



HAL
open science

Trends in rates of retinal surgery in England from 1968 to 2004: studies of hospital statistics

Ahmed N El-Amir, Tiarnan D.L. Keenan, Mohammed Abu-Bakra, Vaughan Tanner, David Yeates, Michael J Goldacre

► **To cite this version:**

Ahmed N El-Amir, Tiarnan D.L. Keenan, Mohammed Abu-Bakra, Vaughan Tanner, David Yeates, et al.. Trends in rates of retinal surgery in England from 1968 to 2004: studies of hospital statistics. *British Journal of Ophthalmology*, 2009, 93 (12), pp.1585-n/a. 10.1136/bjo.2009.159939 . hal-00486089

HAL Id: hal-00486089

<https://hal.science/hal-00486089>

Submitted on 25 May 2010

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Title

Trends in rates of retinal surgery in England from 1968 to 2004: studies of hospital statistics

Authors

Ahmed N El-Amir, MRCOphth^{1,2}, Tiarnan D. L. Keenan MRCOphth¹, Mohammed Abu-Bakra, MRCOphth², Vaughan Tanner, FRCOphth², David Yeates, PhD³, Michael J. Goldacre, FFPHM³

Institutions

1. Oxford Eye Hospital, Oxford OX3 9DU
2. The Royal Berkshire NHS Foundation Trust, Reading RG1 5AN and Prince Charles Eye Unit, Windsor SL4 3DP
3. Unit of Health-Care Epidemiology, Department of Public Health, University of Oxford OX3 7LF

Author for correspondence

Ahmed N El-Amir

The Royal Berkshire NHS Foundation Trust, Reading RG1 5AN and Prince Charles Eye Unit, Windsor SL4 3DP

Email: ahmedlamir@hotmail.com

Licence for Publication

The Corresponding Author has the right to grant on behalf of all authors and does grant on behalf of all authors, an exclusive licence (or non exclusive for government employees) on a worldwide basis to the BMJ Publishing Group Ltd to permit this

article (if accepted) to be published in BJO and any other BMJ PGL products and sublicenses such use and exploit all subsidiary rights, as set out in our licence (<http://bjo.bmj.com/fora/licence.pdf>).

Competing Interest: None declared.

Keywords

Vitreo-retinal surgery; scleral buckle surgery; vitrectomy; trends; record linkage

Word count

2702 (including abstract)

ABSTRACT

Aim

To describe trends over time and geographical variation in rates of vitreo-retinal surgery in England from 1968-2004.

Methods

Routinely collected hospital statistics were analysed for England, using the Hospital In-patient Enquiry and Hospital Episode Statistics from 1968-2004, and for the Oxford National Health Service Region using the Oxford Record Linkage Study from 1963-2004.

Results

Annual English admission rates for surgery were around 5 episodes per 100 000 population in the 1960s, rising gradually to about 10 per 100 000 in the early 1990s, and then more sharply to 30 by 2004. The ORLS shows that multiple admissions per person were rare, which confirms that the observed increase represents a real increase in the number of people treated. Annual English rates for buckle procedures declined to around 6 episodes per 100 000 population in 2004 whereas vitrectomy surgery rose to around 26 in 2004.

Conclusion

Vitreo-retinal surgery has developed over the last 40 years in England, rapidly so over the past 15. Vitrectomy surgery has become much more common in England and buckle surgery has shown a steady decline. We demonstrate statistically significant geographical variation in the annual rate of surgery, currently, between local authorities in England.

INTRODUCTION

A century ago, retinal detachment was considered an untreatable cause of blindness. In 1929, Gonin gained recognition for his method of reattachment of detached retina by ignipuncture and thermocautery^{1,2}, despite initial criticism. Schepens established scleral buckle surgery for retinal detachment in 1951³, and this was followed in 1971 by the introduction of vitrectomy by Machemer^{4,5}. In fact, Kasner was the first to publish a case report of a vitrectomy procedure in an 'open sky' method in 1968⁶. In England, the pars plana approach was described in 1969 by Hudson, whose work was discussed by Duguid and Romanes at the Annual Meeting of the Ophthalmological Society of the UK⁷.

Since this time, surgical advances and refinements in instrumentation have led to improved success rates and an expansion in the indications for vitreo-retinal surgery. This increased surgical demand has been met in many vitreo-retinal units by increasing capacity: greater subspecialisation in ophthalmology has led to an increased number of dedicated vitreo-retinal surgeons, and more operating theatre time devoted to this workload. Healthcare demands created by this increased surgical through-put have been minimised in many hospitals by a gradual transition towards more patients undergoing surgery under local anaesthesia with shorter in-patient stays, including day case surgery⁸.

We have examined trends over time in national and regional rates of vitreo-retinal surgery, and geographical differences in rates, to determine the scale of change and variation over the past 40 years. We have also documented changes in surgical practice over this time period by comparing trends in the rates of patients undergoing scleral buckle versus vitrectomy surgery.

