



ORIGINAL ARTICLE

Canine desexing attitudes and practices of Australian veterinarians: A cross-sectional survey

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Canine desexing is one of the most common small animal surgical procedures in Australia, yet little is known about current practices. This study characterised attitudes, practitioner recommendations and surgical practices for routine canine desexing among Australian veterinarians using an online cross-sectional survey ($n = 107$). Respondent demographics were broadly comparable to the 2023/2024 Australian Veterinary Workforce Survey, suggesting appropriate representation. Most veterinarians (93.6%) recommended routine desexing, with orchiectomy and ovariectomy being the predominant surgical approaches. Alternative approaches were occasionally recommended but rarely performed. The main reasons reported for recommending desexing dogs of both sexes were prevention of unwanted mating, perceived health benefits, population control and, for males, preventing undesirable behaviour. Recommended timing was influenced by age, expected adult size, breed and owner preference. Recommended age of desexing did not differ by sex, but larger expected adult size was associated with a later recommended age ($p < 0.001$). In female dogs, 59.3% respondents reported advising desexing after one or more seasons, with a mean minimum post-oestrus interval of 1.8 ± 0.9 months and 17.6% of respondents reported advising desexing less than 4 months of age. Drug choices did not differ between male and female desexing operations for premedication ($p = 0.66$), induction ($p = 1.00$) and postoperative analgesia ($p = 0.51$). Medetomidine, alfaxalone, acepromazine and methadone were commonly used for premedication; alfaxalone and propofol for induction; and non-steroidal anti-inflammatories postoperatively. Local anaesthetic blocks were infrequently used. Our findings provide an overview of desexing practices, highlight key areas for future research and inform future veterinary training.

Keywords anaesthesia; analgesia; Australia; canine; desexing; gonadectomy

Abbreviations AVA, Australian Veterinary Association; CSV, comma separated values; NSAID, non-steroidal anti-inflammatory drugs; OHE, ovariectomy; USMI, Urethral Sphincter Mechanism Incompetence; WSAVA, World Small Animal Veterinary Association

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Introduction

Canine desexing is one of the most commonly performed surgical procedures in Australian small animal veterinary clinics. It offers a number of benefits, which include prevention of unwanted mating, population control, modification of specific behaviours of urine marking, roaming and mounting, and reduced risk of certain diseases, specifically pyometra, benign prostatic hyperplasia and testicular neoplasia.^{1,2} However, there are also a number of potential disadvantages with surgical desexing, including predisposing to obesity, increasing the incidence of urinary incontinence and prostatic carcinoma, as well as the risks and complications associated with surgery and anaesthesia.¹⁻⁵

Desexing protocols should be safe, humane, timely, cost effective and driven by consideration of their impact on the patient's health status and outcomes.⁶ In practice, the choice of protocol is also influenced by non-patient factors such as client expectations, drug availability and the age, gender and surgical experience of the clinician.^{7,8} Historically, desexing recommendations for client-owned dogs have favoured routine early-age (<16 weeks) gonadectomy. However, recent literature has challenged a universal 'one size fits all' approach, highlighting potential associations between early desexing and increased risk of intraoperative complications and infection, premature physal closure, as well as an increased risk of certain diseases. Specific disease concerns raised include potential increased risk of hip dysplasia, cranial cruciate ligament tear or rupture and elbow dysplasia, as well as certain neoplasias, including lymphoma, mast cell tumour, hemangiosarcoma and osteosarcoma.^{9,10}

In Australia, professional guidance is provided by the Australian Veterinary Association (AVA). The AVA policy outlines recognised risks and benefits of different desexing techniques and timing, but does not prescribe specific protocols or recommended ages for routine desexing.¹¹ Internationally, the recently published WSAVA Global Guidelines on Reproductive Control provide a detailed discussion of surgical and non-surgical options, emphasising contextual decision-making.¹² Consequently, desexing recommendations are increasingly framed as individual decisions that balance potential health against the broader considerations and animal context, including welfare concerns, socioeconomic factors, owner considerations and responsible pet ownership and wider cultural perspectives and expectations.^{2,12}

Rather than endorsing a universal age recommendation, the WSAVA guidelines emphasise balancing individual health

considerations against owner capacity to manage reproduction responsibly. By contrast, in shelter or free-roaming populations where uncontrolled breeding poses welfare concerns, prophylactic desexing is more strongly supported to reduce population-level harm and alleviate pressure on shelter systems. The guidelines also acknowledge that cultural norms and societal expectations surrounding desexing vary internationally, influencing both professional recommendations and owner decision-making.

Despite the availability of guidance, little is currently known about how Australian veterinarians integrate evolving evidence and policy recommendations into clinical practice. Previous Australian surveys have explored practitioner attitudes toward desexing,^{13–16} but have not comprehensively characterised surgical techniques, anaesthetic protocols, analgesic strategies, and timing recommendations. International studies have more broadly examined both attitudes and practice patterns,^{17–20} but comparable contemporary Australian data are lacking.

The aim of this study was to characterise current attitudes, recommendations and surgical practices relating to canine desexing among Australian veterinarians. Specifically, this study described timing recommendations, procedural choices, anaesthetic and analgesic protocols and factors influencing clinical decision-making. Establishing a baseline understanding of current practice allows for comparison with existing guidelines and will help to inform and guide veterinary education and ongoing professional development initiatives to ensure that they are both congruent with the current industry practice and grounded in evidence-based medicine.

Methods

A cross-sectional study was conducted between March and November 2025 to capture Australian veterinarians' attitudes and practices for routine canine desexing. See Appendix S1 for a copy of the survey questionnaire. Ethics approval was obtained from the University of Melbourne Human Research Ethics Committee (Approval number: 30261). The study was conducted in accordance with the National Statement on Ethical Conduct in Human Research.

