

# Implementation of a nurse-delivered intravitreal injection service

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## Abstract

**Purpose** The purpose of this study was to introduce nurse-delivered intravitreal injections to increase medical retina treatment capacity.

**Methods** Indemnity, clinical governance, training, planning, and implementation issues were addressed. The outcome measures were patient safety, patient experience, and clinic capacity.

**Results** No serious vision-threatening complications were recorded in a consecutive series of 4000 nurse-delivered intravitreal injections. A Mann–Whitney test showed a significant increase in intravitreal injections ( $P = 0.003$ ) in the medical retina service after introduction of nurse-delivered intravitreal injections. The majority of patients accepted and were satisfied with a nurse-delivered intravitreal injection.

**Discussion** Nurse-delivered intravitreal injections appear safe, acceptable to patients, and are an effective means to increase intravitreal injection capacity in medical retina clinics.

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## Introduction

Anti-vascular endothelial growth factor (Anti-VEGF) treatment has revolutionised the management of neovascular age-related macular degeneration (AMD). The majority of patients attend for an intensive follow-up and injection regime at six weekly intervals in alignment with current NICE guidelines.<sup>1</sup>

Intravitreal ranibizumab is currently licensed only for administration by an ophthalmologist. Expansion of intravitreal injection services is necessary for conditions such as diabetic macular oedema and retinal vein occlusions.

Recent reforms to the UK medical training system have reduced the number of

ophthalmologists in training. An ageing population, economic constraints, and the introduction of clinical commissioning have created an incentive to explore new methods of multidisciplinary working.

Traditional nursing work has changed considerably in recent years with the introduction of extended roles in many surgical specialties. There is a growing awareness of the positive impact of extended roles both for health professionals and for patients.

## Purpose

The purpose of this study was to introduce nurse practitioner-delivered intravitreal injections to provide increased treatment capacity within the medical retina service.

## Materials and methods

The following issues were addressed:

### 1) Indemnity

The Trust sought legal advice related to vicarious liability and confirmation of indemnity cover from the National Health Service Litigation Authority (NHSLA). A separate consent form and patient information leaflet were formulated for the nurse-delivered intravitreal injections. This was necessary in view of the current licensing of ranibizumab for administration by an ophthalmologist.

### 2) Clinical governance

A comprehensive policy and procedure document was produced including a stipulation that a continuous audit of each nurse practitioner's complications would be recorded. It was agreed that consultant ophthalmologists

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would retain clinical responsibility for the patient. Nurse-delivered injections would be initially supervised, and then run independently but parallel to an ophthalmologist-delivered list so that a doctor is always available for advice. Approval from the Trust's clinical audit, clinical governance, and management executive committees were obtained.

### 3) Training

A rigorous training schedule was developed for nurse practitioners before undertaking this procedure (Figure 1).

This included attendance at a full day intravitreal injection course including practical training on pig eyes in a wetlab.

Wetlab training is an established method of surgical training to allow staff to fully understand practical procedures using biological materials such as animal tissue. Each nurse training to perform intravitreal injections was provided with a disposable work station consisting of an instrument pack, gloves, apron, and a pig eye obtained from a UK supplier of fresh tissues. The procedure was then demonstrated to nurses and they performed the procedure themselves on the pig eye.