In the context of increased commissioning power of Primary Care Trusts, these trends should allow more accurate predictions of future surgical requirements, and may help vitreo-retinal departments attract greater funding by demonstrating sustained increases in surgical activity; they may also permit a closer match between supply and demand for vitreo-retinal surgery across England. The data should assist in workforce planning, i.e. recruiting a suitable number of vitreo-retinal surgeons trained in the appropriate procedures operating in the relevant regions, as well as providing important insights for shaping the structure of vitreo-retinal services in the future.

METHODS

At the start date for our national analysis, 1968, English national hospital statistics were collected as the Hospital In-Patient Enquiry (HIPE). This comprised a statistical summary of a one-in-ten sample of all hospital discharges from NHS hospitals. The data were intended, as a random one-in-ten sample, to be representative of NHS hospital care throughout England. The sampling was done and the data were collected by each of the (then) 14 Regional Health Authorities of England, and were collated nationally by the (then) Office of Population Censuses and Surveys. This system ceased in 1985 and was replaced, though not until 1989, by Hospital Episode Statistics (HES)⁹. HES have been collected on all hospital inpatient and day case admissions since then, rather than on a sample of all admissions. Both HIPE and HES are statistical databases of demographic, medical and administrative information about each episode of hospital care, similar to the data systems known as hospital separation systems in some other countries. From 1998, HES data were linked by the

Oxford Unit of Health-Care Epidemiology, thereby bringing together successive episodes of care for each person, which means that data about individuals can be analysed taking account of multiple episodes of care. Neither HIPE nor HES included patients treated privately. HES include data on all 'day cases' or office procedures, as well as patients admitted for overnight stay, whereas the HIPE did not include day cases.

Annual rates of patients undergoing retinal surgery were calculated from HIPE and HES from 1968 to 2004; rates were analysed separately for patients undergoing buckle surgery versus vitrectomy surgery. From 1968-1998 the data are unlinked: a patient who has more than one admission for vitreo-retinal surgery is counted more than once in the statistics. Linked data were analysed for the years 1998 to 2004. In these data, annual rates were calculated such that each surgical admission counted towards the 'episode' rate, but multiple surgical admissions within the calendar year counted only once towards the 'people' rate.

Hence a patient undergoing two sequential vitreo-retinal operations, with the operations in different calendar years, was counted twice in the 'episode' rate, and twice in the 'people' rate. However, a patient undergoing two sequential vitreo-retinal operations, with both operations within one calendar year, was counted twice in the 'episode' rate, and once in the 'people' rate. Finally, a patient undergoing two vitreo-retinal operations within the same admission (whether two operations on one eye or one operation on each eye) was counted once in the 'episode' rate, and once in the 'people' rate.

The Oxford Record Linkage Study (ORLS) consists of computerised abstracts of hospital episode statistics, including day cases, for all patients treated in the former Oxford Regional Health Authority (ORHA) area. From its start in 1963, the ORLS collected linked data (as above for HES from 1998), so that data about individuals can be traced through multiple episodes of care. The ORLS was the source of the Oxford component of the HIPE data from 1976-1985; it continued through the period 1985-1988 when national data ceased; and, from 1989, the ORLS and the Oxford component of HES are essentially the same dataset. Annual rates of patients undergoing vitreo-retinal surgery were calculated from ORLS, distinguishing episodes of care and individual people treated, from 1963 to 2004; as above, rates were analysed separately for patients undergoing 'external' buckle versus 'internal' vitrectomy surgery.

English national HES were analysed to produce a geographical profile of hospital admission for retinal surgery by local authority (LA) between 1998 and 2004. The data were used to construct a map showing the person-based admission rate per 100 000 resident population for each LA, expressed as an average annual rate. The LAs were arranged into quintiles: the fifth of LAs with the lowest rates are shown with the lightest colour, and the fifth of LAs with the highest rates are shown with the darkest colour.

The operative codes used to identify patients undergoing buckle surgery from the datasets were: 162 and 166 in the Office of Population, Censuses and Surveys: Classification of Interventions and Procedures, 1st revision (OPCS-1), 163.1, 163.2,

164.1 and 165 in OPCS-2, 163.1, 163.2, 163.5, 163.7, 164.1, 164.4 and 165 in OPCS-3 and C54.1, C54.2, C54.3, C54.4, C54.5, C54.8, C54.9 and C55.3 in OPCS-4.

The operative codes used to identify patients undergoing 'internal' vitrectomy surgery from the datasets were: 168.1 in OPCS-2, 168.1 and 168.2 in OPCS-3, and C79.2 and C79.3 in OPCS-4.

RESULTS

Figure 1 shows the English national rates and ORLS rates for vitreo-retinal surgery. Annual English admission rates for surgery were just under 5 episodes per 100 000 population in the late 1960s. They rose steadily, but gradually, to around 10 episodes per 100 000 population by the early 1990s. Over the past 15 years, the English rate of surgery has increased significantly and substantially from 11 (1989) to 30 (2004) episodes per 100 000 population. The ORLS admission rates declined gradually from around 10 episodes per 100 000 population in the early 1960s to around 1 in 1986, but then increased sharply to reach 30 in 2004 (Figure 1).

