Title: *Patterns of Attendances to the Hospital Emergency Eye Care Service: A National Multicentre Study in England.*

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Competing Interests: None of the authors have any competing interests to declare.

Abstract

Background/Objectives: To characterise the patterns of presentation and diagnostic frequencies in Hospital Emergency Eye Care Services (HEECS) across 13 hospitals in England.

Methods: Retrospective, cross-sectional, observational multi-centre (n=13) study to assess HEECS attendances over a 28-day study period. Data derived included: number of consecutive attendances, patient demographics and diagnoses. Age and gender variations, impact of day of the week on attendance patterns, diagnostic frequencies and estimates of the annual incidence and attendance rates were evaluated.

Results: A total of 17,667 patient (mean ± standard deviation age = 49.6±21.8 years) attendances were identified with an estimated HEECS annual attendance rate of 31.0 per 1,000 population. Significantly more females (53%) than males (47%) attended HEECS (p<0.001). Weekends were associated with a significant reduction in attendances compared to weekdays (χ^2=6.94, p<0.001). Among weekdays, Mondays and Fridays were associated with significantly higher attendances compared to midweek (χ^2=2.20, p=0.032). Presenting pathologies involving the external eye, cornea and conjunctiva accounted for 28.6% of the caseload. This was followed by trauma-related pathologies (13.7%) and adnexal pathologies (13.6 %).

Conclusion: This is the largest multicentre study assessing attendance patterns in HEECS in England and the first to report annual attendance rates to HEECS. We have, for the first time, observed a "weekend effect" in relation to attendance to HEECS. Differences in health seeking behaviour and lack of awareness of HEECS weekend services maybe partly

attributed to the differences observed. Our findings, along with the type of presentations, have the potential to guide commissioners with future planning of HEECS.

Introduction

Over the past two decades, there has been a rise in demand for ophthalmology led Hospital Emergency Eye Care Services (HEECS) in England [1]. London's two largest HEECS units, Moorfields Eye Hospital and the Western Eye Hospital, have reported an increase in annual attendance by 7.9% and 9.6% per year respectively [2]. This reflects a similar trend observed in general accident & emergency (A&E) departments which have seen an annual increase in attendance of approximately 0.5 million per year, with 25 million patients presenting in the last year alone [supplementary figure 1] [3]. The increase in attendance in HEECS have been attributed to: (a) increasing population size and ageing demographic, (b) further indications for treatment, (c) defensive medico-legal practice amongst community practitioners [4], (d) changes to service accessibility and (e) patient health seeking behaviours [5].

Ophthalmology-led HEECS within the NHS can be accessed through an appointment-based system, a walk-in service, or a combination of the two. Access to HEECS is predominantly available during extended outpatient clinic hours. Outside of these hours, patients often have access to on call services [5, 6].

Community-based optometry schemes have been made available in some regions of UK. Examples include the Primary Eye-care Acute Referral Scheme, Acute Community Eye-care services, and Minor Eye Conditions Services. The overarching aims of these schemes are to provide patients with access to an eye care professional in their local area, subsequently reducing the burden of low-risk pathology presentations on HEECS [7].

Information regarding the nature and patterns of demand on HEECS is essential for planning acute eye care service provision. There is limited published data from the UK, and previous reports have been confined to single centre studies [8]. Therefore, this multi-centre study, utilising data from across England, aims to describe the demographic and diagnostic patterns in acute eye care

presentations to better understand demands on HEECS and to facilitate commissioning and provision of emergency eye care.

Methodology

This Triple E (English Emergency Eye care) study is a retrospective, cross sectional, observational multicentre study, conducted by members of the British Emergency Eye Care Society (BEECS) across 13 different ophthalmology-led HEECS centres in England (figure 1). The Triple E study involved a convenience sample of centres in England selected based on engagement of clinicians from those locations in BEECS. We aimed to include a variety of sizes of units, defined by the number of attendances, and service designs. This included 7 walk-in centres and 6 centres with booked or acute referral clinics. There were 5 large sized (>1,000 average attendances per month), 6 mid-sized (between 500 to 1,000 average attendances per month) and 2 small sized (<500 average attendances per month) centres. The BEECS study group defined a 28-day study period from 6th January 2020 to 2nd February 2020, inclusive. All participating sites collected data for consecutive patient attendances in their HEECS during this period for face-to-face consultations. Standardisation of data collection across different sites was achieved through the distribution of a centralised proforma with pre-defined diagnoses. Sites collected information on patient age, gender, date and time of attendance and diagnosis given at that consultation. Diagnoses were further sub-grouped according to their respective subspecialist categories (supplementary figure 2). Each centre also provided their respective monthly attendances during the previous three years between January and April.

