

Table 3 summarises patient and practice factors associated with receiving a prescription for doxycycline, the preferred treatment for chlamydia. This multivariate analysis indicates that patients over 35 years were 20% less likely to receive doxycycline, and confirms no increase in the use of doxycycline over the study period. Practices in the most and least deprived areas were less likely to prescribe doxycycline. Patterns were similar when analyses were restricted to younger men. In the subsample (54%) for whom an individual deprivation index was available, patients from the least deprived quintile were least likely to receive doxycycline. The odds ratio (adjusted for age group and event year) for the least deprived quintile compared to all others was 0.9 (95% CI = 0.7 to 1.2) for all men (*n* = 3498) and 1.0 (95% CI = 0.7 to 0.8) for men aged under 35 years (*n* = 1350).

Excluding 1575 men with diagnostic codes for orchitis did not alter the results. Sensitivity analyses showed that the proportion of cases with evidence of care elsewhere increased as the time window for management was widened for patients managed within practice, but the pattern of care was similar (Appendix 2).

DISCUSSION

Summary of main findings

A substantial caseload of epididymo-orchitis is seen in primary care and the condition is not restricted to younger men. Incidence fell between 2003 and 2008, with the greatest decline in younger age groups and a relatively stable incidence in older men. Fifty-seven per cent of all cases were managed entirely within primary care and of these, 56% received recommended antibiotics but very few had appropriate testing.

Table 2. Treatment and investigation of cases managed within practice only.

	n (%			
	All, *n* = 6943	Aged <35 years, *n* = 2726	Aged ≥35 years, *n* = 4217	*P*-value for difference between age groups
Treatment				
Antibiotic recommended for *Chlamydia trachomatis*				
Doxycycline	1270 (18.3)	541 (19.9)	729 (17.3)	0.007
Ciprofloxacin	2511 (36.2)	941 (34.5)	1570 (37.2)	0.022
Ofloxacin	224 (3.2)	88 (3.2)	136 (3.2)	0.990
Ceftriaxone	0	0	0	
Any one of the above[a]	3859 (55.6)	1514 (55.5)	2345 (55.6)	0.980
Other UTI antibiotic[b]	2045 (29.4)	796 (28.9)	1249 (29.6)	0.720
Any other antibiotic[b]	508 (7.3)	212 (7.8)	296 (7.0)	0.230
Any antibiotic[a]	6412 (92.4)	2522 (92.5)	3890 (92.3)	0.640
Investigation				
Chlamydia test	180 (2.6)	120 (4.4)	60 (1.4)	<0.001
Neisseria gonorrhoeae test	4 (0.06)	3 (0.1)	1 (0.02)	0.146
Any microbial test	649 (9.4)	284 (10.4)	365 (8.7)	0.014
Urine test[c]	1507 (21.7)	547 (20.1)	960 (22.7)	0.008

[a]Total of rows above. [b]Excludes all antibiotics in preceding rows of tables. [c]Bacterial urine testing, including dipstick tests and midstream urinalysis. UTI = urinary tract infection.

Strengths and limitations of the study

This research examined an unselected population of men with epididymo-orchitis seen in primary care. To the authors' knowledge this is the first study that has considered management by GPs rather than GUM clinics or in secondary care. By using real-time patient records, the study avoided the response bias that affects self-report questionnaire data completed by doctors. As electronic patient record databases are designed primarily for patient care, caution is required. Only coded data were used (based on Read Codes) and information entered as free text in the record was not accessed. This means that there may be some errors both in the classification of men as cases and in the assessment of their management. As epididymo-orchitis is not included in any Quality and Outcomes Framework targets, there is little incentive for GPs to code all elements of the consultation beyond diagnosis and prescribing accurately. Relevant management information, such as advice to attend a GUM clinic, may be present in text only.

Definition as a case requires the GP both to make a diagnosis and record it as a code. The study may have excluded cases diagnosed by the GP but coded using non-specific symptoms rather than a diagnostic code. Equally, some cases with a diagnostic code may not truly reflect a confirmed diagnosis, although sensitivity analyses suggest that the inclusion of cases of possible viral orchitis has not affected results.