The ORLS data show rates based on the number of people admitted to hospital for vitreo-retinal surgery as well as number of episodes of care for surgery (episodes of separate admission or transfers within an admission, or both). They show that the scale of multiple admissions per person was small. The figure confirms that the large increase in hospital episodes in the 1990s represents a large increase in the number of people treated. It also shows, more accurately than the English figures (which omit data for 1986-8), that the start of rapid increase in surgery was about 1986-87.

Figure 2 shows the English national rates and ORLS rates for buckle surgery. Annual English rates increased gradually from around 4 episodes per 100 000 population in 1968 to around 12 episodes per 100 000 population in 1995. The rate then declined to 6 episodes per 100 000 population in 2004. ORLS rates fluctuated from around 11 to 7 episodes per 100 000 population in the 1960s, then declined steadily to around 1 episode per 100 000 population by 1986. This was followed by a steep rise to around 11 episodes per 100 000 population in 1991, similar to the English rate that year. A steady decline followed to around 4 episodes per 100 000 population in 2004.

Figure 3 shows the English national rates and ORLS rates for vitrectomy surgery. Both the annual English rates and ORLS rates were less than 1 episode per 100 000 population in 1968. The operation rates continued at this level for 20 years until 1987, when the ORLS data demonstrate the start of a rapid increase in surgical rates. Over the last 15 years the rate has risen to around 26 (HES) or 27 (ORLS) episodes per 100 000 population by 2004.

Vitreo-retinal service provision has traditionally included emergency admissions to treat retinal detachment. Figure 4 shows the English national rates and ORLS rates for emergency admissions. The annual English national rates show a steady increase from 2 episodes per 100 000 population in 1968 to 8 in 2004. The ORLS rates show a decline from 5 episodes per 100 000 population in 1963 to less than 1 in 1986; however, this was followed by a rise to 7 episodes per 100 000 population in 1992, with subsequent fluctuations between 4 and 5 over the last decade.

Figure 5 shows a geographical profile of the annual rate of vitreo-retinal surgery by LA. LAs showed a wide variation in rates of vitreo-retinal surgery from 10 to 37 people per 100 000 population.

Figure 6 illustrates the scale of variation; it shows that the variation is attributable not just to small numbers of atypical outlying areas, but there is a general gradation of varying rates across the country. The confidence intervals are wide but the lower 95% limit of the LAs with the highest rates do not overlap with the upper 95% limit of the LAs with the lowest rates. As judged from the error bars, the variation between the LAs with the highest and lowest rates is statistically significant.

DISCUSSION

National and regional rates of vitreo-retinal surgery increased dramatically from the late 1980s, which coincides with the widespread uptake of vitrectomy surgery. Both Oxford and English data showed a near 10-fold increase from 1968 to 2003.

Scleral buckle surgery and its variations showed a three-fold increase in England from 1968 to a peak in 1994; the rate then fell to half by 2004. The Oxford data showed a relatively high rate of this type of surgery in the 1960s and 1970s, which fell to very low levels by 1986. Between 1987 and 2004, the rates rose and became similar to the English rates. Scleral buckle surgery was introduced by Schepens in 1951 as a treatment for retinal detachment, and improved surgical outcomes to almost 90% reattachment³. Buckle techniques and their variations became commonly practised by vitreo-retinal surgeons over the following years. It has been considered the 'gold standard' treatment for uncomplicated rhegmatogenous retinal detachment¹⁰, and a

recent retrospective study has demonstrated anatomical reattachment of 95% at follow-up of 20 years¹¹.

Our data demonstrate vitrectomy procedures in England as early as 1968. However, rates of patients undergoing vitrectomy showed more than a 10-fold increase from 1985 to 2004, for both England and Oxford. The dramatic rise in vitrectomy surgery shown in the 1980s and 1990s coincides with significant improvements in operating microscopes and surgical instrumentation, as well as important advances in surgical techniques and training. Vitrectomy became the preferred surgical treatment for complicated rhegmatogenous retinal detachment¹⁰, and a recent retrospective study has demonstrated final anatomical reattachment of 95% in complicated retinal detachment (i.e. accompanied by proliferative vitreo-retinopathy, pseudophakia, large breaks or posterior pole breaks)¹².

However, vitrectomy may also be used in primary repair of uncomplicated retinal detachment, and one vitreo-retinal centre in England has reported that almost two-thirds of rhegmatogenous retinal detachment cases received primary vitrectomy in 1999¹³. Vitreo-retinal surgeons differ over their indications and preferences for scleral buckle versus vitrectomy surgery and, until recently, no randomised controlled trial was available to compare these surgical modalities in the treatment of primary rhegmatogenous retinal detachment¹⁴⁻¹⁶.

Further reasons for the dramatic expansion in the number of patients undergoing vitreo-retinal surgery, in particular vitrectomy, include an expansion in the indications of macular hole repair, epiretinal membrane and complications of advanced diabetic

retinopathy. The advent of vitrectomy meant that more vitreo-retinal disease became amenable to treatment, and this expansion has been assisted by advances in vitreo-retinal imaging (in particular ocular coherence tomography) and the use of adjuvant dyes during surgery.