Centres were invited to include either new patients or a combination of new patients and urgent follow-up patients. Collected data was anonymised and then curated by the study investigators. To ensure standardisation of disease definitions, diagnoses and sub-speciality categorisation, two independent external data validation tests were conducted. When multiple diagnoses were present, only the main diagnosis for their presenting complaint was attributed. The validation process involved evaluating the electronic data submitted by each centre for every patient to ensure that

they were correctly defined the correct diagnosis and diagnosis subcategory. In cases with insufficient data, the investigators for those centres were approached for clarification.

To calculate the annual attendance rate, only data of new patients of 'walk in' HEECS were used. 'Booked' HEECS were excluded from this calculation as their attendances are determined by the number of available clinical appointments. This provided the number of new attendances in the 28-day period. The annual number of HEECS attendances were derived by extrapolating the number of HEECS attendances for a year, based on this 28-day data. The catchment population of HEECS was derived from estimating the population served by each of the study centres across England. This was based on the relative general A&E attendances at each of the centres in comparison to the total A&E attendances in England (supplementary table 1) [9]. Moorfields Eye Hospital was excluded from these calculations since it was a standalone centre without a general A&E service. The annual age specific attendance rates were estimated using demographic data from the Office for National Statistics (ONS) [10].

Only centres with a seven-day walk-in service with the same opening hours irrespective of the day of the week were used to assess the effect of the day of the week on the number of attendances. We further divided the data into weekdays (Monday to Friday) and weekends (Saturday and Sunday).

Statistical Analyses

Statistical analysis was performed with SPSS software (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp). Shapiro-Wilk test was used to test for normality of the data. Gender and age in the study population and general population of England (derived from latest update of the ONS)[10] demonstrated non-normally distributed data. Rates of attendances over the seven-day week demonstrated normally distributed data.

The Pearson chi-squared test (χ^2) was used to assess the relative proportions between the following groups: (a) males and females in the study population compared to the general population in England (ONS data); (b) age and gender proportions for each subspecialty group.

An unpaired *t*-test was used to examine differences between the mean attendances on weekdays and weekends. Similarly, an unpaired *t*-test was used to test our null hypotheses that there were no differences in mean attendances for Monday and Friday in comparison to the midweek (Tuesday, Wednesday, and Thursday). Data was transformed for each day attendance as a percentage of total attendance per week. All analyses were considered significant at a type 1 probability value of $p<0.05$.

Results

Age and Gender

During the 28-day study period, a total of 17,667 patients (mean ± standard deviation age = 49.2 ± 21.8 years) attended HEECS across all sites. A higher percentage of females (53.3%) presented to HEECS compared to males (46.7%). The proportion of females presenting to HEECS during the study period was significantly higher in comparison to that reported for the general population ONS data ($\chi^2 = 52.9$, $p<0.001$). The preponderance of females in the HEECS study amongst those ≥50 years was also found to be significant ($\chi^2 = 34.4$, $p<0.001$) showing a difference of 13% more females than males in our study. There were no significant differences in the proportion of males and females aged <50 years attending HEECS when compared to the general population ONS data ($\chi2 = 3.35$, $p = 0.07$). Figure 2 illustrates the overall demographic data based on age and gender.

We estimated that the population served by the 12 centres (excluding Moorfields Eye Hospital) to represent approximately 9.3% of the total population in England. The calculated annual 'walk in'

HEECS attendance rate was 31.0 per 1,000 population for new patients. This was based on three 'walk in' HEECS services representing 5057 attendances over the 28-day period.