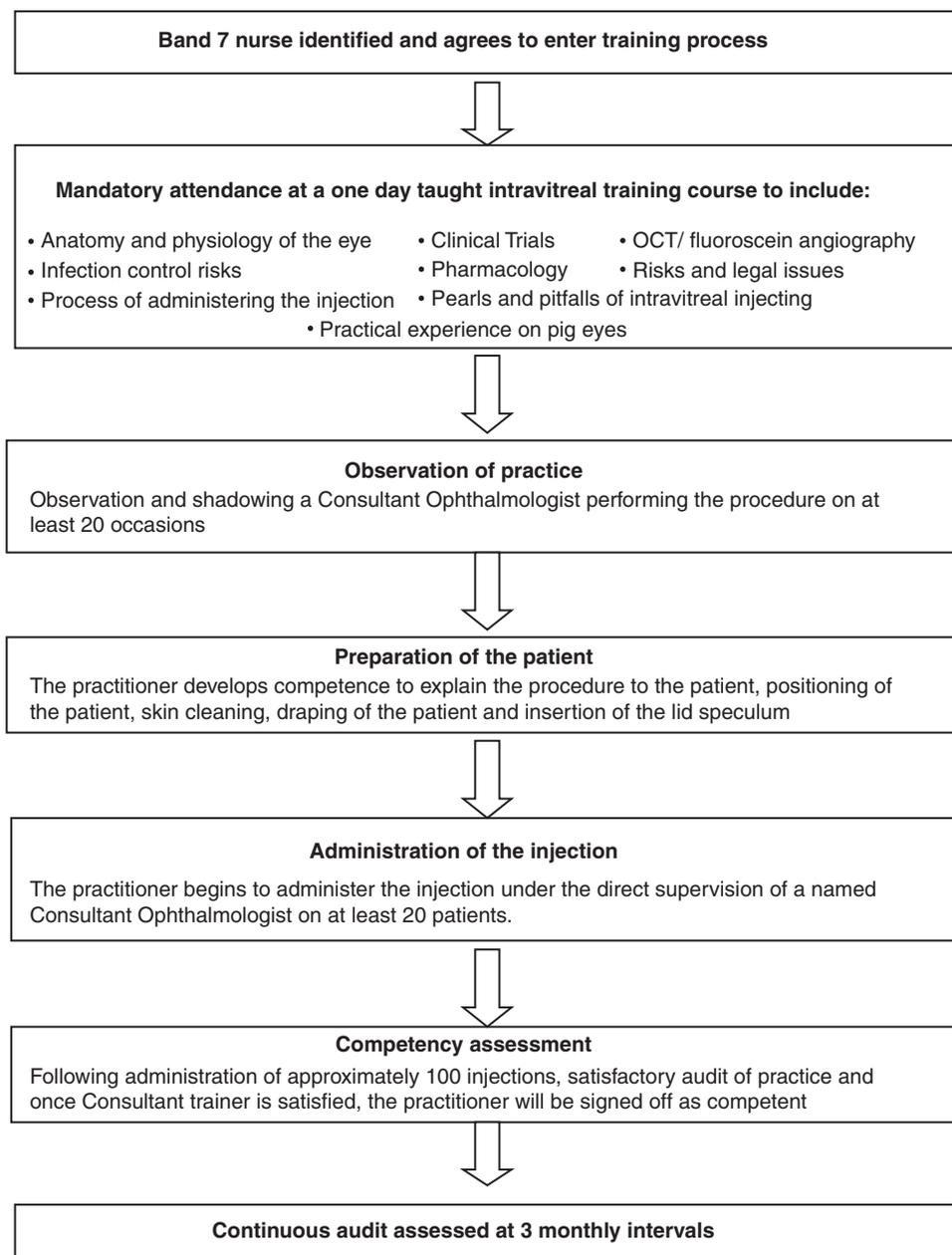


Figure 1 Training process for nurse-delivered intravitreal injections.

This was valuable to practise identifying the injection site, the angle of needle insertion, and the speed of injection.

This was then followed by observation of the procedure on a patient and graded exposure under the supervision of a consultant trainer. At the end of the training period of 100 supervised procedures, nurses underwent competency assessment. Patients were fully informed and consented before a nurse performed the procedure. Regular teaching and professional development sessions were organised to support nurses undertaking this extended role.

#### 4) Planning and implementation

Most jobs in the NHS are covered by the Agenda for Change pay scales. This covers all staff except doctors, dentists, and most senior managers. The Agenda for Change job evaluation system determines a points score (<http://www.nhscareers.nhs.uk/working-in-the-nhs/pay-and-benefits/agenda-for-change-pay-rates/>), which is used to match jobs to one of the nine pay bands and determine levels of basic salary. A career in nursing may start at band 2 (clinical support worker) rising to band 8 (nurse consultant). A fully qualified nurse would start their career at band 5. After consultation with senior nurses and nurse managers, it was felt appropriate that senior nurses at band 7 perform this extended role. There then followed consultation with the Human Resources department on remuneration and banding for nurse intravitreal injection sessions. A review of timetables across different sites, and arrangements for additional cover to allow senior nurses to train, was organised. A business case was completed for additional funding. Planning incorporated provision for nurse injectors at the Trust's site in central London and also in several satellite hospitals. A named consultant trainer was allocated for each nurse trainer. A pilot initiative was instigated, and after successful completion an expansion of this initiative was commenced. It was agreed that intravitreal bevacizumab would not be administered by nurses, as this is an unlicensed treatment for neovascular AMD in the UK.