LA's vary in the provision of vitreo-retinal surgery, particularly for retinal detachment. The Royal College of Ophthalmologists emphasises that some but not all cases of retinal detachment require urgent surgery, and adds that a sensible aim is to perform all vitreo-retinal surgeries inside normal working hours¹⁷. We have demonstrated that the rate of patients undergoing emergency vitreo-retinal surgery in England showed a 5-fold increase between 1968 and 2004. These data capture patients undergoing emergency admission, rather than out-of-hours surgery, and it is likely that many of these operations are being performed during working hours. However, every LA and vitreo-retinal unit should consider its demand and capacity for elective, emergency and out-of-hours vitreo-retinal surgery, along with its local workforce issues and referral patterns, when deciding whether emergency vitreo-retinal cover is required and/or adequate.

We have demonstrated significant variation in the rate of patients undergoing vitreo-retinal surgery across LA's in England, with some LA's in the South showing some of the lowest rates. It is beyond the scope of this paper to investigate the reasons for this variation. However, possible explanations include differences in the prevalence of vitreo-retinal disease, differences between areas in thresholds for referral for surgery and to tertiary centres, differences in patients' choice about the acceptability of surgery, and differences between areas in commissioning and in the capacity of

services. The presence of geographical variation raises the question: is there inequity in the provision of services? Further work might include, first, seeking agreement about appropriate national levels of service, to then be applied locally, taking account of clinical need, demand, capacity, patient access, and costs. Second, the epidemiology of vitreo-retinal disease is not well understood and it merits further study.

We have demonstrated significant changes over time in national and regional rates of vitreo-retinal surgery in England over the past 40 years, and documented important trends in surgical practice during this time period. These changes have major implications for commissioning, workforce planning, and surgical training in vitreo-retinal units across the country, and should help shape the structure of vitreo-retinal services in the future. Once service provision meets the incident rate of treatable vitreo-retinal disease, we predict that operation rates will reach steady-state levels in a mature health service.

ACKNOWLEDGEMENTS

Some of these data were presented by the first author at the British and Eire Association of Vitreo-retinal Surgeons annual meeting (St Andrews 2007 and Berkshire 2008).

The work of the Unit of Health-Care Epidemiology on the national and Oxford datasets is funded by the English NIHR Co-ordinating Centre for Research Capacity Development.

ETHICAL APPROVAL

The datasets are anonymised; approval to analyse them in a programme of research undertaken by the Unit of Health-Care Epidemiology, Oxford University, has been obtained through the NHS Central Office for Research Ethics Committees (reference 04/Q2006/176).

REFERENCES

1. Gonin J. La thermoponction oblitérante des déchirures rétinienne dans le décollement de la rétine. *Ann Oculist* 1931;168:1-29
2. Gonin J. Divergence of principles and differences of techniques in the treatment of retinal detachment. *Am J Ophthalmol* 1934;17:74-79
3. Schepens CL, Okamura ID, Brockhurst RJ. The scleral buckling procedures. I. Surgical techniques and management. *AMA Arch Ophthalmol* 1957; 58:797-811
4. Machemer R, Parel JM, Buettner H. Vitrectomy. A new concept for vitreous surgery. I. Instrumentation. *Am J Ophthalmol* 1972; 73:1-7
5. Machemer R, Norton EW. Vitrectomy, a pars plana approach. II. Clinical experience. *Mod Probl Ophthalmol* 1972; 10:178-185
6. Kasner D, Miller GR, Taylor WH, *et al.* Surgical treatment of amyloidosis of the vitreous. *Trans Am Acad Ophthalmol Otolaryngol* 1968;72(3):410-418
7. Leaver PK. *The History of Moorfields Eye Hospital*. London: The Royal Society of Medicine Press Ltd, 2004

8. Desai A, Rubinstein A, Reginald A, *et al.* Feasibility of day-case vitreoretinal surgery. *Eye* 2008; 22(2):169-72

9. NHS Executive. *Hospital Episode Statistics*. London: Department of Health, 2007.
<http://www.dh.gov.uk/PublicationsAndStatistics/Statistics/HospitalEpisodeStatistics/f>
s/en

10. Sodhi A, Leung L-S, Do DV, *et al.* Recent trends in the management of rhegmatogenous retinal detachment. *Surv Ophthalmol* 2008; 53(1):50-67

11. Schwartz SG, Kuhl DP, McPherson AR, *et al.* Twenty-year follow-up for scleral buckling. *Arch Ophthalmol* 2002; 120:325-329

12. Schmidt JC, Rodrigues EB, Hoerle S, *et al.* Primary vitrectomy in complicated rhegmatogenous retinal detachment: a survey of 205 eyes. *Ophthalmologica* 2003; 217:387-392

13. Minihan M, Tanner V, Williamson TH. Primary rhegmatogenous retinal detachment: 20 years of change. *Br J Ophthalmol* 2001; 85:546-548