The highest annual attendance rate was observed in the 80-84-year age group with approximately a five-fold higher rate of attendance compared to those aged in the 5-9-year group, who had the lowest attendance rate. Figure 3 illustrates the age specific annual attendance rates per 1,000 population.

Attendance by 'Day of the week'

The highest proportion of attendances were on Mondays (16.6% of total week caseload) and Fridays (15.7%). The lowest proportion of attendances were on Sundays (10.0%) and Saturdays (13.0%) (figure 4). Overall, a significant reduction in attendance was observed on weekends in comparison to weekdays (t=-6.94, p<0.001) (figure 4). Furthermore, a significant increase in attendance was observed on Mondays and Fridays compared to other weekdays (t=-2.20, p=0.032) (figure 4).

Attendance by subspecialty

Of the total 17,667 HEECS attendances observed across the 28-day study period, 15,400 (87.2%) had sufficient diagnostic data to enable appropriate subspecialty grouping. Cases with insufficient data and patients that self-discharged prior to the clinical consultation were excluded from this sub-study. External eye disease, cornea, and conjunctiva group (n=4,404) were the most frequently presenting diagnoses, representing 28.6% of cases. Trauma (n=2,110), adnexal (n=2,094) and vitreoretinal (n=1,648) conditions followed, representing 13.7%, 13.6% and 10.7% of attendances, respectively. Subspecialities of other and glaucoma group had the least frequent attendances. The glaucoma group (n=323) represented 2.1% of all case attendances to HEECS. Table 1 illustrates the breakdown of attendance based on subspecialties.

Our results showed that in all but one subgroup category there was a statistically significant difference in proportion of attendances between those <50 to those ≥50 years old. The most significant difference was observed in vitreoretinal cases (3.3% v 16.6% respectively, χ^2=486.09, p<0.001) and trauma (21.1% v 7.9% respectively, χ^2=369.92, p<0.001). The exception to these observed differences was in the uveitis group, where a near equal proportion of cases were seen in both age groups;<50 group (9.6%) and the ≥50 group (9.0%) (χ^2=1.03, p=0.310). Subgroup analysis by age ≥50 years and gender are also highlighted in Table 1.

There were significantly more proportion of female patients (7.4%) presenting with neuro-ophthalmological conditions than male patients (4.6%) (χ^2=51.46, p<0.001). Furthermore, there were significantly more proportion of female patients (6.7%) than male patients (4.8%) in the 'no ocular abnormality detected' group (χ^2=23.46, p<0.001).

Seventy percent of all trauma cases were observed in patients <50 years old and this rose to 83.6% when including all patients <60 years old. There were significantly more males (18.7%) who presented with trauma compared to females (9.2%) (χ^2=292.64, p<0.001). Trauma-related pathology was the most common presentation in males <50 years old (29.6%). The ratio of males: females ≤16 years presenting with trauma was 1.32:1.

Comparatively, in females <50 years old, trauma accounted for only 13% of presentations while almost half of presentations were due to adnexal and external eye diseases (48.1%).

Discussion

To our knowledge, we have reported the largest multicentre observational study assessing clinical presentations to HEECS. This Triple E study highlights the spectrum of diagnoses and demographics of patients accessing HEECS during a 4-week period in 2020 across 13 different sites in England. To date, literature reporting the annual attendance rates for HEECS has been scarce. Based on a sample of 28 days, we have calculated the annual attendance of HEECS presentation to be 31.0 per 1,000 population. Our results corroborate previous estimates of new eye casualty attendances, which have been between 20-30 per 1,000 population per year [11].

Compared to the ONS data, our results showed that the largest proportion of patients accessing HEECS were between those aged 50-90 years. This in part can be explained by the increased presentations of ocular emergencies in the older age groups such as vitreoretinal, retinal vascular and macular disorders [5, 12, 13]. After adjusting for the population differences within each age group, the highest attendance rate was observed in the 80–84-year age group.

We observed a significantly greater proportion of female patients accessing HEECS than male patients compared to the gender difference in the general population. One study of urgent eye care services [14] and another review of patients attending general practice in the UK [15] found similar female preponderances. After allowing for the gender difference in the general population of England, we found that female patients were 17% more likely to present to HEECS in those ≥50 years of age.

