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Pre-pubertal feline neutering: the role of the veterinary nurse in owner education

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ABSTRACT: Pre-pubertal neutering (PPN), which occurs at or before four months of age, is endorsed by several feline charities and veterinary bodies in an effort to curtail feline overpopulation and reduce the numbers of unwanted cats in rescue centres.

The concept of PPN remains controversial among veterinary surgeons due to concerns over increased anaesthetic and surgical risks, as well as perceived long-term health and behavioural repercussions. Despite active promotion and support of PPN by feline welfare bodies, as well as scientific evidence that PPN has no significant health risks or disadvantages compared with traditional age neutering (TAN), many private practices still do not recommend or perform PPN.

Registered Veterinary Nurses (RVNs) play a crucial role in client education and must maintain up-to-date, accurate knowledge, to provide appropriate advice on timing and effects of feline neutering, enabling them to gain informed consent from owners for neutering procedures.

Introduction

Historically, the veterinary profession has advised that cats are neutered from around six months of age (Yeates & Yates, 2014), a procedure known as traditional-age neutering (TAN). Feline welfare bodies have been encouraging private veterinarians to neuter kittens younger than this traditional age for several years, in order to minimise the number of unwanted litters produced (Cat Group, 2006). In 2013, The Cat Population Control Group (CPCG) was formed, comprising of several animal welfare organisations,¹ with the aim of maximising the effectiveness of neutering in the UK. CPCG neutering policies recommend that all kittens are neutered pre-pubertally, with owned cats neutered at four months of age, and rescue kittens neutered prior to rehoming (as early as eight weeks of age). This policy is supported by both the British Veterinary Association and the British Small Animal Veterinary

Association (RSPCA, 2014a). In order for the scheme to be successful, private veterinary practices need to collaborate with the CPCG on the policy of PPN.

RVNs are at the forefront of providing advice to clients about neutering, and are often responsible for the admission of patients for surgery. Appraisal of the anaesthetic and surgical implications, as well as relevant long-term health and behaviour consequences of PPN, ensures that VNs are able to provide current and appropriate advice to owners, and gain informed consent for surgical procedures. A questionnaire completed by 20 VNs in general practice surveyed current beliefs and knowledge on the short- and long-term physiological and behavioural effects of PPN, as well as ascertaining whether the advice given to clients is based on accurate, evidence-based facts, or restricted to policies regulated by the practices they work in.

The UK feline population crisis

The UK cat population has reached crisis point. Welfare centres are full to capacity, with some relying heavily on private boarding establishments to house many of the unwanted and abandoned cats in their care, incurring significant financial costs in the process (RSPCA, 2014b).

A single, unneutered queen can produce up to 20,000 kittens in five years (Cats Protection, 2009a). In 2012, the RSPCA stated that 86% of owned cats were neutered, but that in order to stabilise the cat population, this figure needed to increase to 92% (RSPCA, 2014b). A 2007 cross-sectional study, collected data on 1260 cats owned by a random sample of UK households by means of telephone questionnaires. It found that more than 17% of female cats in the UK had produced at least one litter, with over 70% of litters occurring as the result of an unplanned pregnancy (Murray, Roberts, Whitmarsh, & Gruffydd-Jones, 2009). By 2012, the RSPCA stated the proportion of unplanned litters had reached 85%, with 21% of queens going on to have a second litter, and 7% a third (RSPCA, 2014b). For many years, major rescue organisations have provided neutering vouchers with each kitten rehomed, providing owners with the opportunity of subsidised neutering at private practices. However, despite putting this process in place, poor owner compliance inevitably leads to some of these unneutered kittens having at least one unplanned litter (Bessant, 2013; RSPCA, 2014b).

A contributing factor to the high proportion of unplanned litters is a lack of owner awareness of feline reproduction. Many are unaware of how early kittens are capable of conceiving, not realising that pregnancy can occur as early as four months of age (Joyce & Yates, 2011). A long-term cohort study reported that over 80% of owners believed cats could not become pregnant until at least five months old, and over 26% believed a queen could not conceive until at least one year old (Welsh, Gruffydd-Jones, & Murray, 2013). The same paper reported that over a third of owners were unaware or unsure of the fact that siblings would mate and many still believed that queens should have a litter before spaying (Welsh et al., 2013).