14. Ahmadieh H, Moradian S, Faghihi H, *et al.* Anatomic and visual outcomes of scleral buckling versus primary vitrectomy in pseudophakic and aphakic retinal detachment: six-month follow-up results of a single operation – report no.1. *Ophthalmology* 2005; 112:1421-1429

15. Sharma YR, Karunanithi S, Azad RV *et al.* Functional and anatomic outcome of scleral buckling versus primary vitrectomy in pseudophakic retinal detachment. *Acta Ophthalmol Scand* 2005; 83:293-297

16. Heimann H, Bartz-Schmidt KU, Bornfeld N, *et al.* Scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment: a prospective randomized multicenter clinical study. *Ophthalmology* 2007; 114(12):2142-54

17. Wong D. Management of retinal detachment. London: The Royal College of Ophthalmologists, 2005 (revised 2008), available at <http://www.rcophth.ac.uk/docs/profstands/ophthalmic-services/ManagementRetinalDetachment.pdf>

Hospital admission rates 1963-2004 for vitreo-retinal surgery for ORLS and National data measured as episodes and people per year, male and female, all ages, all sources of admission, any mention of the procedure

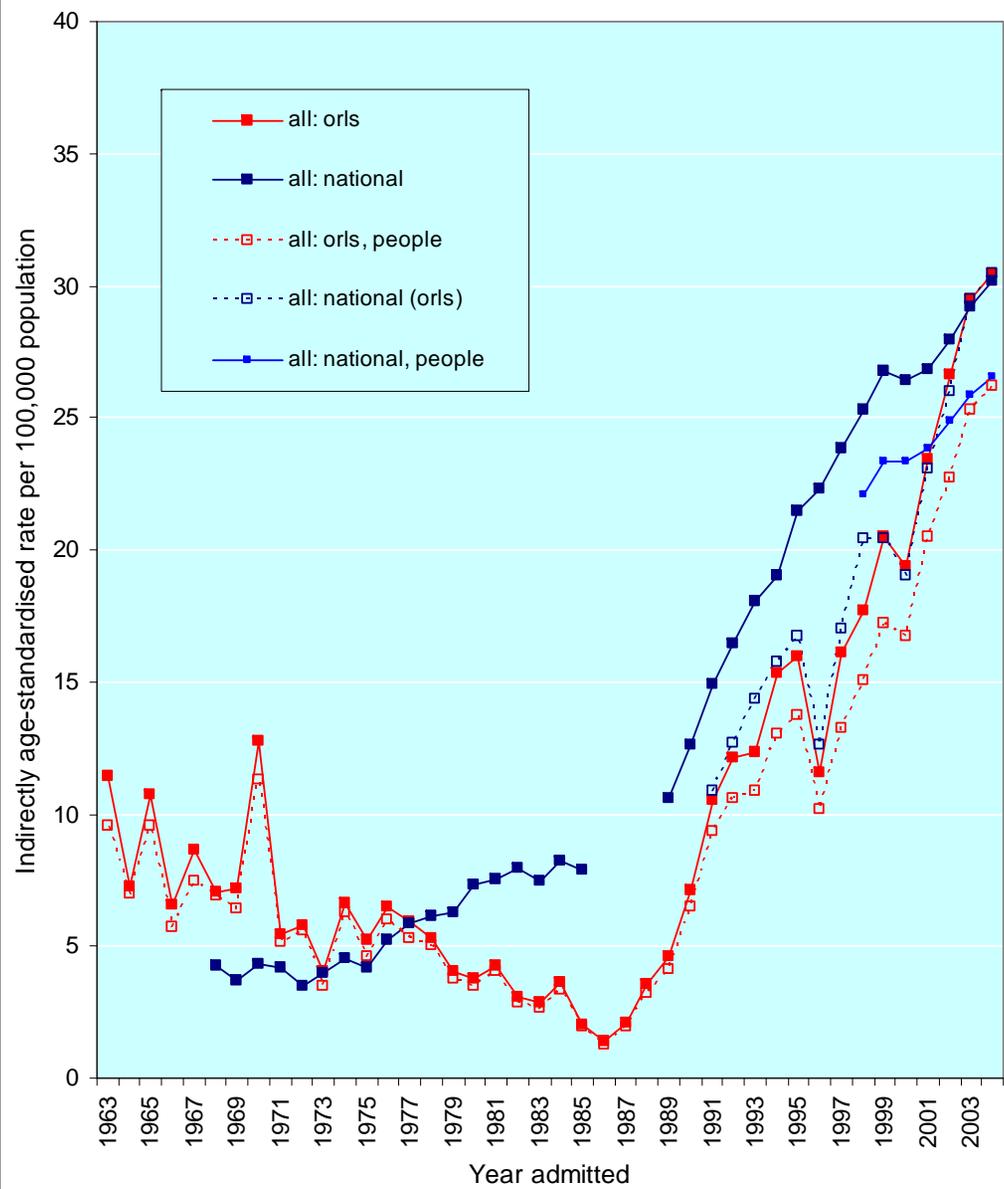


Figure 1

Hospital admission rates 1963-2004 for
 'external' buckle Vitreo-retinal surgery
 for ORLS and National data measured as episodes and people per
 year, male and female, all ages, all sources of admission, any mention
 of the procedure