The observed gender differences may be partly attributed to the differences in health seeking behaviours between males and females [15-18]. Further studies would be required to assess if the lower attendance rate in males ≥50 years of age puts them at greater risk of sight threatening harm than females. Conversely, our findings may represent an underutilisation of community eye care services by females, or a health education need to address the greater number of females

presenting to HEECS for low sight threatening risk presentations that may be appropriately self-managed. A secondary consequence of sight threatening disease includes the significant impact on the patients' social and psychological wellbeing and the impact on the wider community, and evaluation of gender differences in this would also be useful [19-21].

To our knowledge, this study is the first to objectively report on the impact of the day of the week on emergency eye care attendances and an apparent 'weekend effect', where there was a significant reduction in attendance on weekends compared to weekdays. Previous studies reporting trends in general A&E attendances showed the highest attendance was on a Monday (10% higher than any other day) and lowest on a Friday, with no significant difference in the number of attendances on weekends compared to the weekdays [22, 23]. Anecdotal experience from the authors suggested the contrary in that acute eye departments seem less busy over the weekend. Our observation of an apparent 'weekend effect' would need further research to fully understand these findings. One explanation may be a perception of the lack of awareness regarding the availability of HEECS during the weekend. This may change health seeking behaviours on a weekend where patients may access alternative sources such as a local pharmacy, optometrist or present earlier or later, avoiding weekends. Furthermore, reduced access to the general practitioner or general optometric services that act as primary referral sources to a portion of HEECS may be a factor over weekends, with some patients delaying presentation to primary care until the weekday. Conversely, this may also increase weekend attendances due to absence of alternative primary care services. This may be especially important for specific sight-threatening conditions where delay in presentation may be detrimental. Further research to study the impact of our findings is required to determine the sight threatening risk of the reduced presentation over the weekend. This may highlight an important public health message for patients with significant visual symptoms to present as early as possible including over the weekend, as well as commissioning the correct services and allocation of staff to ensure service availability for patients presenting with an emergency eye condition at weekends.

Anterior segment disease (anterior segment trauma, external eye conditions, adnexal and anterior uveitis) was the most common collection of diagnoses made in the HEECS (65.3%) during the study period. This finding is consistent with previous studies, where anterior segment diseases were diagnosed in 55-75% of all presentations [8, 14]. We identified a five-fold higher vitreoretinal presentations in both genders ≥50 years old. This reflects known evidence of higher prevalence of vitreoretinal conditions in the older population. A less substantial higher attendance was found in patients ≥50 years presenting with glaucoma, medical retina, and post-operative/treatment conditions. Our findings can help to prepare disease-specific resources available required to meet the demand in HEECS.

Strategies to reduce patient attendance at HEECS can include: (a) effective triaging, (b) appropriate training of general A&E staff and community general practitioners, and (b) the utilisation of community optometry schemes [8, 24, 25].

Previous studies have identified that a significant proportion of anterior segment diseases may be suitable for management outside the hospital eye service setting [8]. A study involving 2123 patients in the minor eye conditions scheme in Lambeth & Lewisham over 12 months showed that >75% of patients were managed in the community alone [7]. No abnormality was identified in 6% of attendances to HEECS in this study which may be a further group of cases to potentially be managed in the community, thus reducing the demand on HEECS. More detailed diagnostic information on the presentations and suitability of cases to be managed in the community setting would be required in future studies.

We found a higher proportion of trauma in young males, which was consistent with findings in other published studies [26-30]. A large study on ocular injuries in the USA showed that 66% of patients were males and 91% were <60 years old [31]. In Scotland, a study on serious ocular trauma showed that 85% of cases were males [29]. These findings may be attributed to the increased prevalence of manual labour vocations in males compared to females [32]. One study proposed that the gender

segregation of occupations and the gender division of labour within specific occupations can place men at a greater risk of injury compared to female counterparts [33]. In a study of ocular injuries in children, the difference in gender prevalence was attributed to boys being more adventurous or possibly displaying more aggressive behaviours [34].