The classification of the location of management was complex. The referral (rather than clinical) record was used in the study as evidence of care elsewhere, but this record file may not be used consistently by GPs. Some Read Codes taken as evidence of care elsewhere were non-specific and may not have been actually related to the epididymo-orchitis diagnosis. As expected, as the management window was widened, the proportion with evidence of care elsewhere increased but more unrelated referrals may have been included. The proportion with evidence of care elsewhere increased during the study period, which may be due to better recording of referrals. It was assumed that a prescription was for epididymo-orchitis based on the interval between date of prescription and date of diagnostic code, with similar potential for an overestimate of antibiotic use. However, sensitivity analyses did not indicate that the estimates of treatment were dependent on the length of the management window.

Comparison with existing literature

Incidence estimates for epididymo-orchitis for 1994–2001, based on the Royal College of General Practitioners Weekly Returns Service,[1] are higher than those in the present study (38/10 000 person-years in 2001). The difference is probably because this study counted first episode only, whereas the previous estimate counted repeat episodes and relied on the GP classification of new/follow-up consultation.

The decline in incidence may be due to a true fall in incidence of the condition, or may reflect more cases being seen outside general practice, or changes in coding practice. There are consistent data, including from the GPRD, that pelvic inflammatory disease, an associated infection in women, is declining.[20–22] It is unclear how this is related to increasing rates of testing for chlamydia in England.[23] Literature reviews of the impact of *C. trachomatis* screening on health outcomes have found little evidence that pelvic inflammatory disease in women is reduced, and the effect on male health outcomes such as epididymo-orchitis has not been studied.[24,25] It is possible that the National Chlamydia Screening Programme in England has contributed to the decline in incidence observed, though it is estimated that coverage rates of 30% are required to reduce *C. trachomatis* prevalence by 29%.[26] The greater decline in younger age groups is consistent with a role for the screening programme.

Given the assumed contribution of STIs to epididymo-orchitis, it was surprising to find that incidence was relatively consistent across all age groups of men up to the age of 45 years. This was also reported in a survey of cases in US hospitals, where patients over 35 years accounted for more than 50% of cases, although this study relied only on the number of cases.[27] The present data confirm that the disease is not restricted to younger men. It was also surprising to find that there was some evidence that men from more affluent areas were less likely to

Table 3. Factors associated with receiving doxycycline prescription for epididymo-orchitis

	Adjusted odds ratio for receiving doxycycline (95% CIs) for those managed within practice only	
	All ages (*n* = 6928)	≤35 years (*n* = 2476)
Age group, years		
15–24	1.0 (0.8 to 1.2)	
24–35	1	
35–44	0.8 (0.7 to 1.0)	
45–60	0.8 (0.7 to 1.0)	
Event year		
2003	1	1
2004	1.1 (0.9 to 1.3)	1.1 (0.8 to 1.4)
2005	1.1 (0.9 to 1.3)	1.1 (0.8 to 1.4)
2006	1.1 (0.9 to 1.3)	1.1 (0.8 to 1.5)
2007	1.2 (1.0 to 1.4)	1.1 (0.8 to 1.5)
Practice quintile of deprivation		
1 (least deprived)	1	1
2	1.5 (1.3 to 1.9)	1.2 (0.9 to 1.7)
3	1.4 (1.1 to 1.7)	1.3 (0.9 to 1.7)
4	1.3 (1.1 to 1.6)	1.4 (1.0 to 1.8)
5 (most deprived)	1.0 (0.8 to 1.2)	1.0 (0.7 to 1.3)

receive doxycycline. This should be explored in other studies.

Ciprofloxacin was the most commonly prescribed antibiotic, which is consistent with reports from secondary care where quinolones were the treatment of choice for epididymo-orchitis,[16,17] whereas doxycycline treatment was the norm in GUM clinics.[9] The extremely low rates of *C. trachomatis* testing reported in the present study are consistent with reports of 3% in a US hospital.[17] Cassell *et al*, using data from a British national probability survey, reported that few men received a *C. trachomatis* diagnosis in general practice,[28] and that rates of non-specific urethritis (often a clinical diagnosis) were disproportionately high in comparison with chlamydia in primary care.[19] The rates of investigation for urethritis found in the present study are even lower than the 18% reported by UK urologists.[16]