To stabilise the population crisis, the death rate needs to exceed the birth rate over a given time period (Joyce & Yates, 2011), suggesting that a profound,

collaborative effort between welfare bodies, private veterinary practices and cat owners is needed.

Current practice

A 2008 survey of 863 UK veterinarians (Murray, Skillings, & Gruffydd-Jones, 2008) reported that 97.5% of practices have policies in place for the recommended age at which kittens should be neutered. The mean age recommended ranged between 12 and 32 weeks, with a mean of 22.6 weeks; 28% of veterinary surgeons agreed with the concept of neutering at 12–16 weeks, while 77% considered it appropriate to neuter cats at 17–20 weeks. Despite these personal beliefs of individual surgeons, which appear to support early neutering, 51% stated that the practices they worked in did not recommend neutering before the age of six months.

In order to improve veterinary awareness and compliance of PPN, the CPCG recently launched an online kitten neutering training support resource for veterinary professionals. The database, known as the Kitten Neutering Database (KiND), includes scientific evidence to support the practice of PPN, a suggested anaesthetic protocol for younger kittens, videos demonstrating surgical techniques of PPN and a comprehensive team training pack to support practices keen to introduce PPN. Practices who sign up to the scheme are publicly promoted by the database and welfare centres (KiND, 2015).

Pathophysiological considerations of pre-pubertal neutering

Paediatric anaesthesia

A survey assessing opinions on the ideal age for feline neutering found that 29% of veterinarians believed that neutering between the ages of 12 and 16 weeks was associated with an increased risk of anaesthetic complications (Murray et al., 2008). This belief does not appear to be supported by the published evidence which suggests that kittens tolerate anaesthesia well, recover more quickly and return to normal behaviour sooner than their older counterparts Root Kustritz (2014). Several anaesthetic protocols have successfully been used for kittens undergoing PPN. Veterinary surgeons with several years' experience of performing PPN at a large charity hospital found that such licensed intramuscular protocols were unreliable

in achieving anaesthetic depth in kittens under 1.5 kg (Joyce & Yates, 2011). Dosing inadequacies in smaller patients were attributed to their greater body surface area to mass ratio, leading to derivation of the "quad" protocol, promoted (off-licence, with owner consent) by Cats Protection and RSPCA clinics (Cats Protection, 2009b; KiND, 2015). Addition of a non-steroidal anti-inflammatory drug completes multi-modal analgesia (Flaherty, 2009). The intramuscular administration of induction agents is preferable to intravenous or mask induction, as it avoids excessive restraint and stress (Joyce & Yates, 2011).

Holden (2011) cites increased drug sensitivity, prolonged drug metabolism, hypoglycaemia, hypothermia and limited capacity for cardiovascular compensation as the primary anaesthetic concerns in kittens. Careful choice of anaesthetic protocol is paramount, with drugs calculated according to body mass or surface area, diluting solutions if beneficial and administering via insulin syringes for accurate dosing (Looney et al., 2008; Welsh, 2013).

Increased tissue oxygen consumption and decreased ventilatory efficiency potentiates hypoxaemia (Pettifer & Grubb, 2007) and immature baroreponses mean that cardiac output is predominantly dependent on heart rate, increasing the risk of hypotension (Joyce & Yates, 2011). Immature hepatic function and reduced glycogen reserves predispose patients to hypoglycaemia (Holden, 2011). Blood glucose levels should be checked if recovery is delayed, with hypoglycaemic patients supplemented with oral glucose or intravenous dextrose (Taylor, 2002; Welsh, 2013).

Surgical procedures

Neutering is an elective procedure which should be restricted to healthy animals who have received a thorough clinical examination. Vaccination courses should ideally be complete in order to reduce disease transmission, but where not possible, neutering should be scheduled when there are a minimum of other patients in the surgery (Cat Group, 2006).