The questionnaire was distributed online via the Australian Veterinary Association (AVA) website (<https://www.ava.com.au/member-updates/surveys/>), and promoted through social media platforms including LinkedIn and Facebook. All social media posts contained a summary of the survey rationale and aims, and a direct link to the AVA survey page. This method of distribution was selected due to logistical and funding limitations. The survey was conducted using the Qualtrics survey platform (Qualtrics, WA, USA). No incentives were offered for survey completion.

The questionnaire was divided into three sections to maintain engagement and avoid respondent fatigue, with each covering a major theme: Background, Perspectives and Practices. All participants were required to give informed consent. Questions were a mix of multi-choice, Likert scales²¹ and open text box. Where Likert scales were used, the five ordinal points representing respondents' level of agreement with each statement were: Routinely, Often, Sometimes, Rarely and Never. 'Always' is commonly used as the

highest level of agreement in similar studies; however, 'Always' implies every single time, and given normal physiological variation between individuals and circumstances, this is unlikely to be true for veterinary patients. As such, 'Routinely' was deemed the most appropriate term. All survey questions were optional.

Background questions collected data on gender, postcode, type of practice, year and place of graduation, information on their specific practice including role and number of veterinarians, and hours worked. These data were collected to allow comparison of respondent demographics against the general practising veterinary population in Australia, based on the 2023/2024 Veterinary Workforce Survey.²² No specific individual identifying data were collected, for example, name or age.

Perspective questions explored respondents' desexing recommendations. These include whether they recommend routine desexing, factors influencing their current practice, reasons for desexing, preferred surgical approaches, timing of desexing based on individual patient factors of age, previous seasons, expected adult size, breed and owner preference, and consideration of additional procedures performed concurrently.

Practice questions examined the frequency and type of desexing procedures performed, as well as anaesthetic and analgesic protocols in both male and female dogs. Anaesthetic maintenance agents were not assessed.

Question order was structured to reflect the clinical sequence of decision-making and was not randomised. Prior to distribution a small pilot study was run on a subset of veterinary practitioners independent of the main study population to allow for refinement of the questions and order.

Data were exported as a CSV file and analysed using Microsoft Excel (Version 2512, Microsoft, WA, USA), and SPSS Statistics (Version 30.0.0.0 (172), International Business Machines (IBM), NY, USA). Descriptive statistics are presented as counts and percentages, with continuous variables reported as mean $\pm$ standard deviation (SD) where appropriate. Given the exploratory nature of the study and sample size ($n = 107$), analyses were primarily descriptive.

Responses comparing male and female dogs (recommended age of desexing, premedication, induction and postoperative pain relief) and the association between expected adult weight and recommended age of desexing were analysed using Pearson's chi-square tests of independence on aggregated ordinal survey responses, with cases weighted by response frequency for each category (e.g. small breed (<20 kg), medium breed (20–40 kg) and large breed (>40 kg)). Statistical significance was reported at $p < 0.05$.

Results

As the survey provided for a very large amount of information from the 107 respondents, only the key results have been included here. Full results are available upon request to the authors.

Demographic data

Demographic responses showed that 84.3% of respondents were female, and 15.7% were male. The average year of graduation was 2009 (SD = 12), with the earliest year of 1972 and the most recent year of 2024.

For employment, most respondents had their primary area of practice as small animal practice (79.3%), followed by mixed practice (6.1%) and specialty and referral (6.1%), locum practice (4.9%) and emergency practice (3.7%). Seventy-two percent were employed as an associate veterinarian in a clinic, 8.5% as a locum or consultant, 14.6% as a practice owner or partner and 4.9% did not fit into any of the above categories of employment, which included two clinical directors, one clinical lecturer and one respondent working across multiple roles. Regarding clinic size, 46.9% worked in a clinic employing one to three full-time (38+ hours per week) veterinarians, 29.6% in a clinic employing four to seven veterinarians and 23.5% employing greater than eight veterinarians.

Respondents were predominantly practising in Victoria (45.7%), New South Wales (27.2%) and Queensland (17.3%); with fewer respondents from Western Australia (7.4%) and Tasmania (2.5%). The majority of respondents graduated from an Australian veterinary school (81.9%), with 27.7% graduating from the University of Melbourne, 21.7% from the University of Sydney, 16.9% from the University of Queensland, 8.4% from Murdoch University, 6.0% from Charles Sturt University and 1.2% from the University of Adelaide.

Hours worked was answered within a range, so we cannot give an overall average for number of hours worked; however, the distribution across the range of hours worked was: One to 10 h (12.3%), 11–20 h (4.9%), 21–30 h (21.0%), 31–40 h (51.9%), 41–50 h (8.6%) and 51–60 h (1.2%). No one reported greater than 60 h worked per week.

Attitudes and perspectives

Key determinants of practice. The majority of respondents recommended routine desexing of dogs (93.6%). In free-text responses, several respondents indicated recommendations were conditional on individual factors, particularly age and breed and indicated Hart

et al.⁹ and Romagnoli et al.¹² as key references guiding decision-making.

When asked which procedures are offered by their practice, for male dogs orchietomy was offered by 100% of respondents, vasectomy via midline incision was offered by 6.9% and laparoscopic vasectomy by 1.4%. For female dogs, ovariohysterectomy via midline coeliotomy was offered by 98.6%, with ovariectomy via midline coeliotomy offered by 12.5%, laparoscopic ovariectomy by 6.9%, laparoscopic ovariohysterectomy by 2.8% and ovary-sparing spay by 5.6%.