Implications clinical practice and future research

The management of epididymo-orchitis in primary care fails to recognise the need to test for a STI, even in younger men. Syndromic treatment is often given with no apparent investigation. This is consistent with what has been seen in urology but is of greater concern due to the large numbers of patients seen in general practice and the potential public health impact. Potential reasons for this syndromic treatment include reluctance of the doctor or patient to undertake invasive and potentially embarrassing tests. There is a need for further research to understand the pattern of care delivered in general practice. Surprisingly high rates of epididymo-orchitis were found in men over 35 years in this study. Work is needed to understand the aetiology, particularly in older men, so that guidelines are evidence based. The accuracy of coded information in primary care databases needs to be confirmed, and the authors plan to consult anonymised free text in a selection of patients to investigate whether textual data alter the estimates of management.

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Ethical approval

The study was approved by the GPRD Independent Scientific Advisory Committee (protocol number 08_097).

Competing interests

The authors have stated that there are none.

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Appendix 1. Code lists:
A. Diagnostic codes for epididymo-orchitis.

GPRD Medical Code	Read/OXMIS Term	Read/ OXMIS Code
205990	A981311	Acute gonococcal orchitis
207436	K242300	Epididymo-orchitis in diseases EC
216427	K241200	Epididymitis unspecified
216428	K242000	Epididymo-orchitis with abscess
220371	604 AT	ABSCESS TESTIS/TESTICLE
237903	0980F	ORCHITIS GONOCOCCAL*
238377	6075TT	INFECTION TESTIS
243662	K241100	Epididymitis with no abscess
243664	K241z00	Epididymitis NOS
252783	K241.00	Epididymitis
252784	K241000	Epididymitis with abscess
252785	K241300	Epididymitis in diseases EC
252786	K24z.00	Orchitis and epididymitis NOS
256799	604 BA	ORCHITIS ACUTE*
266026	604 AE	ABSCESS EPIDIDYMIS
266027	604 C	ORCHITIS NOT MUMPS
271289	K242200	Epididymo-orchitis unspecified
280340	K241600	Chlamydial epididymitis
280341	K242.00	Epididymo-orchitis
280342	K242100	Epididymo-orchitis with no abscess
289462	K241400	Acute epididymitis
298729	K242z00	Epididymo-orchitis NOS
304349	604 A	EPIDIDYMITIS
304350	604 B	ORCHITIS
304351	604 D	EPIDIDYMO-ORCHITIS
207435	K240z00	Orchitis NOS
234647	K240200	Orchitis unspecified
252780	K24..00	Orchitis and epididymitis
252781	K240000	Orchitis with abscess
252782	K240300	Orchitis in diseases EC
280339	K240100	Orchitis with no abscess
298728	K240.00	Orchitis
265494	0980E	GONOCOCCAL EPIDIDYMITIS
265495	0980EF	GONOCOCCAL EPIDIDYMO-ORCHITIS
278873	A981300	Acute gonococcal epididymo-orchitis
220376	6075AD	ABSCESS VAS DEFERENS

Appendix 1. Code lists: B. Code lists for chlamydia test.