Surgical duration of PPN is faster than that of TAN, due to physiological differences between kittens and adult cats. Pre-pubertal ovaries are relatively large compared to kitten size, making them easily identifiable. Vasculature is smaller and more elastic, with minimal subcutaneous and ovarian fat facilitating visualisation, allowing meticulous haemostasis required

in paediatric patients with relatively small blood volumes (Howe, 2006). A midline approach is recommended in kittens undergoing pre-pubertal ovariohysterectomy, optimising exposure and minimising muscle trauma (Grint, Murison, Coe, & Waterman-Pearson, 2006; Joyce & Yates, 2011). Several studies advocate no increase in intraoperative complications (Fagella & Aronsohn, 1993; Porters, Polis et al., 2014), with evidence to suggest that for closed castration, spermatic cord knot placement was faster than ligation (Porters, Polis et al., 2014), with a lower incidence in post-operative complications following PPN (6.5%) compared with TAN (10.8%) (Howe, 1997).

Mammary neoplasia

Mammary tumours are one of the most common neoplasms in cats. The majority of feline mammary tumours are malignant and have metastasised by the time of diagnosis (Augusto, 2014; Overly, Shofer, Goldschmidt, Sherer, & Sorenmo, 2005). Neutered female cats are up to seven times less likely to develop mammary tumours than those left intact (Root Kustritz, 2014), with timing of neutering playing a critical role (Reichler, 2009). Early studies (Hayes, Milne, & Mandel, 1981) showed that the greatest decrease in incidence of mammary neoplasia was associated with spaying before first oestrus. A more recent retrospective, case-controlled study (Overly et al., 2005) showed that the risk of mammary neoplasia was reduced by 86% when cats were spayed before 12 months old, with this figure rising to 91% in queens spayed before six months of age (Figures 1 and 2).

Behavioural effects

The documented undesirable behavioural habits of cats include aggression to people and other cats, increased sexual behaviour, inappropriate urination, vocalisation during oestrus, roaming and

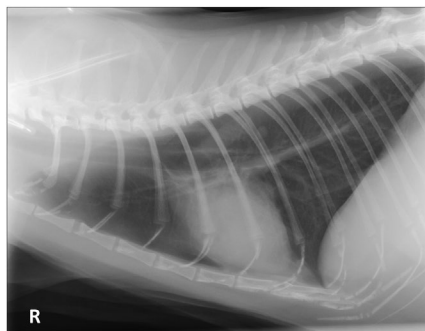


Figure 1. Lateral thoracic radiograph of metastatic lung disease in a 12-year-old female cat with mammary carcinoma. Source: Anderson Moores Veterinary Specialists, 2014

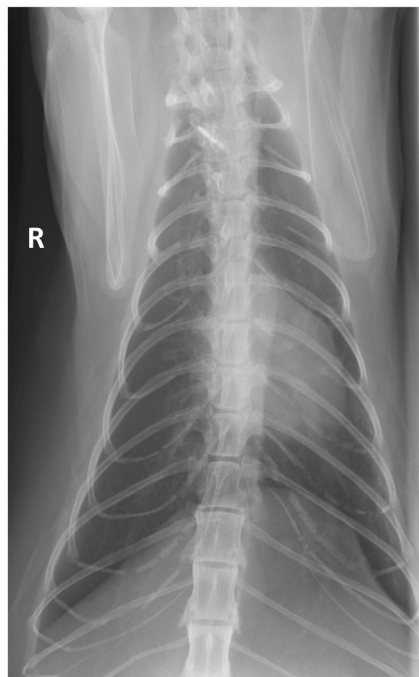


Figure 2. Dorso-ventral radiograph of metastatic lung disease (same cat as Figure 3). Source: Anderson Moores Veterinary Specialists, 2014

fighting (leading to increased transmission of infectious diseases and road traffic accidents), fearfulness and destructive behaviour (Porters, de Rooster et al., 2014; Scarlett, Salman, New, & Kass, 2002). Studies have indicated no behavioural differences between cats neutered at 7 weeks and 7 months, with entire cats demonstrating less affection to humans and more interspecies aggression (Howe et al., 2000; Porters, de Rooster et al., 2014; Stubbs, Bllomberg, Scruggs, Shille, & Lane, 1996). Spain, Scarlett and Houpt (2004) followed 1660 cats for up to 11 years and found that cats neutered pre-pubertally displayed less aggression, with decreased occurrence of abscesses, decreased sexual behaviour and decreased urine spraying compared with those neutered at the traditional age.