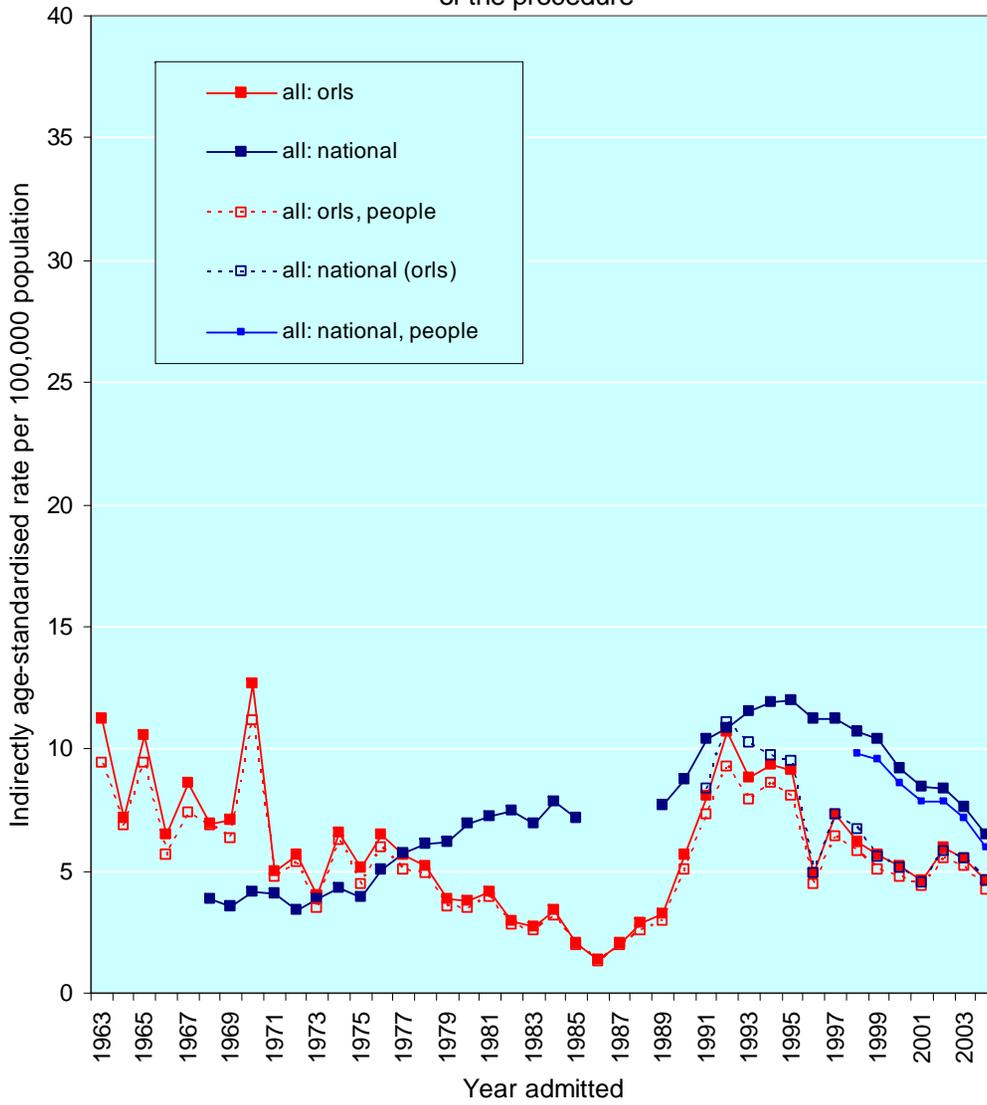


Figure 2

Hospital admission rates 1963-2004 for 'internal' vitrectomy surgery for ORLS and National data measured as episodes and people per year, male and female, all ages, all sources of admission, any mention of the procedure