#### Outcome measures

##### 1) Safety

Each nurse practitioner recorded details of procedures performed, as well as complications.

##### 2) Patient experience

The numbers of patients who declined nurse-delivered intravitreal injections and the reasons for this were

recorded. A modified externally validated patient questionnaire<sup>2</sup> was formulated (Figure 2). In this questionnaire, seven elements of patient satisfaction were examined: general satisfaction, technical quality, interpersonal manner, staff attitude, information/communication, time spent with the doctor, and staff competence.

##### 3) Number of injections before and after initiation of the nurse injector programme

A retrospective audit of the number of intravitreal injections performed before and after the introduction of three nurse practitioners at the Trust's main site was performed.

#### Results

##### 1) Safety

Complications for consecutive nurse-delivered intravitreal injections ( $n = 4000$ ) were recorded over a 24-month period (Table 1). No cases of endophthalmitis, retinal detachment, lens damage, loss of central artery perfusion, uveitis, or vitreous haemorrhage occurred.

##### 2) Patient experience

During the pilot phase of a consecutive series of the first 100 nurse-delivered intravitreal injections, thirteen patients declined the injections. Of these, 10 declined in the first month and 3 declined subsequently.

Some of the reasons given for declining nurse-delivered injections included anxiety related to lack of experience of the nurse and preference for a doctor.

Patient experience questionnaires ( $n = 50$ ) were completed and the results were analysed.

Out of 50 patients, 31 (62%) patients reported complete satisfaction in all elements of care with a maximal score of 5/5 for all questions answered. A further 19 (38%) patients were satisfied with all elements of care with a score of 4/5 for all questions answered. Table 2 shows the mean score in each of the seven elements of patient care.

##### 3) Numbers of injections before and after initiation of the nurse injector programme

Our results show that introduction of three trained nurse intravitreal injectors increased the mean numbers of intravitreal injections by 25% compared with a similar 5-month period the previous year (Figure 3). A Mann-Whitney test showed a significant ( $P = 0.003$ ) increase in intravitreal injection numbers. This result refers to nurse-delivered intravitreal injection numbers for neovascular AMD only as the initiation phase of the

**Patient satisfaction questionnaire (PSQ-18)**

The questions below are about how you feel about the care you receive when you have your eye injection. Please read each one carefully. How strongly do you AGREE or DISAGREE with each of the following statements? (Circle one number on each line)

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
1. The nurse was friendly, approachable and sensitive to my needs.....	1	2	3	4	5
2. When I go for my eye injection nurses are careful to check everything when treating me.....	1	2	3	4	5
3. When I attend for my eye injection the care I received was very good.....	1	2	3	4	5
4. I was happy with the time taken for my hospital visit today.....	1	2	3	4	5
5. The nurse made sure I was comfortable and pain free during my injection.....	1	2	3	4	5
6. I have some doubts about the ability of the nurse who administers my injection	1	2	3	4	5
7. My eye injection procedure was explained to me clearly.....	1	2	3	4	5
8. Nursing staff appear knowledgeable and competent.....	1	2	3	4	5
9. I have no confidence or trust in the nurse administering my injection.....	1	2	3	4	5
10. Nurses act too formal and impersonal towards me.....	1	2	3	4	5
11. I was treated with warmth and understanding.....	1	2	3	4	5
12. Nurses sometimes hurry too much when they treat me.....	1	2	3	4	5
13. Staff talked in front of me as if I wasn't there.....	1	2	3	4	5
14. The way a doctor gives an injection is safer than a nurse.....	1	2	3	4	5
15. Nurses usually spend enough time with me.....	1	2	3	4	5
16. I would be happier with a doctor giving my eye injection.....	1	2	3	4	5
17. I am dissatisfied with some things about the care I receive.....	1	2	3	4	5
18. I felt in safe hands when the nurse gave the injection.....	1	2	3	4	5

THANK YOU

Please give completed questionnaire to your nurse

**Figure 2** Modified patient satisfaction questionnaire (PSQ-18).

**Table 1** Complication rate with nurse-delivered intravitreal injections

Complication	Number of complications (%)
Subconjunctival haemorrhage	228 (5.7%)
Endophthalmitis	0
Retinal detachment	0
Cataract	0
Loss of central artery perfusion	0
Vitreous haemorrhage	0
Uveitis	0
Any other	0

nurse injector programme occurred before NICE approval for ranibizumab for diabetic macular oedema and retinal vein occlusions.