Reasons for recommending desexing included: to prevent unwanted mating, selected by 89.3% of respondents for males and 94.7% for female dogs; health benefits to the individual, selected by 81.3% for males and 92.0% for females; to prevent or manage unwanted behaviour, selected by 86.7% for males and 57.3% for females; and population control, selected by 66.7% for males and 68.0% for females. 'Other' was selected by 8.0% for males and 10.7% for females, with free-text answers noting council registration requirements, reducing registration fees, owner's issues with managing dogs on heat and specific mention of reducing mammary carcinomas, pyometra and prostatic disease.

Respondents also rated how often they recommended and performed different procedures for routine desexing (Table 1). Orchietomy was routinely recommended by 86.1% and routinely performed by 86.6%. No respondents routinely recommended vasectomy, with 58.0% reporting never recommending it and 84.6% never performing it. Ovariohysterectomy was routinely recommended by 87.5% and routinely performed by 88.1%. Ovariectomy was routinely recommended by 7.1% and never recommended by 55.7%, with 78.5% never performing ovariectomy. Ovary-sparing spay was not routinely recommended by any respondent and was never recommended by 69.6%, with 93.8% never performing it.

Respondents' current desexing approach was most often determined by 'the adoption of new techniques and methodologies' (53.9%), followed by 'how respondents were taught in veterinary school' (40.8%), and 'clinic standard operating protocols' (38.2%). Free-text responses additionally cited Romagnoli et al.¹² and client financial

Table 1. Percentage of respondents (n = 72) who reported frequency (routinely, often, sometimes, rarely, never) for recommending and performing different methods of routine desexing in dogs

		Routinely	Often	Sometimes	Rarely	Never
Recommend	Orchietomy	86.1%	8.3%	5.6%	0.0%	0.0%
	Vasectomy	0.0%	0.0%	2.9%	39.1%	58.0%
	Ovariohysterectomy	87.5%	8.3%	2.8%	1.4%	0.0%
	Ovariectomy	7.1%	2.9%	11.4%	22.9%	55.7%
	Ovary sparing	0.0%	1.5%	5.8%	23.2%	69.6%
Perform	Orchietomy	86.6%	1.5%	3.0%	3.0%	6.0%
	Vasectomy	0.0%	0.0%	0.0%	15.4%	84.6%
	Ovariohysterectomy	88.1%	0.0%	1.5%	4.5%	6.0%
	Ovariectomy	0.0%	0.0%	6.2%	15.4%	78.5%
	Ovary sparing	1.6%	0.0%	0.0%	4.7%	93.8%

considerations as key determinants. New surgical techniques were most commonly introduced through 'self-directed learning' (65.9%), 'advice from colleagues' (58.5%), and 'mentorship from a senior veterinarian' (34.1%). In free-text responses, 19.5% of respondents noted continued professional development (CPD) as a key source of introduction.

Recommended timing for desexing. For male dogs, the key factors influencing veterinarians' recommended timing for surgical desexing were animal age (95.8%), expected adult size (83.3%), breed (83.3%) and owner preference (66.7%). For female dogs, animal age was again the most frequent response (97.2%), followed by time since the end of the most recent oestrus (87.5%), expected adult size (73.6%), owner preference (70.8%) and number of previous oestrous cycles (41.7%). Free-text responses noted that owner capacity to confine dogs, financial considerations, temperament, environment, cryptorchidism, charity versus private desexing contexts and recommendations in the literature, including Hart et al.^{9,10} and Romagnoli et al.,¹² were also factors influencing decisions on the timing of desexing.

There was no significant difference in the recommended age of desexing between male and female dogs ($\chi^2[4] = 3.00$, $p = 0.56$). However, expected animal size had a significant effect on the recommended age of desexing ($p < 0.001$), with a significant linear trend across ordered age categories ($p < 0.001$), such that a larger expected adult size was associated with a later recommended age of desexing (Figures 1 and 2).

When asked about the minimum age for desexing all female dogs, 17.6% of respondents reported they would desex before 4 months of age, 36.8% would desex at a minimum between 4 and 5 months of age, 42.6% at a minimum between 6 and 11 months of age and 2.9% would not desex until after 12 months of age. With respect to timing relative to oestrus, 40.7% of respondents reported recommended desexing prior to the first season, with the remaining 59.3% reporting recommending desexing after one season. No respondents reported recommending more than one season prior to desexing.

The mean recommended interval between the most recent season and surgery was 1.8 months (SD 0.9; $n = 61$), with the minimum recommended wait period ranging from 2 weeks to 4.5 months.

When asked about concurrent procedures performed at the time of desexing, 67.6% respondents reported routinely discussing and recommending brachycephalic obstructive airway surgery, 67.6% prophylactic gastropexy, 13.2% corrective procedures for hip dysplasia while 14.7% reported not routinely discussing additional procedures. Free-text responses included retained deciduous tooth extraction, umbilical hernia repair, dewclaw removal and screening imaging for spinal malformations in brachycephalic breeds.

Surgical practices

Premedication, induction and postoperative pain relief.

Veterinarians performed an average of 3.6 (SD ± 3.1) surgical desexing procedures per week. There was no significant difference between male and female dogs in the reported frequency of drug use for premedication ($\chi^2[4] = 2.42$, $p = 0.66$), induction ($\chi^2[4] = 0.07$, $p = 1.00$), or postoperative pain relief ($\chi^2[4] = 3.29$, $p = 0.51$). Therefore, the results are presented collectively for male and female dogs, with key findings reported in the text below and in Table 2.