Feline lower urinary tract disease (FLUTD)

Perceived associations between early castration and increased occurrence of obstructive FLUTD may cause reluctance to perform PPN (Root, Johnston, Johnston, & Olson, 2006; Spain, Scarlett, & Cully, 2002). A survey of 627 veterinary surgeons found that the most common medical concern related to PPN was increased risk of FLUTD and urethral obstruction, due to narrowed urethral diameter (Spain et al., 2002). A further study showed that 24% of veterinarians associated PPN with an increased risk of developing FLUTD (Murray et al., 2008). Substantial retrospective cohort studies (Howe et al., 2000; Porters, Polis et al.,

2015; Spain et al., 2004) followed cats neutered pre-pubertally and at traditional age for up to 11 years, and found no association between the age of neutering and incidence of FLUTD. Contrast retrograde urethrography has been used to measure urethral diameter of male cats at one year of age, and found no variation in urethral diameter between cats neutered at 7 weeks, 7 months or left entire (Root et al., 1996).

Obesity

A growing concern among veterinary surgeons is the increasing incidence of obesity in pet cats (Spain et al., 2004), with obese cats at greater risk of diabetes mellitus, hepatic lipidosis, FLUTD, lameness and non-allergic skin disease (Reichler, 2009; Scarlett & Donoghue, 1998). Several studies have shown that neutering is a risk factor for obesity (Courcier, Mellor, Pendlebury, Evans, & Yam, 2012; Nguyen et al., 2004; Root et al., 1996), with neutered cats more than three times more likely to become obese than entire cats (Reichler, 2009). A US survey, questioning the practices and beliefs of 677 randomly sampled veterinary surgeons, showed that 6.5% of veterinarians perceived that PPN increases the risk of obesity (Spain et al., 2002). Several studies have concluded that all neutered cats had a greater bodyweight and body condition score than those left entire, but that there was no significant difference in body weight and body condition score between cats neutered pre- and post-pubertally (Howe et al., 2000; Spain et al., 2004; Stubbs et al., 1996).

Delayed physal closure

Some vets believe that PPN is associated with increased risk of physal fractures (Figure 3) due to delayed physal closure of long bones (Little, 2008).

Prospective studies (Root, Johnston, & Olson, 1997; Stubbs et al., 1996) compared the effect of age at neutering on physal closure, concluding that physal closure is delayed in neutered cats when compared to entire cats, but that there is no difference between cats undergoing PPN or TAN. A large retrospective cohort study of 1660 cats (Spain et al., 2004) failed to find any association between PPN and the risk of long bone fractures in cats followed for up to 11 years. Perry, Fordham and Arthurs (2014) examined pelvic and femoral radiographs of 808 cats, and found that while physal closure was delayed in neutered males, no effect was shown when comparing female entire and female neutered cats, suggesting that neutered males are at increased risk.

Lafuente (2011) identified obesity as a contributing factor in atraumatic physal fractures. McNicholas et al. (2002) monitored 26 cats presented with atraumatic capital physal fractures, identifying male neutered cats as being at increased risk, although the majority of cats assessed were also obese which is likely to have been a contributing factor.

The role of the veterinary nurse

RVNs are at the forefront of client education in preventative healthcare, and are frequently responsible for discussing neutering with clients, both by telephone and in person. Presentation of information in a manner which makes sense and is easily understood is a vital key to owner compliance, increasing the likelihood that recommendations are followed (Gerrard, 2015).