GPRD Medical Code	Read/OXMIS Term	Read/ OXMIS Code
205965	Chlamydial infection, unspecified	A78AW00
205969	Other viral or chlamydial disease NOS	A7z..00
206063	[X]Other chlamydial diseases	Ayu6100
207468	Female chlamydial pelvic inflammatory disease	K40y100
214967	Chlamydial inf of pelviperitoneum oth genitourinary organs	A78A300
215059	[X]Chlamydial infection, unspecified	Ayu6200
225563	Chlamydia cervicitis	K420900
242170	Chlamydial infection of genitourinary tract, unspecified	A78AX00
242258	[X]Chlamydial infection of genitourinary tract, unspecified	Ayu4K00
251351	Chlamydial infection of lower genitourinary tract	A78A000
258276	Chlamydia antigen by ELISA	43U0.00
267536	Chlamydia antigen test	43U..00
278838	Other viral and chlamydial diseases	A7...00
278847	Other viral or chlamydial diseases	A78..00
278852	Chlamydial infection	A78A.00
280340	Chlamydial epididymitis	K241600
285745	Chlamydia antigen ELISA positive	43U1.00
285746	Chlamydia antigen ELISA negative	43U2.00
287974	Other specified viral and chlamydial diseases	A78y.00
289351	Chlamydial peritonitis	J550400
297184	Chlamydial infection of anus and rectum	A78A200
297190	Other specified viral or chlamydial diseases	A7y..00
297288	[X]Other diseases caused by chlamydiae	Ayu6.00
302966	INFECTION CHLAMYDIAL	0399C
302967	CHLAMYDIA TRACHOMATIS	0399CT
307938	Chlamydia trachomatis IgG level	43eJ.00
308079	Chlamydia trachomatis L2 antibody level	43eC.00
308199	Chlamydia group complement fixation test	43eF.00
308461	Chlamydia antibody level	43eE.00
308950	Chlamydia trachomatis polymerase chain reaction	43h0.00
309472	Chlamydia group antibody level	43WM.00
309613	Chlamydia trachomatis IgM level	43ez.00
309766	Endocervical chlamydia swab	4JK9.00
309829	Urethral chlamydia swab	4JKA.00
332003	Chlamydia trachomatis IgA level	43n9.00
342066	Chlamydia trachomatis antigen test	43U3.00
342214	Chlamydia deoxyribonucleic acid detection	43jK.00
342310	Chlamydia serology	4JDM.00
343726	Urine screen for chlamydia	68K7.00
343949	Chlamydia PCR positive	43U4.00
343968	Chlamydia PCR negative	43U5.00
344624	Urine Chlamydia trachomatis test positive	46H6.00
344736	Urine Chlamydia trachomatis test negative	46H7.00
345942	Chlamydia screening declined	8I3T.00
346998	Chlamydia screening counselling	677L.00
347186	Chlamydia trachomatis contact	65PJ.00
347227	Low vaginal swab for chlamydia taken by patient	4JKD.00
347301	Chlamydial infection of genital organs NEC	A78A500
347315	Chlamydia test offered	9Oq0.00
347970	Chlamydia test positive	43U8.00
348085	Chlamydia test negative	43U6.00
348329	Chlamydia test equivocal	43U7.00

Appendix 1. Code lists: C. Tests for *Neisseria gonorrhoea*.

GPRD Medical Code	Read/OXMIS Term	Read/ OXMIS Code
249090	Gonorrhoea infect. titre test	43E6.00
309228	Neisseria gonorrhoeae polymerase chain reaction	43h6.00
309635	Neisseria gonorrhoeae nucleic acid detection	43jA.00
340376	Gonococcal swab	4JLA.00
342356	Gonococcal cervical swab	4JKB.00
343558	Gonococcal urethral swab	4JKC.00
348093	Gonorrhoea test positive	4JQA.00
348168	Gonorrhoea test negative	4JQ8.00
348381	Gonorrhoea screening counselling	677M.00

Appendix 1. Code lists: D. Other microbial tests.

GPRD Medical Code	Read/OXMIS Term	Read/ OXMIS Code
203712	Infectious titres NOS	43E..00
203917	Sample microscopy	4I15.00
203918	White cells seen on microscopy	4I15100
203919	RBCs seen on microscopy	4I15200
203947	High vaginal swab culture negative	4JK2100
203948	HVS culture – Trichomonas vaginalis	4JK2200
205666	Refer for microbiological test	8HP2.00
210464	PENILE SWAB CULTURE NEGATIVE	L 167DN
210515	HVS TRICHOMONAS VAGINALIS	L1670FT
212942	Sample culture	4J17.00
212962	Semen sent for C/S	4JL8.00
219515	SWAB CERVICAL ABNORMAL	L 167FC
219570	HVS LACTOBACILLI	L1670FL
221698	Direct microscopy	31B1.00
222017	Sample: no organism isolated	4J11.00
222018	Sample: organism isolated	4J12.00
222020	Sample: bacteriology – general	4J2..00
222022	Sensitivity-bacteriology	4J2..13
222038	Microbiology NOS	4JZ..00
228578	MICROBIOLOGY REPORT ABNORMAL	L 2MA
228611	HVS CULTURE NEGATIVE	L 167FN
228613	SWAB CULTURE BACTERIAL GROWTH	L 167XE
230862	Blood sent – infectious titres	43E1.00
231003	Parasite in urine	46H..15
231090	Microbiology	4J...00
231091	Sample – microbiological exam	4J1..00
231094	Sample: dir.micr.:no organism	4J71.00
231095	Bacteria on microscopy	4J72.11
231108	Urethral swab culture positive	4JK1000
231109	High vaginal swab: white cells seen	4JK2500
231110	Vaginal swab culture negative	4JK6.00
237538	MICROBIOLOGY REPORT	L 2MR
237571	VAGINAL SWAB CULTURE POSITIVE	L 167FZ
237574	SWAB CULTURE FUNGAL GROWTH	L 167XC
237587	VIRAL TITRES	L 189D
237617	HVS GARDNERELLA VAGINALIS	L1670FG
237618	HVS YEAST	L1670FY
240066	Sample: direct micr. organism	4J7..00
240075	High vaginal swab culture positive	4JK2000
240076	HVS culture – Gardnerella vaginalis	4JK2300
240077	Low vaginal swab taken	4JK3.00
240078	Misc. sample for organism	4JL..00
246733	SWAB CERVICAL	L 167FA
246735	URETHRAL SWAB CULTURE NEGATIVE	L 167IN
249028	Swab sent to Lab	4147.00
249310	Culture – general	4J...11
249324	Cervical swab culture positive	4JK5000
258486	Sample: microbiology NOS	4J1Z.00