The most common premedication sedatives were medetomidine, alfaxalone and acepromazine, with only a small number routinely using ketamine and midazolam. The most common opioid used was methadone, with only a small percentage routinely using buprenorphine, butorphanol or morphine. Free-text responses noted additional use of gabapentin and trazodone. The survey did not assess specific drug combinations; therefore, concurrent use of sedatives and opioids cannot be determined.

For induction, Alfaxalone was reported to be routinely used by 60.0% of respondents, almost twice as much as propofol at 31.5%. Gaseous induction was reported to be routinely used by 13.7% of respondents, with a ketamine-diazepam co-induction reported to be routinely used by 4.8% of respondents. A ketamine-diazepam combination was reported to be used sometimes or rarely by 31.0% of

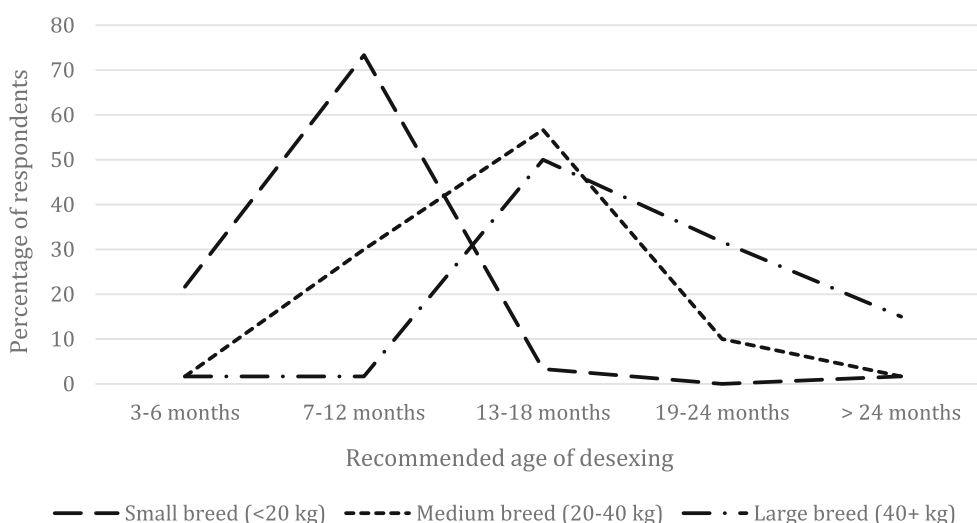


Figure 1. Recommended age of desexing for male dogs by expected adult weight category, expressed as a percentage of respondents ($n = 72$).

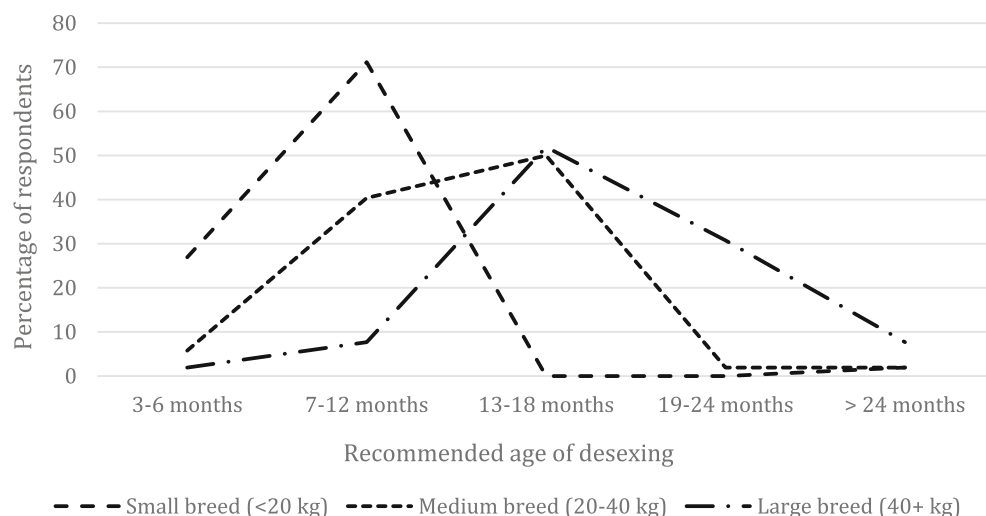


Figure 2. Recommended age of desexing for female dogs by expected adult weight category, expressed as a percentage of respondents ($n = 72$).

Table 2. Percentage of respondents (total $n = 129$; for male dog $n = 65$, for female dog $n = 64$) who reported frequency of use (routinely, often, sometimes, rarely, never) for each of the listed premedication, induction and postoperative pain relief options for routine desexing. Data for male and female dogs combined