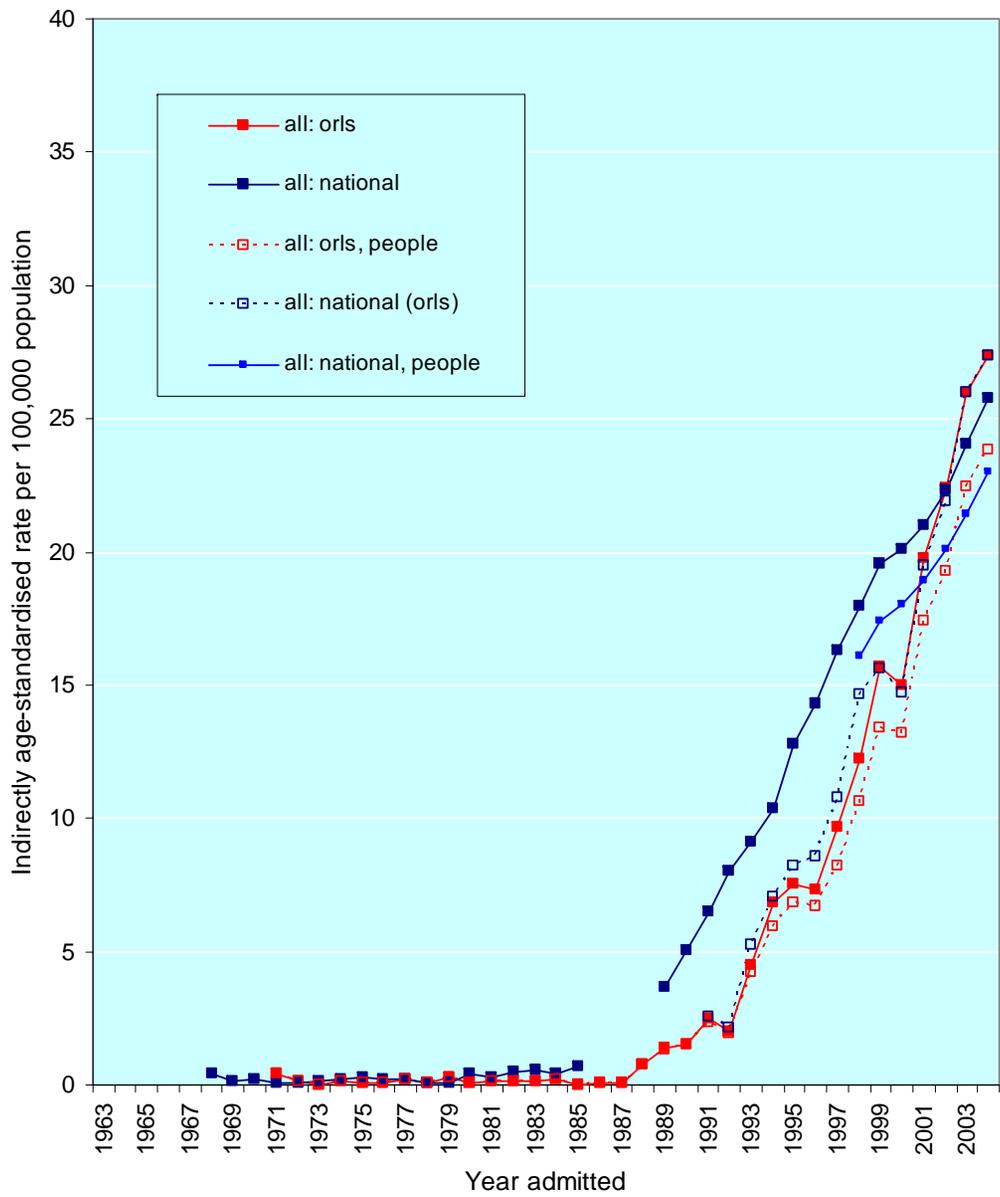


Figure 3

Emergency hospital admission rates 1963-2004 for vitreo-retinal surgery for ORLS and National data measured as episodes and people per year, male and female, all ages, any mention