Appendix 1. Code lists: D. Other microbial tests continued.

258503	Urethral swab culture negative	4JK1100
258504	Vaginal swab culture positive	4JK7.00
258505	Penile swab culture positive	4JK8000
258506	Penile swab culture negative	4JK8100
265145	PENILE SWAB	L 167D
265146	PENILE SWAB CULTURE POSITIVE	L 167DP
265197	HVS WBC	L1670FW
267662	Urine microscopy: orgs/FBs	46H..00
267735	Sensitivity-microbiol.	4J...12
267736	Sample: organism sensitivity	4J15.00
267739	O/E: stained micr.: organism	4J8..00
267754	Vaginal swab taken	4JK..11
267755	Vulval swab taken	4JK4.00
267756	Penile swab taken	4JK8.00
267757	GUT swab NOS	4JKZ.00
274368	HVS EPITHELIAL CELLS	L1670FE
276782	Culture – bacteriology	4J2..12
276783	Sample sent for culture/sensit	4J22.00
276800	GUT sample taken for organism	4JK..00
276801	High vaginal swab taken	4JK2.00
276802	Cervical swab taken	4JK5.00
283373	HVS	L 167F
283374	HVS CULTURE POSITIVE	L 167FP
283375	VAGINAL SWAB CULTURE NEGATIVE	L 167FY
285938	Microscopy, culture and sensitivities	4I16.00
285943	Sample: bacteria cultured	4J23.00
285955	Urethral swab taken	4JK1.00
285958	Microbiology test	4JQ..00
292462	MICROBIOLOGY REPORT NORMAL	L 2MN
292509	SWAB CERVICAL NORMAL	L 167FB
292511	URETHRAL SWAB CULTURE POSITIVE	L 167IP
292515	SWAB CULTURE NO GROWTH	L 167XB
295145	High vaginal swab: fungal organism isolated	4JK2400
295146	Cervical swab culture negative	4JK5100
297019	Microbiology report received	9ND3.00
301878	VAGINAL SWAB	L 167FX
301879	URETHRAL SWAB	L 167I
301882	SWAB CULTURE YEAST GROWTH	L 167XD
308931	Bacterial antibody level	43e..00
309727	Microscopy	4JS..00
331709	Gram stain microscopy	4JS0.00
332043	Anaerobic culture	4J18.00
339918	Concentrate microscopy	4JS2.00
340342	Genital microscopy, culture and sensitivities	4I1C.00
340745	Fluid microscopy, culture and sensitivities	4I1D.00
343815	Semen microscopy	49L..00
343816	Aerobic culture	4J19.00
344353	Additional urine tests	46h..00
345784	Culture for fungi	4J45.00

Appendix 1. Code lists: D. Other microbial tests continued.