Premedication	Routinely	Often	Sometimes	Rarely	Never
Acepromazine	30.5%	18.0%	20.3%	21.9%	9.4%
Alfaxalone	31.7%	9.5%	12.7%	19.8%	26.2%
Ketamine	1.6%	3.2%	16.1%	33.1%	46.0%
Medetomidine	44.5%	21.9%	18.0%	12.5%	3.1%
Midazolam	3.2%	5.6%	21.4%	43.7%	26.2%
Tiletamine/Zolazepam	0.0%	0.0%	2.4%	13.8%	83.7%
Buprenorphine	4.8%	1.6%	7.2%	15.2%	71.2%
Butorphanol	1.6%	0.0%	6.3%	17.5%	74.6%
Fentanyl	0.0%	0.0%	1.6%	12.1%	86.3%
Hydromorphone	0.0%	0.0%	1.6%	4.0%	94.3%
Methadone	89.9%	7.0%	0.8%	2.3%	0.0%
Morphine	1.7%	0.0%	0.0%	10.8%	87.5%
Other	14.2%	0.0%	17.2%	5.9%	62.7%
Induction	Routinely	Often	Sometimes	Rarely	Never
Alfaxalone	60.0%	16.2%	16.2%	6.2%	1.5%
Gaseous	13.7%	0.0%	1.6%	8.0%	76.6%
Ketamine + diazepam	4.8%	1.6%	10.3%	20.6%	62.7%
Ketamine + midazolam	0.0%	0.8%	1.6%	14.5%	83.1%
Propofol	31.5%	11.0%	12.6%	15.7%	29.1%
Thiopentone	0.0%	0.0%	1.6%	1.6%	96.7%
Other	8.4%	0.0%	0.0%	0.0%	91.6%
Postoperative pain relief	Routinely	Often	Sometimes	Rarely	Never
Fentanyl IV	0.0%	0.8%	1.6%	3.9%	93.7%
Fentanyl patch	0.8%	0.8%	2.3%	3.9%	92.2%
Gabapentin	0.0%	2.3%	43.8%	18.8%	35.2%
Oral NSAIDs	93.9%	3.0%	1.5%	0.0%	1.5%
Oral buprenorphine	0.8%	0.8%	12.3%	21.5%	64.6%
Paracetamol	0.0%	8.5%	21.5%	37.7%	32.3%
Tramadol	0.0%	0.0%	0.8%	12.6%	86.6%
Other	20.0%	0.0%	5.0%	5.0%	70.0%

veterinarians, and ketamine-midazolam was reported to be used sometimes or rarely by 16.1% of veterinarians. One respondent reported using an alternative, unlisted induction protocol.

Postoperative oral non-steroidal antiinflammatory drugs (NSAIDs) were reported to be routinely used by 93.9% of veterinarians. Twenty percent of respondents reported routinely using postoperative analgesia not listed in the survey, including injectable NSAIDs, repeating parenteral injection of buprenorphine and methadone, and transdermal fentanyl patches. Several additional drugs were noted to be used 'often', 'sometimes' or 'rarely', with gabapentin, paracetamol and oral buprenorphine being the most represented and to a lesser degree tramadol. These results indicate that while these additional drugs are not considered to be routine postoperative pain relief, one or more of these drugs is considered for use non-routinely by a majority of veterinarians.

Local anaesthetics. Local anaesthetic was not reported to be routinely used by a majority of respondents (Table 3). For male dogs, 33.3% of respondents reported routinely using intratesticular blocks, and 4.8% routinely using spermatic cord blocks. For female dogs, 15.6% respondents reported routinely using splash or ovarian pedicle blocks. Twenty-eight percent of respondents reported never using any form of local anaesthetic blocks for routine surgery, with over half of respondents reporting never using splash blocks, ovarian pedicle blocks or spermatic cord blocks. Free-text responses noted occasional use of pre-scrotal blocks and transversus abdominis plane (TAP) blocks. Data were only collected for the use of each individual local anaesthetic block, and not on the combination of different techniques or blocks.

Additional comments

Respondents were invited to provide any final comments in an open text box. Responses were varied, but several consistent comments emerged. Several respondents ($n = 9$) described making desexing decisions collaboratively with owners and individualising recommendations according to patient-specific factors. Several ($n = 4$) highlighted a commitment to evidence-informed practice and to incorporating updated guidelines into clinical decision-making. Some respondents ($n = 5$) noted challenges in keeping pace with evolving evidence around 'best practice' recommendations, as well as perceived societal expectations favouring routine desexing. Concerns were also raised regarding limitations of existing studies, including small sample sizes and potential confounding factors ($n = 2$). Practical constraints were reported, including financial limitations, geographic context and the influence of charitable or shelter settings on decision-making ($n = 5$). Several respondents ($n = 4$) reported

limited familiarity with alternative desexing procedures beyond routine orchiectomy and ovariohysterectomy, and expressed interest in additional training or support to offer procedures such as vasectomy, ovary-sparing spay and ovariectomy.

Discussion

Demographic data

Demographic questions mirrored those used in the AVA's 2023/2024 Veterinary Workforce Survey,²² to assess representativeness relative to the Australian veterinary workforce. Respondent characteristics broadly matched with national workforce data, suggesting reasonable alignment with the practising Australian veterinary population. As with other voluntary surveys, response bias cannot be excluded in this study. Given the small sample size relative to the overall practising population and the aims of this survey, the minor demographic discrepancies are unlikely to meaningfully undermine the findings or their interpretation.

A greater proportion of respondents identified as female (84.3%) than in the Workforce Survey (69.7%). Respondents were predominantly from small animal general practice (79.3%), consistent with the study's focus on veterinarians actively performing routine canine desexing procedures, with fewer from mixed, locum, emergency, specialty and referral practice. Employment status was comparable to Workforce survey data, with employed/associate veterinarians comprising 72.0% versus 62.7%, and practice owner or partner with 29.4% versus 25.7%, respectively. Direct comparison of clinic size was limited by differences in categorisation between surveys. However, when adjusted for structural differences (e.g., multi-location and corporate practices), the distribution across small, medium and large practices differed by less than 10% in each category.

Respondents reported working fewer hours per typical week than those in the 2021 Workforce Survey, with only 9.8% versus 45.6% working more than 40 h per week.²³ Equivalent data were not reported in the 2023/2024 Veterinary Workforce Survey, so a direct comparison is not possible, and the reason for this difference is unclear but may reflect sampling variation. More respondents reported practising in Victoria (45.7%) than in the national workforce data (29%), and there was a higher proportion of graduates from the University of Melbourne (27.7% vs. 19%), likely reflecting regional recruitment patterns associated with survey distribution. As the topics explored were not region-specific, the observed demographic variation is unlikely to substantially alter the interpretation of national practice patterns.