Our study design aimed at capturing acute presentations to the eye casualty clinics, therefore a limitation is this does not represent all acute ocular presentations to hospital services. Attendances "out of hours" that may have been managed in the emergency department or referrals to other urgent "fast-track clinics" will be missed in our data capture process. The authors did not include the above as the purpose and focus of the Triple E study was to assess the presentations to the HEECS (walk in or booked acute referral clinic) to evaluate the service demand. Another limitation of our study relates to the calculation of the HEECS attendances rates. Several assumptions were made when calculating the population served by the NHS trusts in this study and the relative age specific attendance rates. We assumed that our sample 28- day study period was a reflective representation of HEECS attendances across the year. We validated this annual HEECS attendances by using the monthly attendances for the previous two years between January and April for each site. The difference between the two methods was less than 1%.

Furthermore, we assumed the population demographics in the study centres were reflective of the distribution in England and the general A&E attendance rate was the same across England. The authors investigated alternative methods of estimating catchment areas, however identified the calculation used in this study to provide the best representation of the study population.

The authors acknowledge that these results are based on the chosen convenience sample and results from a single 28-day period. The study design was chosen to try and achieve a balance of different sized units and chose the specific month of January, as we found these to be more reflective of annual attendance patterns. The results on weekend and day of the week attendances presented do represent a significant contribution from city road, Moorfields. Sub-group analysis

excluding this centre yielded similar results and the same conclusions. Finally, from conducting the study, the authors noted that HEECS centres have different ways of recording data, coding diagnoses and availability of these data for retrospective analysis. Considerable time and resources were taken to reassess each of the cases for the purposes of this study. The author's would conclude that future studies and analysis would be helped by a more consistent way of record keeping and a consistent method of coding diagnosis across all HEECS.

In conclusion, this national multi-centre study highlights the attendance rates of HEECS and differences in presentation to HEECS based on gender, age, day of the week and diagnosis subgroup. This will guide service delivery including staff allocation based on local demographics and day of the week. Moreover, targeted training with emphasis on anterior segment disorders both within HEECS and community-based triaging services will help reduce burden of presentations and follow-ups to hospitals. With an increase in community-based optometry schemes and the advent of teleophthalmology, our dataset will provide the foundation for commissioning and establishing the best infrastructure to screen and triage for majority of the ocular emergency presentations.

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References

1. Siempis T. Urgent Eye Care in the UK Increased Demand and Challenges for the Future. Med Hypothesis Discov Innov Ophthalmol. 2014;3(4):103-10.

2. Smith HB, Daniel CS, Verma S. Eye casualty services in London. Eye (Lond). 2013;27(3):320-8.

3. NHS England UK. A&E Attendances and Emergency Admissions 2020-21 2020 [Available from: https://www.england.nhs.uk/statistics/statistical-work-areas/ae-waiting-times-and-activity/ae-attendances-and-emergency-admissions-2020-21/].

4. Dyer C. Court overturns optometrist's conviction for gross negligence manslaughter. BMJ. 2017;358:j3749.

5. Buchan JC, Barnes B, Cassels-Brown A, Chang BY, Harcourt J, Pilling RF, et al. The urgent need to develop emergency EYE care in the UK: the way forward? Eye (Lond). 2017;31(11):1515-8.

6. The Royal College of Ophthalmologists. The way forward: Emergency eye care 2017 [Available from: https://www.rcophth.ac.uk/wp-content/uploads/2015/10/RCOphth-The-Way-Forward-Emergency-Eye-Care-Summary-300117.pdf].

7. Konstantakopoulou E, Harper RA, Edgar DF, Larkin G, Janikoun S, Lawrenson JG. Clinical safety of a minor eye conditions scheme in England delivered by community optometrists. BMJ Open Ophthalmol. 2018;3(1):e000125.

8. Hau S, Ioannidis A, Masaoutis P, Verma S. Patterns of ophthalmological complaints presenting to a dedicated ophthalmic Accident & Emergency department: inappropriate use and patients' perspective. Emerg Med J. 2008;25(11):740-4.

9. Activity HAaE. Hospital Accident & Emergency Activity 2018-19 2019 [Available from: https://digital.nhs.uk/data-and-information/publications/statistical/hospital-accident--emergency-activity/2018-19].