350883	Low vaginal swab taken by patient	4JKE.00
350959	Self taken low vaginal swab	4JKE.11
203821	Urine exam. — general	461..00
203822	Urine dipstick test	4618.00
203825	Urine protein test = +	4674.00
203826	Urine protein test = ++	4675.00
203827	Urine ketone test = ++++	4687
203831	Urine sent for microscopy	46D1.00
203832	Urine microscopy: no casts	46E1.00
203840	Urine culture — no growth	46U1.00
203841	Urine culture — E. coli	46U3.00
203842	Urine culture — Str. faecalis	46U5.00
203843	Urine culture — Staph. albus	46U6.00
203844	Urine culture — Bacteria OS	46U8.00
210442	URINE INVESTIGATIONS	L 131AA
210443	URINE CASTS PRESENT	L 132CP
210520	ABNORMAL URINE TEST NOT YET DIAGNOSED	L2590AN
210544	URINE NEGATIVE	L7891N
211701	STERILE PYURIA	7891D
212820	Urine examination	46...00
212821	MSU sent to lab.	4615.00
212822	Urine inspection	462..00
212823	Urine: cloudy	4627
212827	Urine protein test = ++++	4677
212830	Urine: trace non-haemol. blood	4693.00
212840	Urine Microscopy: white cells	46G8.00
212959	Urine for culture	4JJ..13
212960	Early morning urine	4JJ..14
212961	Urine sample for organism NOS	4JJZ.00
219490	MSU NORMAL	L 133MN
219573	URINE ALBUMIN +++	L2400CC
219576	CASTS IN URINE POSITIVE	L2591PV
221916	MSU = no abnormality	4616.00
221921	Urine blood test	469..00
221922	Urine bacteria test NOS	46BZ.00
221923	Urine microscopy: no crystals	46F1.00
221924	Sterile pyuria	46G4.12
221925	Urine micr.: bacteria present	46H4.00
221955	Urine culture — Escherich. coli	46U3.11
222034	MSU sent for bacteriology	4JJ2.00
228591	URINE CULTURE POSITIVE GROWTH	L 133P
228673	URINE ALBUMIN +	L2400AA
230985	Urinalysis requested	4612.00
230986	Urine = normal on inspection	4621.00
230987	Urine inspection NOS	462Z.00
230993	Urine protein test	467..00
230994	Urine protein test negative	4672.00
230995	Urine dipstick for protein	4679.00
230996	Urine: trace haemolysed blood	4694.00

Appendix 1. Code lists: D. Other microbial tests continued.

230997	Urine microscopy: no cells	46G1.00
230998	RBCs — red blood cells in urine	46G2.11
230999	Urine micr.: leucocytes present	46G4.00
231000	Leucocytes in urine	46G4.11
231001	Urine micr.: leucs — % polys	46G5.00
231002	Pus cells in urine	46G7.11
231003	Parasite in urine	46H..15
231031	Urine culture — mixed growth	46U2.00
237549	URINE CULTURE	L 133
237622	URINE ALBUMIN ++	L2400BB
237649	URINE TEST	L7890T
239977	Urine protein test = trace	4673.00
239980	Urine microscopy — general NOS	46DZ.00
239981	Urine microscopy — casts	46E..00
239982	Urine microscopy: epith. casts	46E2.00
239986	FB in urine — microscopy	46H..12
239987	Urine microscopy: no orgs/FBs	46H1.00
240073	Mid-stream urine sample	4JJ..12
240074	Urine sent for culture	4JJ3.00
246820	MSU	L7891MS
249215	Urine exam. — general NOS	461Z.00
249223	Urine dipstick for blood	4698.00
249224	Urine bacteriuria test	46B..00
249225	Urine bacteria test: positive	46B3.00
249226	Urine microscopy — general	46D..00
249227	Urine micr.: leucs — % lymphs	46G6.00
249228	Urine microscopy: red cells	46G9.00
249229	Bacteria in urine O/E	46H..11
249242	Urine test NOS	46Z..00
249322	Urine sample for organism	4JJ..00
255953	URINE WBC'S ABSENT	L 132WA
255954	URINE WBC'S PRESENT	L 132WP
258374	MSU = equivocal	461A.00
258375	Urine: red — blood	4625.00
258376	Urine: looks clear	4626
258381	Proteinuria	4678.00
258384	Urine blood test = ++	4696.00
258385	Urine blood test = +++	4697.00
258386	Urine bacteria test: negative	46B2.00
258387	Urine microscopy: casts NOS	46EZ.00
258390	Urine microscopy: cells	46G..00
258391	Urine microscopy: RBCs present	46G2.00
258392	Urine microscopy: pus cells	46G7.00
258398	Urine protein	46N..00
258399	Urine protein abnormal	46N2.00
258414	Urine culture	46U..00
258502	MSU sent for C/S	4JJ1.00
265127	URINE CULTURE NO GROWTH	L 133N
265202	PROTEINURIA	L2020PV

Appendix 1. Code lists: D. Other microbial tests continued.