**Discussion**

AMD is the commonest cause of visual loss and blind registration in patients over the age of 50 years in the developed world.<sup>3,4</sup> In the United Kingdom, it has been estimated that there are about 26 000 new cases of neovascular AMD in the UK each year.<sup>4</sup> The increasingly

ageing population have led to a projected rise in cases of sight loss due to neovascular AMD from ~145 000 to 190 000 by the year 2020.<sup>5</sup>

The advent of intravitreal ranibizumab therapy has changed the goal of treatment for neovascular age-related macular degeneration from stabilising visual loss to visual improvement. The majority of patients require long-term follow-up and intravitreal ranibizumab retreatment within a 6-week interval for clinical effectiveness. A high-quality service for these patients is challenging to provide with current economic constraints on spending. NICE approval of ranibizumab for diabetic macular oedema has further increased the demand for intravitreal injection therapy. Figures from 2010 showed that the United Kingdom has the lowest ratio of ophthalmologists per head of the population in the

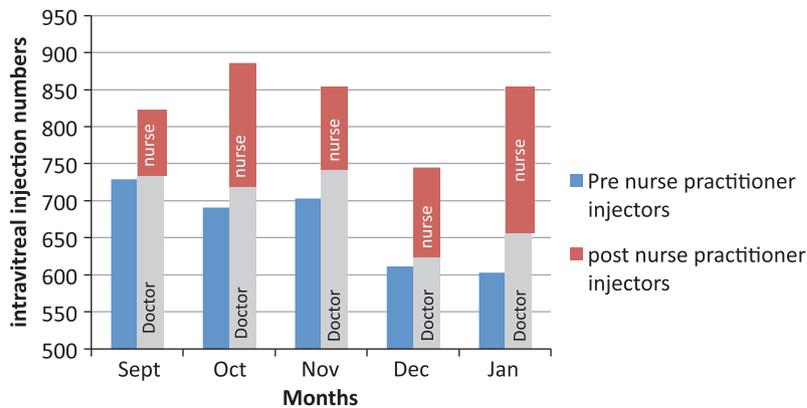
European Union (5.2 per 100 000).<sup>6</sup> The challenges of providing increased capacity coupled with reduced numbers of medically trained staff have been acknowledged by the Royal College of Ophthalmologists.<sup>7,8</sup> The Royal College of Ophthalmologists position is that, where circumstances and facilities allow, intravitreal injections should be administered by a specialist doctor trained in the procedure.<sup>7</sup> However, the College is also aware of the enormous pressure that eye departments are under to deliver this treatment to thousands of new and follow-up patients. The College therefore considers that it is reasonable for non-medical health-care practitioners to administer anti-VEGF agents provided that certain stipulations are met. These include provision of appropriate indemnity arrangements, training, and supervision from ophthalmic specialist doctors particularly with regard to managing any complications.<sup>7</sup>

We have successfully introduced nurse-delivered intravitreal injections as part of a consultant-led multidisciplinary team. The rationale for this was to increase the capacity to cope with the rising demand for intravitreal injections, reduce reliance on medical staff, and provide continuity of care for patients.

Shared care is an integrated model of health-care provision characterised by collaborative working across professional boundaries. This acknowledges the contribution of different professional groups towards delivering safe, high-quality care through agreed patient

**Table 2** Mean patient satisfaction score (n = 50)

Scale	Mean score (maximum 5)
General satisfaction	4.82
Technical quality	4.66
Interpersonal manner	4.78
Staff attitude	4.87
Information/communication	4.73
Time spent with doctor	4.76
Staff competence	4.55



Month	Total intravitreal injection numbers			Variance on previous year (%)
	2011	2012	2013	
Sept	729	823		12.90
Oct	691	886		28.2
Nov	703	853		21.3
Dec	611	745		21.90
Jan		603	852	41.30