Table 3. Percentage of respondents ($n = 66$) who reported frequency of use (routinely, often, sometimes, rarely, never) for each of the listed local anaesthetic blocks for routine desexing in dogs

	Routinely	Often	Sometimes	Rarely	Never
Intratesticular block	33.3%	16.7%	15.2%	9.1%	25.8%
Line block	16.7%	13.0%	16.7%	12.1%	40.9%
Spermatic cord block	4.8%	4.8%	1.6%	12.7%	76.2%
Splash or ovarian pedicle block	15.6%	9.4%	14.1%	7.8%	53.1%
Other	16.7%	8.3%	0.0%	0.0%	75.00%

Surgical approach to desexing

While most respondents recommended routine desexing, considerable variation was observed in timing recommendations, surgical approaches and perioperative management. Qualitative responses further indicated that clinicians frequently tailor decisions to individual patient and owner circumstances.

Across surgical approaches, orchiectomy in male dogs and ovariohysterectomy (OHE) in female dogs were clearly the dominant procedures offered and performed. All respondents reported offering orchiectomy, and almost all offered OHE. Alternative techniques, including vasectomy, ovariectomy and ovary-sparing spay, were offered by a minority of clinicians. A clear discrepancy was observed between recommendation and performance of alternative surgical techniques. Although some veterinarians indicated that vasectomy, ovariectomy and ovary-sparing spay may be appropriate in selected cases, these procedures were rarely performed in practice. For example, 39% of respondents reported rarely recommending vasectomy, yet 85% reported never performing the procedure. Similarly, approximately 10% of respondents routinely or often recommended ovariectomy, but none reported routinely performing it. Ovary-sparing spay was sometimes or rarely recommended by 29% of respondents yet was infrequently performed (<5%).

These findings highlight a distinction between conceptual acceptance of alternative techniques as appropriate and practical adoption within routine clinical settings. Potential explanations include familiarity with traditional techniques, limited training exposure, equipment constraints, client choice and referral patterns. Qualitative responses further indicated that some veterinarians perceive skill limitations as a barrier and expressed interest in expanding their surgical repertoire.

Whether broader adoption of alternative desexing techniques should be encouraged remains a complex issue. Comparative evaluation of surgical methods is beyond the scope of this study but has been reviewed in detail elsewhere, including Romagnoli et al.¹² The appropriateness of different approaches is likely to vary across clinical contexts, depend on patient factors, owner circumstances and practitioner experience with each procedure. Although this survey identified a discrepancy between recommendation and performance, it did not investigate the specific reasons underlying this pattern. Further research is required to explore factors influencing procedural choice, including training exposure, confidence, equipment access, client decision-making and referral pathways.

The present findings indicate that alternative surgical approaches to orchiectomy and OHE are recognised by veterinarians as clinically appropriate in selected cases, yet remain infrequently performed in routine practice. Qualitative responses suggested interest in expanding surgical skill sets and utilising context-specific and evidence-based decision-making to procedure selection. Educational initiatives may support clinicians who wish to broaden their procedural competencies. Overall, the findings suggest practitioners' desire to expand relevant skill sets and increase the offering of alternative surgical approaches. Targeted training during veterinary education or continuing professional development may be a practical strategy to address this gap.

Ovariectomy is perceived to result in less intra-abdominal tissue trauma, be quicker to perform and have less risk of ureteral ligation at the uterine body. Romagnoli et al.¹² assert that where gonadectomy is recommended in the female, in the absence of obvious uterine pathology, ovariectomy should be the preferred procedural choice, yet none of the respondents reported routinely utilising this procedure. Many veterinary training programmes teach ovariohysterectomy primarily to ensure adequate skills acquisition, not solely for desexing but to manage conditions such as pyometra.

Recommendations for desexing

There were notable differences in the reasons for recommending desexing between male and female dogs. Although prevention of unwanted mating was commonly cited for both male and female dogs (89% and 94%, respectively), behavioural modification was more frequently reported as a reason for recommending desexing male dogs (87%) than female dogs (57%). This likely reflects the recognised association between male gonadal hormones and behaviours such as roaming, mounting and urine marking. Existing literature supports a reduction in libido, roaming and marking following desexing in male dogs, although behavioural outcomes are variable and context-dependent.^{1,2,24} Evidence relating to reduction of aggression is less consistent, with some studies demonstrating reductions in specific forms of dog-dog aggression, while others suggest limited or context-specific effects.^{25–27}

Current evidence also suggests that desexing may, in some cases, be associated with increased fearfulness or anxiety-related behaviours, particularly in predisposed individuals.^{26,28} The complexity and inconsistency of reported behavioural outcomes may contribute to variation in practitioner recommendations. In certain at-risk dogs, desexing has been associated with increased fear- and anxiety-related behaviours, which may in turn elevate the risk of undesirable behavioural outcomes, including fear-based reactivity such as mounting, resource guarding and both dog-dog and dog-human aggression. The present survey did not explore specific behavioural indications for desexing or the potential role of temporary medical castration, which warrants investigation in future studies to provide a better overall understanding.

Approximately two-thirds of respondents cited population control as a reason for recommending desexing in both male and female dogs. The extent to which desexing of client-owned dogs contributes to population-level reduction remains debated in the literature.^{2,29} It is possible that respondents interpreted 'population control' as prevention of unwanted litters at the household level rather than reduction of regional dog numbers, and further qualitative investigation of this question would help to increase understanding of how practitioners conceptualise population control.