267459	Urine sample sent to Lab	4146.00
267646	Urine tests	46...11
267647	MSU — general	461..11
267648	MSU = no growth	4619.00
267653	Blood in urine test	469..11
267655	Urine blood test = +	4695.00
267656	Urine blood test NOS	469Z.00
267658	Urine microscopy = abnormality	46D3.00
267659	Urine microscopy: crystals	46F..00
267660	Urine micr.: uric acid crystals	46F3.00
267661	Urine microscopy: no white cells	46G1100
267662	Urine microscopy: orgs/FBs	46H..00
274306	URINE EPITHELIAL CELLS PRESENT	L 132EP
274307	MSU ABNORMAL	L 133MA
276691	Urinalysis — general	461..12
276695	Urine blood test = negative	4692.00
276697	Urine microscopy:hyaline casts	46E3.00
276799	Catheter urine –> culture.	4JJ4.00
285852	Urinalysis = no abnormality	4613.00
285853	Urinalysis = abnormal	4614.00
285854	MSU = abnormal	4617.00
285855	Urine: pale	4624
285858	Urine protein test = +++	4676.00
285859	Urine protein test NOS	467Z.00
285866	Urine micr.: orgs/FBs NOS	46HZ.00
292486	URINE INVESTIGATIONS ABNORMAL	L 131AC
295030	Urine microscopy: no epithelial cells	46G1000
295031	Urine micr.: epithelial cells	46G3.00
301855	URINE INVESTIGATIONS NORMAL	L 131AB
302605	Urine microalbumin positive	46w0.00
333181	Urine leucocyte test	46f..00
333245	Urine leucocyte test = +	46f2.00
333246	Urine leucocyte test = ++	46f3.00
333247	Urine leucocyte test = +++	46f4.00
335402	Urine microscopy	46Z1.00
339791	Urine leucocyte test = negative	46f1.00
340095	Urine microscopy: yeasts	46H5.00

Appendix 2. Results of sensitivity analyses.

28-day management window (1575 orchitis-only cases excluded)	<35 years, %	≥35 years, %
Management		
Managed in practice	56.0	58.2
No evidence of management	19.0	16.9
Evidence of care elsewhere	25.0	24.9
Drug prescribed		
Any recommended drug	56.6	55.7
Ciprofloxacin	34.9	36.7
Doxycycline	20.7	18.1
Test carried out		
Chlamydia trachomatis test	4.6	1.3
Microbial test	11.8	11.1
Urine test	20.1	22.1
42-day management window		
Management		
Managed in practice	52.5	55.3
No evidence of management	17.8	15.2
Evidence of care elsewhere	29.7	29.6
Drug prescribed		
Any recommended drug	55.4	55.4
Ciprofloxacin	34.4	37.0
Doxycycline	20.5	17.5
Test carried out		
Chlamydia trachomatis test	4.5	1.5
Microbial test	13.0	13.0
Urine test	20.8	23.8
60-day management window		
Management		
Managed in practice	50.3	52.4
No evidence of management	16.7	13.9
Evidence of care elsewhere	33.1	33.7
Drug prescribed		
Any recommended drug	54.6	55.1
Ciprofloxacin	34.1	37.0
Doxycycline	20.0	17.5
Test carried out		
Chlamydia trachomatis test	4.5	1.6
Microbial test	13.5	13.7
Urine test	22.6	25.0
90-day management window		
Management		
Managed in practice	46.8	48.7
No evidence of management	15.0	12.3
Evidence of care elsewhere	38.2	38.9
Drug prescribed		
Any recommended drug	54.3	43.6
Ciprofloxacin	34.0	36.9
Doxycycline	20.4	17.2
Test carried out		
Chlamydia trachomatis test	4.6	1.6
Microbial test	14.2	14.7
Urine test	23.1	27.1