10. Office for National Statistics. Overview of the UK population: August 2019 2019 [Available from:

https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/articles/overviewoftheukpopulation/august2019].

11. Ophthalmologists TRCo. Ophthalmic Service Guidance: Emergency eye care in hospital eye units and secondary care [Website]. 2017 [Available from: https://www.rcophth.ac.uk/wp-content/uploads/2017/08/Emergency-eye-care-in-hospital-eye-units-and-secondary-care.pdf].

12. Evans JR, Fletcher AE, Wormald RP, Assessment MRCTo, Management of Older People in the C. Causes of visual impairment in people aged 75 years and older in Britain: an add-on study to the MRC Trial of Assessment and Management of Older People in the Community. The British journal of ophthalmology. 2004;88(3):365-70.

13. Thapa SS, Thapa R, Paudyal I, Khanal S, Aujla J, Paudyal G, et al. Prevalence and pattern of vitreo-retinal diseases in Nepal: the Bhaktapur glaucoma study. BMC Ophthalmol. 2013;13:9.

14. Wasfi EI, Sharma R, Powditch E, Abd-Elsayed AA. Pattern of eye casualty clinic cases. Int Arch Med. 2008;1(1):13.

15. Wang Y, Hunt K, Nazareth I, Freemantle N, Petersen I. Do men consult less than women? An analysis of routinely collected UK general practice data. BMJ Open. 2013;3(8):e003320.

16. Thompson AE, Anisimowicz Y, Miedema B, Hogg W, Wodchis WP, Aubrey-Bassler K. The influence of gender and other patient characteristics on health care-seeking behaviour: a QUALICOPC study. BMC Fam Pract. 2016;17:38.

17. Bertakis KD, Azari R, Helms LJ, Callahan EJ, Robbins JA. Gender differences in the utilization of health care services. J Fam Pract. 2000;49(2):147-52.

18. Hohn A, Gampe J, Lindahl-Jacobsen R, Christensen K, Oksuyzan A. Do men avoid seeking medical advice? A register-based analysis of gender-specific changes in primary healthcare use after first hospitalisation at ages 60+ in Denmark. J Epidemiol Community Health. 2020;74(7):573-9.

19. Mozaffarieh M, Sacu S, Benesch T, Wedrich A. Mental health measures of anxiety and depression in patients with retinal detachment. Clin Pract Epidemiol Ment Health. 2007;3:10.

20. Weger M, Pichler T, Franke GH, Haas A, Thaler HV, Kraigher-Krainer N, et al. Assessment of vision-related quality of life in patients with central retinal artery occlusion. Retina. 2014;34(3):539-45.

21. Liddle J, Bartlam R, Mallen CD, Mackie SL, Prior JA, Helliwell T, et al. What is the impact of giant cell arteritis on patients' lives? A UK qualitative study. BMJ Open. 2017;7(8):e017073.

22. Meacock R, Anselmi L, Kristensen SR, Doran T, Sutton M. Higher mortality rates amongst emergency patients admitted to hospital at weekends reflect a lower probability of admission. J Health Serv Res Policy. 2017;22(1):12-9.

23. C B. Accident and Emergency Statistics: Demand, Performance and Pressure 2017.

24. Fenton S, Jackson E, Fenton M. An audit of the ophthalmic division of the accident and emergency department of the Royal Victoria Eye and Ear Hospital, Dublin. Ir Med J. 2001;94(9):265-6.

25. Kadyan A, Sandramouli S, Caruana P. Utilization of an ophthalmic casualty--a critical review. Eye (Lond). 2007;21(3):441-2.

26. Fea A, Bosone A, Rolle T, Grignolo FM. Eye injuries in an Italian urban population: report of 10,620 cases admitted to an eye emergency department in Torino. Graefes Arch Clin Exp Ophthalmol. 2008;246(2):175-9.

27. Perumal D, Niederer R, Raynel S, McGhee CN. Patterns of ophthalmic referral and emergency presentations to an acute tertiary eye service in New Zealand. N Z Med J. 2011;124(1340):35-47.