Most respondents cited health benefits to the individual as a reason for recommending desexing in both males and females (81% and 92%, respectively). Specific expected health outcomes were not explored in this survey; therefore, it is unclear which conditions informed these recommendations. Respondents referenced reduction in mammary neoplasia, pyometra and prostatic disease in open-text responses. While prevention of pyometra and testicular disease is well established, the broader balance of health risks and benefits

associated with desexing remains an area of ongoing research and debate.² Collectively, these responses highlight that clinical recommendations for desexing are largely guided by recognised disease prevention benefits, despite ongoing uncertainty and debate regarding long-term health trade-offs.

Veterinary education was identified as an enduring influence on clinical practice, with 41% of respondents indicating that how they were taught at university remained a primary determinant of their approach to routine desexing. Given the mean graduation year of 2009, this finding highlights the long-term impact of undergraduate training on procedural norms and underpins the importance of ensuring universities are teaching current best practice while providing graduates the skills to develop their practice in line with changing evidence in their future careers.

More than half of respondents reported adopting new techniques or methodologies over time. Self-directed learning and advice from colleagues were frequently cited for surgical recommendations, alongside reference to contemporary literature and professional guidelines. Approximately one-third of respondents reported mentorship from a senior veterinarian as influential. Fewer respondents (38%) indicated adherence to formal clinic protocols, suggesting that there is substantial individual autonomy in desexing decision-making.

Recommendations for practice

Our findings indicate that veterinarians demonstrated a high degree of individualised care for patients, and that this generally followed current guidelines. Animal age was the primary determinant of the recommended timing of desexing, with no overall difference between male and female dogs. Expected adult size and breed were key determining factors, with larger expected adult size associated with significantly later recommended age of desexing. This pattern aligns with emerging evidence that early age neutering in certain breeds and in dogs expected to reach a larger adult size is associated with increased risk for the development of both orthopaedic and neoplastic diseases.^{9,10}

Given the popularity of the two Hart et al.¹⁰ papers, as evidenced by the number of respondents that cited them in their decision-making, it is important to note that while these papers reported an association with early age neutering, they did not demonstrate a causal relationship. To the authors' knowledge, there are no current studies that establish a causal association between early age neutering and increased risks of orthopaedic or neoplastic conditions, and further work is needed to explore these possible relationships. Therefore, while these associations warrant consideration, the limitations of the evidence available should be disclosed and weighed alongside other factors when advising on age of neutering decisions.

Owner preference was an important determinant for decision-making alongside practical considerations such as financial considerations and management factors (e.g., temperament and housing). These findings underscore the collaborative and shared nature of desexing decision-making in client-owned animals and reflect the contextual framework emphasised in recent guidelines.

For female dogs, there was variability in the minimum recommended age of desexing, although relatively few respondents (18%) reported desexing prior to 4 months of age. While there is no universally endorsed minimum age in current guidelines, there is general agreement that desexing after 6 of age is preferred, with increasing support for risk-based consideration in decision-making, particularly in larger breeds.⁹ Early or juvenile desexing in female dogs may lead to recessed vulva, perivulvar dermatitis or persistent urinary tract infection and juvenile vaginitis,³⁰ and there is some evidence for increased risk of urinary sphincter mechanism incontinence (USMI) in larger breed dogs desexed at a young age.^{5,12} Further investigation into factors influencing veterinarians' determination of minimum age recommendations would provide useful clarification.

The time elapsed since last oestrus was also commonly considered, with a mean interval of 1.8 months prior to surgery being recommended. An average recommended interval of 1.8 months after oestrus may, in some bitches, still coincide with late dioestrus rather than true anoestrus. Late dioestrus may be associated with increased uterine vascularity and elevated prolactin, which may elevate the risk of iatrogenic pseudopregnancy and surgical complexity.^{12,31}

The number of previous oestrous cycles was less consistently used as a determinant of desexing timing. A slight majority of respondents (59%) recommended allowing one oestrous cycle prior to desexing, compared with 41% recommending desexing prior to the first oestrus. This may reflect debate regarding the balance between the reduction in mammary tumour risk associated with early desexing and emerging concerns regarding orthopaedic, neoplastic and behavioural outcomes. Further investigation is warranted considering the reported potential associations between early desexing and conditions such as perivulvar dermatitis, juvenile vaginitis and USMI.^{5,12,30}

Brachycephalic obstructive airway surgery and prophylactic gastropexy were recommended as concurrent procedures by a majority of veterinarians. This likely reflects breed-related morbidity and potential mortality from these conditions, as well as the logistical advantage of combining procedures under a single anaesthetic event. In contrast, corrective procedures for hip dysplasia were discussed by only 13% of veterinarians, and 15% of veterinarians did not routinely discuss any additional surgeries. Recommendations for umbilical hernia repair and removal of retained deciduous teeth were mentioned in free-text boxes by several respondents. These are very commonly observed conditions which are often addressed opportunistically during routine surgery. Dewclaw removal was mentioned by several respondents, likely as prophylactic for potential future injury. However, the evidence supporting routine prophylactic removal is limited.³² AVA guidance states that routine prophylactic dewclaw removal is not acceptable without clear evidence of medical need to the individual patient.³³ However, practice patterns may vary according to clinician preference and owner expectations.

Premedication, induction and postoperative pain relief

We hypothesised that female dogs would receive more extensive multimodal analgesia than male dogs, reflecting the greater surgical tissue trauma associated with ovariohysterectomy compared with orchiectomy³⁴; however, no significant difference in reported drug use was observed between sexes across premedication, induction and

postoperative analgesia. This suggests broadly comparable analgesic approaches for male and female routine desexing procedures. Individual drug combinations were not recorded due to the challenge of an overwhelming number of individual combinations reported in previous surveys of anaesthesia and analgesia protocols.¹⁷ Therefore, while responses likely reflect concurrent sedative and opioid administration, this cannot be confirmed.