RVNs are frequently responsible for the admission of patients for neutering, and must ensure that owners have read and signed a consent form relevant to their pet's procedure. RVNs must communicate effectively with clients to ensure informed consent is obtained before treatments or procedures are carried out (RCVS, 2012). Informed consent means that the client fully understands what it is they are consenting to. The Code of Professional Conduct for Veterinary Nurses (RCVS, 2012) states that informed consent can only be given by a client who has had the opportunity to consider a range of reasonable treatment options, with associated fee estimates, and had the significance and main risks explained to them. VNs must ensure that information provided is both current and accurate, in order to

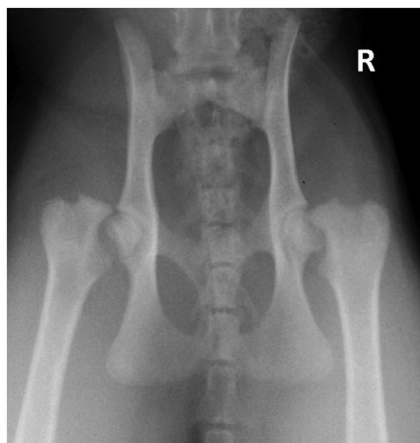


Figure 3. Ventro-dorsal radiograph of the pelvis of a young cat with bilateral spontaneous capital physal fractures. Source: Anderson Moores Veterinary Specialists, 2015

Veterinary nurses confidence in discussing PPN with clients

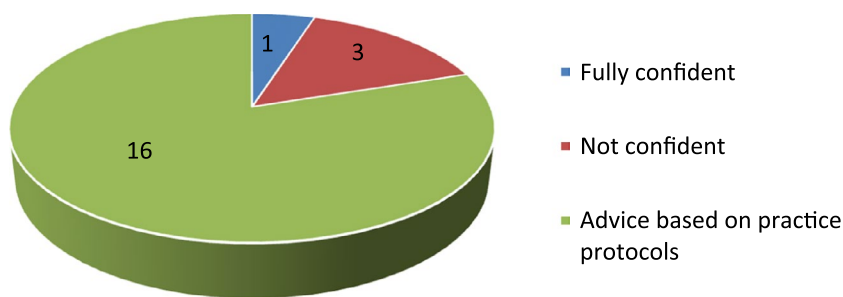


Figure 4. VN confidence in knowledge of pre-pubertal neutering when discussing topic with owners

enable them to advise clients appropriately and answer queries correctly. RVNs are accountable for their actions and if the RVN does not feel they have sufficient knowledge to obtain informed client consent, it is important that they recognise the need to refer the client to a veterinary surgeon (RCVS, 2012).

Survey of veterinary nurses' knowledge

A random survey of 20 VNs working in general practice revealed that current knowledge of PPN is limited, and advice given to owners may be outdated and inaccurate.

Eighteen VNs (90%) were unaware that queens are capable of becoming pregnant at four months of age. Only one VN (5%) was aware that neutering can be safely performed on kittens from two months of age, six VNs (30%) believe four months is the earliest age to safely neuter, and 13 VNs (65%) believe that neutering cannot be safely performed on kittens until they are five months old or more. Only one VN (5%) recommends neutering at or before four months old, with 10 VNs (50%) not recommending neutering until kittens are six months or older. Four VNs (20%) do not introduce the topic of neutering to owners until juvenile nurse clinics, performed at five to six months of age.

One VN (5%) was not aware of any advantages of PPN and only eight VNs (40%) recognise the benefit of preventing unwanted litters. One VN (5%) correctly identified that kittens neutered pre-pubertally recover quicker than those undergoing TAN. Sixteen VNs (80%) believe that anaesthetic and surgical risks are a main disadvantage of PPN. One VN incorrectly stated that PPN would compromise immunity if performed within one week

of vaccination. Only two VNs (10%) correctly identified that there are no disadvantages of PPN.

Only one VN (5%) felt fully confident in their knowledge of PPN, three VNs (15%) do not feel sufficiently confident to discuss PPN with clients, and 16 VNs (80%) stated that the advice given was based purely on practice protocols (Figure 4).