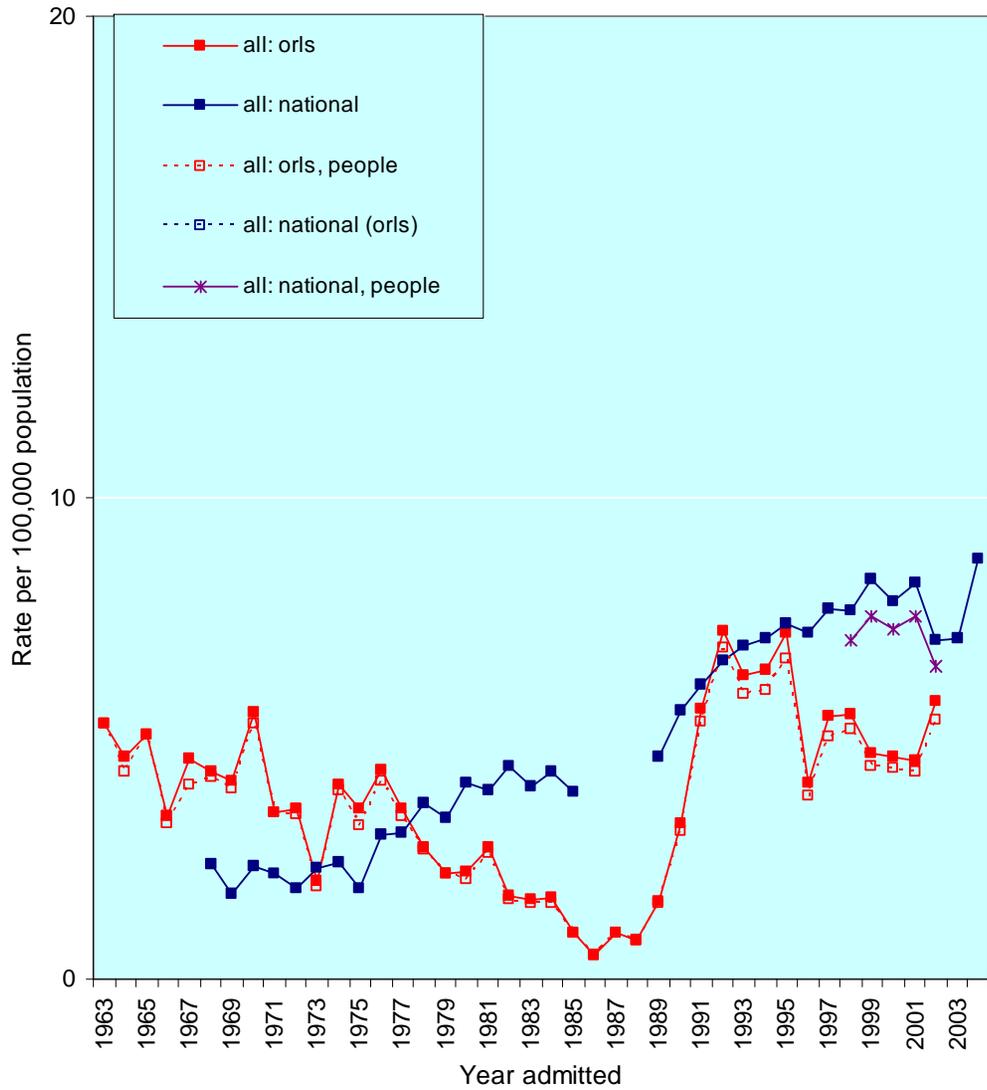


Figure 4

Figure 5. Map of hospital admission rates for vitreo-retinal surgery across England, with expansions for Manchester, West Midlands and London, with quintiles of rates from highest (darkest shading) to lowest (lightest shading).

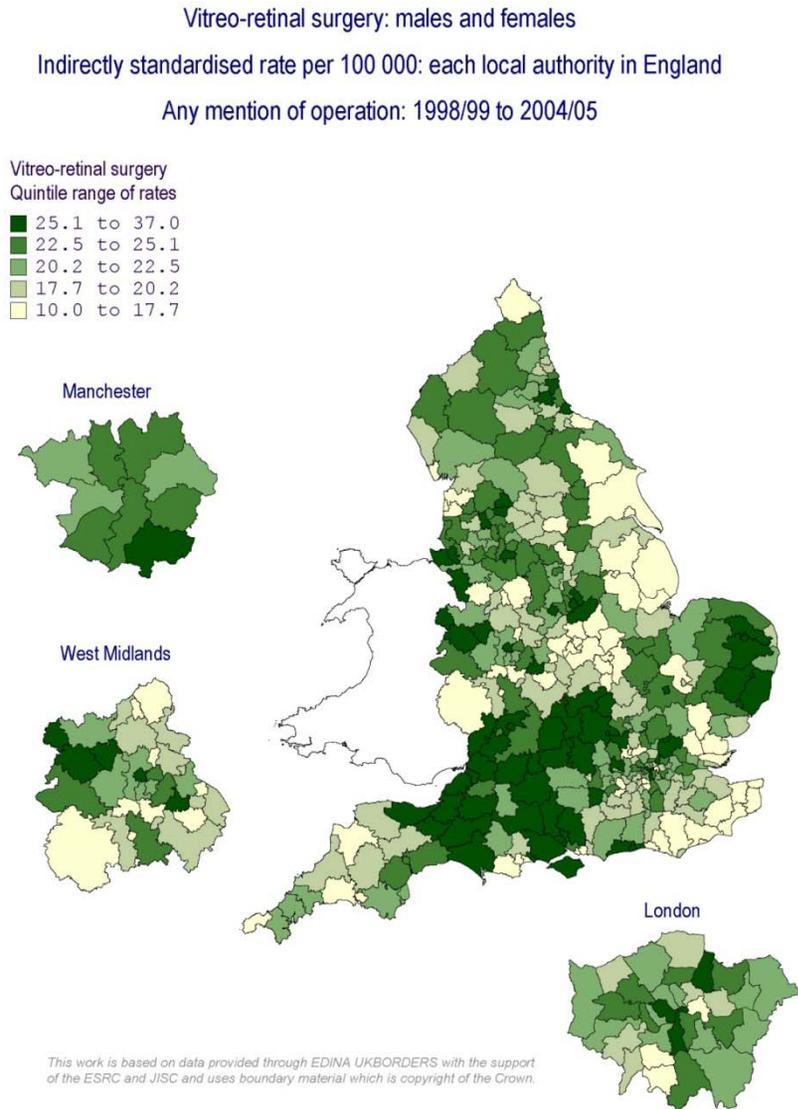


Figure 6. Error bar plot of local authority rates of vitreo-retinal surgery, plotted from highest to lowest, showing each area as a plotted rate (with its 95% confidence interval shown as the vertical bar on the plotted rate).