28. Haring RS, Canner JK, Haider AH, Schneider EB. Ocular injury in the United States: Emergency department visits from 2006-2011. Injury. 2016;47(1):104-8.

29. Desai P, Morris DS, Minassian DC, MacEwen CJ. Trends in serious ocular trauma in Scotland. Eye (Lond). 2015;29(5):611-8.

30. Thompson GJ, Mollan SP. Occupational eye injuries: a continuing problem. Occup Med (Lond). 2009;59(2):123-5.

31. Ramirez DA, Porco TC, Lietman TM, Keenan JD. Ocular Injury in United States Emergency Departments: Seasonality and Annual Trends Estimated from a Nationally Representative Dataset. Am J Ophthalmol. 2018;191:149-55.

32. Mitchell R, Curtis K, Fisher M. Understanding trauma as a men's health issue: sex differences in traumatic injury presentations at a level 1 trauma center in Australia. J Trauma Nurs. 2012;19(2):80-8.

33. Stergiou-Kita M, Mansfield E, Bezo R, Colantonio A, Garritano E, Lafrance M, et al. Danger zone: Men, masculinity and occupational health and safety in high risk occupations. Saf Sci. 2015;80:213-20.

34. MacEwen CJ, Baines PS, Desai P. Eye injuries in children: the current picture. The British journal of ophthalmology. 1999;83(8):933-6.

Acknowledgements: MGT is supported by the National Institute for Health Research (NIHR, CL-2017-11-003). HJK is supported by Medical Research Council (MRC), London, UK (MC_PC_17171).

The sponsor or funding organization had no role in the design or conduct of this research.

Authorship Contribution Statement:

IDS, AS, JB and SV were responsible for study conceptualisation and design. IDS, AS, JYK, RC, SA, RP, FB, RR, PD, FW, BW, LC, DS, FD, BEECS study group, JB and SV were responsible for data collection. IDS, MGT, AS, HJK and JB were responsible for data analysis and interpretation. JYK, RC, RP, FB and RR contributed to literature review. IDS, MGT, AS and JB prepared the original draft of the manuscript. All authors contributed to critical review, editing and revisions of the manuscript.

Conflict of interest statement: no conflicting relationship exists for any authors

Funding: MGT is supported by the National Institute for Health Research (NIHR, CL-2017-11-003). HJK is supported by Medical Research Council (MRC), London, UK (MC_PC_17171).

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Supplementary information is available at Eye's website.

Figure Legends

Figure 1 *– A geographical representation of all sites that took part in the English Emergency Eye care (Triple E) study in England including baseline details about each centre*

Figure 1 is illustrated by the first author of this paper, Mr I De Silva, who has given permission for use in this paper.

Figure 2 *– Age and gender distribution of patients in the English Emergency Eye care (Triple E) study and office for national statistics (ONS) data*

Figure 3 *– a) Annual age specific attendance rate per 1,000 population for HEECS attendances; b) Relative risk of HEECS presentation for each 5-year group*

Figure 4 *– Percentage of patient attendances based on day of the week with mean ± SD shown. All days of the week (A), weekday vs weekend (B) and midweek vs Mondays and Fridays (C)*

Supplementary figure 1: *Growth in general A&E attendances over the last decade in the UK (annual figures from April of each year to April of the following year)*

Supplementary figure 2: *Categorisation of diseases into subspecialty groups*

Table 1 *– Presentations according to subspecialties, gender, and age with* χ^2 *and p values.*

Supplementary table 1 - Estimates of HEECS attendance rates. A+E attendance rates were derived from reference 9.

Summary Box

What was known before?

- Most hospital urgent eyecare presentations are due to anterior segment disease.
- Most young males present with trauma related diagnoses.

What this study adds?

- Identifies the significant gender difference in attendances to the hospital urgent eyecare service for males ≥50 years old.
- Significantly less people present over the weekend than the weekday with Sunday being the quietest day. Mondays and Fridays are the two busiest days.
- Reinforces anterior segment related disease to be the most prevalent group of presentations.

Subject Ontology: Epidemiology, Emergency Ophthalmology

Group Name: BEECS Study Group

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