Discussion

Major charities have been safely neutering pre-pubertal kittens as young as eight weeks old for over a decade. The provision of up-to-date literature on suggested anaesthetic protocols and surgical techniques demonstrates that safe paediatric anaesthesia and surgery is achievable, provided that physiological differences are respected. Nurses play an important role in the well-being of patients during hospitalisation and surgery, and must be aware of the specific considerations of paediatric patients in the pre-, peri- and post-operative period.

Behavioural issues have been cited as the second most common reason of relinquishment of cats to rescue centres (Scarlett et al., 2002), highlighting the importance that PPN does not increase the risk of development of undesirable behaviours. Numerous studies have shown no increase in the prevalence of undesirable behaviours in kittens neutered pre-pubertally, with some studies even establishing positive effects, such as reduction in urine spraying and aggression. Social and environmental factors should be considered in development of individual personality and behaviour, and Porters, de Rooster et al. (2014) believe that these factors play a more dominant role in the development of

individual behaviours than does the time of neutering.

The cancer-protective benefit of neutering kittens before first oestrus was documented over 30 years ago, with more recent studies showing that the risk of developing mammary neoplasia is significantly reduced when spaying before six months old. Oestrus may occur as early as four months old, thus it might be considered that PPN could further increase the reduction in mammary neoplasia compared to TAN. Further studies comparing the incidence of mammary neoplasia in cats neutered pre-pubertally with those neutered at traditional age are required to substantiate this hypothesis.

The perceived risk of decreased urethral diameter and increased occurrence of FLUTD appears unjustified and has been contradicted by many studies. However, such studies have not followed cats for sufficient time periods to be considered completely viable and further long-term research would be valuable in validating facts.

The development of spontaneous physal fractures is multi-factorial, with risk factors including sex (males at increased risk), reproductive status, delayed physal closure and obesity. While it is clear that neutering causes delayed physal closure, there is no evidence that PPN further increases this effect, or that it increases the risk of physal fractures. Neutered cats are at increased risk of obesity, but PPN has not been shown to increase this effect. Provision of dietary advice will aid in the prevention of weight gain. Further studies might investigate whether nurses offer dietary advice to owners of neutered cats, and if so, whether this is provided at the time of neutering, or only if obesity subsequently occurs.

PPN appears to be a safe and viable method of stabilising the population crisis, but success depends on congruity and collaboration between welfare bodies, charities, private vet practices and owners. Education and promotion seem to be key factors in achieving the goal of stabilising the population crisis and reducing the burden currently placed on charity centres.

RVNs play a vital role in client education and are routinely responsible for providing advice on, and for the booking of, neutering procedures. The Code of Professional Conduct for Veterinary

Nurses states that RVNs must maintain and develop the knowledge and skills relevant to professional practice, to comply with requirements on continuing professional development (CPD) (RCVS, 2012). The survey of RVNs revealed a significant lack of knowledge about PPN, potentially leading to the provision of incorrect advice. Of particular significance was the large number of RVNs unaware of how young females can become pregnant, combined with those not broaching the subject of or recommending neutering until kittens reach five to six months of age (well into the age of potential conception), potentially leading to many unplanned litters. Despite 90% of RVNs believing that PPN is related to the increased incidence of at least one detrimental health or behavioural effect, and only 5% recommending PPN in private practice, a surprising 50% agreed with the action of charities in neutering young kittens prior to rehoming. This perhaps is evidence that although current knowledge of the facts of PPN appear poor, with many incorrect assumptions about its safety and long-term effects, RVNs are prominently aware of the need to reduce reproduction in the cat population. Further research may identify whether factors such as RVN age and date of qualification, affect knowledge and opinions on PPN, and also investigate any geographical or socioeconomic trends.

Investigations into the syllabuses of colleges and universities, responsible for training RVNs might highlight the need for further education on the subject of feline neutering, in order to increase their knowledge and confidence. Responsibilities also lie with employers to ensure that nurses possess the appropriate knowledge and experience before embarking on the process of educating clients (Mayne, 2011).