Medetomidine, alfaxalone and acepromazine were the most commonly reported sedatives, and methadone the predominant opioid used for premedication. These agents are consistent with contemporary anaesthetic recommendations for healthy (ASA status 1) patients.³⁵ Buprenorphine and butorphanol were used routinely by a small minority of respondents; although these agents provide analgesia, their duration and potency differ from full μ -agonists and appropriateness may vary depending on clinical context.³⁶ Ketamine and midazolam were used routinely by a very small number of veterinarians, but were reported as being used sometimes or rarely by a majority of veterinarians, indicating that while they are not considered a routine premedicant, they are used as an option for routine desexing by a majority of practising veterinarians. The additional use of gabapentin and trazodone was noted by several respondents, which reflects an appropriate use of these medications for pre anaesthetic anxiolysis in line with the recommendations of the American Animal Hospital Association.³⁵

Alfaxalone and propofol were reported to be the preferred induction agents, with a smaller proportion reporting use of ketamine-based combinations. These agents are widely accepted induction choices in general practice.³⁵ Approximately 14% of respondents reported routine gaseous induction. While inhalational induction may be used in specific circumstances, it may be associated with increased occupational exposure to volatile anaesthetic agents if not carefully controlled.³⁷ Gaseous induction can also cause increased patient stress and is not recommended as a method of induction in the American Animal Hospital Association (AAHA) Anaesthesia and Monitoring Guidelines.³⁵

Oral NSAIDs were reported to be routinely prescribed by the majority of respondents for postoperative analgesia, with some clinicians also reporting the use of additional agents such as gabapentin, paracetamol or repeat opioid administration. These findings suggest that baseline analgesia is commonly provided, although the extent of multimodal strategies varied. However, the provision of effective analgesia for surgery is an important clinical and ethical obligation, and consideration should be given to the best achievable clinical management of pain and not the base requirements. Generally, an appropriate opioid during surgery and postoperative NSAID is appropriate to manage inflammation and maladaptive pain responses in most dogs undergoing routine desexing surgery.^{35,36} The use of appropriate multimodal analgesia is important for animal welfare and facilitates improved patient outcomes.³⁸

Local anaesthetic techniques were infrequently used. While intratesticular and ovarian pedicle blocks were utilised by a subset of veterinarians, the majority reported never using routine local blocks. Local anaesthesia is widely recognised as a safe and effective component of multimodal analgesia and is highly recommended where feasible in surgical patients.³⁵ A recent UK survey reported a higher

uptake of local techniques during desexing procedures,³⁹ suggesting possible geographic variation in practice patterns.

Our findings suggest that local anaesthetic is underutilised by Australian veterinarians in the routine desexing of dogs. The low cost, widespread availability, ease of use and high efficacy for pain management of local anaesthetics^{35,36,38} aligns well with the AAHA recommendation that 'local anaesthetics should be utilized, insofar as possible, with every surgical procedure'.³⁵ Therefore, further investigation into the causes for the relatively low use of local anaesthetics is strongly encouraged, to help better guide the future encouragement of their use. Uptake may be influenced by factors such as clinician training and confidence, perceived time or financial constraints, access to resources and assumptions regarding client expectations.

Limitations

This study has several limitations that should be considered when interpreting the findings. Participation was voluntary and recruitment occurred primarily through professional networks and social media, introducing potential selection bias. Veterinarians with a particular interest in desexing practices or evolving guidelines may have been more likely to participate. Although respondent demographics were broadly aligned with national workforce statistics, the overall sample size was modest relative to the Australian veterinary population, and geographic over-representation of Victoria was observed.

Data were self-reported. Social desirability bias may have influenced responses, particularly in areas relating to analgesia or adherence to guideline-based care. In addition, specific drug combinations, dosages and clinical decision pathways were not captured, limiting a detailed interpretation of perioperative protocols. The survey was designed to provide a breadth of information and did not explore the underlying reasoning behind many clinical choices. For example, behavioural indications for desexing, interpretation of population control and determinants of surgical procedural timing were not examined in depth. As such, causal inferences cannot be drawn from the observed associations.

Finally, cross-sectional design precludes assessment of temporal change. Desexing practices are evolving in response to emerging evidence, and the findings represent a snapshot of practice during the study period.

Acknowledging these limitations, this survey provides important contemporary descriptive insight into canine desexing practices across a diverse group of Australian veterinarians and highlights areas warranting further investigation.

Conclusions

This study provides insights into the attitudes and clinical practices of Australian veterinarians regarding routine canine desexing. Respondent demographics were broadly aligned with national workforce characteristics, although participation was voluntary and the sample size was modest.

Overall, the findings suggest that desexing recommendations are frequently contextualised and reflect contemporary guideline principles,

particularly with respect to individualised timing decisions based on patient factors. Traditional surgical approaches remain dominant, and a discrepancy was observed between the recognition of alternative techniques and their implementation in practice. Areas of potential divergence from current evidence-based recommendations included that a number of veterinarians routinely use volatile anaesthetic agents for gaseous induction, relatively low routine use of local anaesthetic blocks and variation in recommended interval following oestrus prior to surgery.

While this study describes current patterns of practice, it does not elucidate the underlying reasoning driving these decisions. Several themes identified, including behavioural indications, surgical procedure choice and timing considerations, warrant further qualitative exploration. An improved understanding of clinical decision-making processes will inform professional education, guideline development, future research priorities and ultimately improve patient outcomes.

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site: <http://onlinelibrary.wiley.com/doi/10.1111/avj.70146/supinfo>.

Appendix S1. Desexing survey – perspectives, practices and procedures.

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