**Figure 3** Intravitreal injections provided before and after the start of nurse injecting programme.

pathways. Shared care is instrumental to remove professional barriers, increasing job satisfaction among allied health-care professionals, and providing a cost-effective health-care system.<sup>9</sup> Hospital-based shared care involving optometrists and ophthalmic nurses working alongside ophthalmologists to manage patients with ophthalmic disease have been well established.<sup>10–12</sup>

The concept of extended roles has been supported by documents such as the NHS Plan,<sup>13</sup> which promotes the use of allied health professionals to perform some of the roles traditionally performed by doctors. NHS reforms, such as the European working time directive and modernising medical careers, have led nurses to develop their roles. The Nursing and Midwifery Council supports the idea of extended roles provided that nurses are competently trained and accountable for their own practice.<sup>14</sup>

Clinical management of neovascular age-related macular degeneration places an increasing burden on the hospital eye service. Despite ongoing efforts to streamline services and patient pathways, considerable problems related to the provision of treatment for neovascular AMD continue. In 2008, NICE-approved ranibizumab and the implications of long-term management are becoming significant. Few of these patients will ever be discharged from follow-up with regular monitoring required to detect disease reactivation. Demand for intravitreal therapy is likely to increase considerably following NICE approval for conditions such as diabetic macular oedema and retinal vein occlusions. NICE approval for these indications was granted in 2013.<sup>15,16</sup>

Implementing a shared care model provides a long-term solution to managing eye clinic capacity and increased demand. Medical retina services in many parts of the United Kingdom are under considerable pressure and are operating at maximal capacity. Medical retinal diseases comprise a spectrum of chronic conditions that may be amenable for appropriately trained and supervised non-medical practitioners to manage once stable. Clinical management of these conditions should be driven by protocol, local, and national guidelines based on evidence-based practice.

Our results have shown that trained nurse practitioners can safely deliver intravitreal injections to increase the capacity in medical retina intravitreal injection clinics. Our preliminary results of a series of 4000 nurse-delivered injections associated without serious vision-threatening complication is indicative that this procedure can be safely administered by a nurse. No cases of post-intravitreal anti-VEGF endophthalmitis occurred in our series. A prospective study<sup>17</sup> from the British Ophthalmological Surveillance Unit estimated

that the incidence rate of post-intravitreal anti-VEGF endophthalmitis in the United Kingdom was 0.025%.

Other units in the United Kingdom have recently introduced nurse-delivered intravitreal injections, and the results published at present indicate that this is safe.<sup>18</sup>

Our results demonstrate that nurse-delivered intravitreal injections provided a high level of patient satisfaction and were accepted by the majority of patients.

This initiative met several challenges before accomplishing successful implementation. The major challenge to overcome was a legal issue relating to licensing restriction of ranibizumab. Ranibizumab is currently licensed for administration by a trained ophthalmologist only. However, there are treatments in ophthalmology, such as intravitreal administration of triamcinolone, that are not licensed and are in widespread use and are generally accepted. The issue of licensing, therefore, is distinct from practice that would be regarded as not standard. At the time of commencement of the nurse intravitreal programme at Moorfields Eye Hospital, there was no generally accepted body of evidence to support the safety of nurse-administered intravitreal injections. Therefore, should a patient suffer loss of vision as a result of a nurse-administered intravitreal injection this raised potential for a claim of clinical negligence. Legal consultation regarding vicarious liability cover for nurse-administered intravitreal injections was obtained. Vicarious liability in a workplace context refers to situations where employers may be held liable for the acts or omissions of employees provided that it can be shown that this took place in the course of their employment. Written confirmation of vicarious liability cover for nurse practitioner-delivered intravitreal injections by the NHS Litigation Authority (NHSLA) was obtained.

Consultant-led training and individual professional development of the nurse practitioner is critical to driving this change forward. Clarification of indemnity cover, detailed planning, available funding, and a supportive framework to maintain motivation are essential factors for successful implementation.

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## Summary

### What was known before

- Extended roles for nurses within ophthalmology are well established. Anti-VEGF intravitreal therapy is usually a safe procedure with a low complication rate.

### What this study adds

- Nurse-delivered intravitreal injections can be performed safely. Nurse intravitreal injections increase medical retina clinic capacity. Nurse intravitreal injections are acceptable to the majority of patients.
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### Conflict of interest

The authors declare no conflict of interest.

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