Practice policies serve to standardise the advice provided to clients, preventing the provision of conflicting information. Veterinary professionals graduating in recent years may be more likely to endorse PPN, as they possess more up-to-date information and may therefore be more open-minded than those who graduated many years ago. Despite the practice of PPN being taught at several of the UK's vet schools (RSPCA, 2014b), it is possible that graduates will adopt the neutering policies of the practices they join, rather than practice what they have been taught. Communication with colleagues and maintenance of CPD, such as the comprehensive on-line training support provided

by KiND (2015), could improve and standardise practice protocols, increasing confidence in information provided to clients and compliance with PPN.

Topical waiting room displays and client information leaflets may be developed by RVNs; however, the use of such information should not be used as a substitute for discussions with individual clients. Discussions about the timing of neutering are important, and an increased emphasis by veterinary practices on educating owners about timely neutering could significantly reduce the number of unplanned litters. Uptake of PPN is perceived to be higher if owners are targeted during the early, novel stages of ownership (Yates, 2009) and booking neutering appointments at the time of vaccinations keeps neutering at the forefront of owners' minds, thus improving compliance (Welsh, 2013). Earle (2007) believes that clients often feel more able to openly discuss things with RVNs compared to veterinary surgeons and scheduling separate time with an RVN at vaccination appointments provides the ideal opportunity to discuss the procedure, encouraging clients to raise questions or concerns.

Conclusion

The role of PPN in controlling the feline cat population and reducing charity burdens is clear. The traditional recommendation of neutering at around 6 months of age is based on perceived risks of earlier neutering, despite no existence of evidence to show that pre-pubertal neutering has any negative developmental or behavioural consequences. The development of safe anaesthetic protocols and surgical techniques has made PPN as safe or safer than TAN, with fewer peri- and post-surgical complications and faster recoveries.

RVNs play a prevalent role in discussion of the timing, risks and benefits of feline neutering with clients. It is imperative that the advice provided is both up-to-date and accurate, in order to gain informed consent when admitting patients for neutering procedures. Practice policies standardise information provided by staff members to clients, but it is vital that staff recognise and understand the information they are providing, to avoid confusion and ensure client confidence and compliance. Introduction of the topic of PPN at an early stage ensures that sufficient time is available for RVNs to discuss the procedure with clients and book timely appointments for surgery.

Note

1. The Cat Population Control Group (CPCG) was formed, comprising the following animal welfare organisations: Cats Protection; RSPCA; Blue Cross; International Cat Care; PDSA; Wood Green; Battersea Dogs and Cats Home; The Mayhew Animal Home; Celia Hammond Trust; University of Bristol.

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Multiple Choice Questions

1. Pre-pubertal neutering occurring at or before, how many months of age in cats?

- (a) Four
- (b) Three
- (c) One
- (d) Two

2. How many kittens can a single un-neutered queen produce in 5 years?

- (a) Up to 200
- (b) Up to 2000
- (c) Up to 20000
- (d) Up to 200000

3. According to the RSPCA what were the percentage of unplanned litters in 2012?

- (a) 25%
- (b) 50%

- (c) 85%
- (d) 95%

4. According to Welsh et al. (2013), how many owners believed that cats could not become pregnant until they were at least five years old?

- (a) Over 20%
- (b) Over 40%
- (c) Over 60%
- (d) Over 80%

5. The quadruple intramuscular anaesthesia induction protocol promoted for pre-pubertal neutering by the RSPCA and Cats Protection is "off license".

- (a) True
- (b) False

6. According to the article what is the percentage of RVNs currently

recommending pre-pubertal neutering in private practice?

- (a) 20%
- (b) 50%
- (c) 5%
- (d) 10%

7. The greatest decrease in mammary tumours in cats associated with neutering is associated with:

- (a) Spaying before first oestrus
- (b) Spaying after first oestrus
- (c) Spaying after six months of age
- (d) Spaying after 12 months of age

8. Studies indicate that there is no behavioural difference between cats neutered at seven weeks of age and seven months of age:

- (a) True
- (b) False

For the answers to the MCQs, please go to: <http://www.bvna.org.uk/publications/veterinary-nursing-journal>

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