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Cat Management in an unregulated shelter environment:

Relationship between care provision and cat health in Hong Kong

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Raw data can be assessed by contacting S-KK

Abstract

Cat shelter practices may have important implications for cats’ health and wellbeing. This study explored the relationship between husbandry practices and cat health in Hong Kong’s shelters which are unregulated. Cat health was measured by body condition score (BCS), coat condition and signs of oculo-nasal discharge. A total of 314 cats in 24 cat shelters were assessed. A satisfactory BCS was associated with regular veterinary input (odds ratio 8.21, 95\% confidence interval [CI] 2.97-22.7; \( p=0.001 \)), more than once per day disinfection (OR 2.37, 95\%CI 1.06-5.31; \( p=0.038 \)) and more than once per day change in water (OR 5.30,
The presence of oculo-nasal discharge — as a marker of upper respiratory tract infection — was associated with a lack of regular veterinary input (OR 0.35, 95CI 0.16-0.77; p=0.014) and less frequent change of water within the shelter (OR 0.38, 95CI 0.17-0.81; p=0.013). A lack of regular feeding (OR 0.10, 95CI 0.04-0.29; p=0.008) was the only factor associated with a dull coat. In summary, this study showed that some husbandry practices had important associations with different aspects of cats’ health for cats housed in an unregulated shelter environment in Hong Kong. These findings provide evidence-base support for husbandry guidelines or regulations for cat shelters which could have a positive impact on cats’ health and welfare for cats housed in a shelter.

Keywords: cat shelters, cat health, feeding regime, husbandry, regulation, welfare.
Introduction

Cats (*Felis silverstris catus*) are popular household pets worldwide (Sparkes et al 2013). According to Hong Kong’s Government Census, the total number of surveyed households keeping cats increased from 19% in 2005 to 76% in 2018 (Census & Statistics Department HKSAR, 2019). With a local population of seven million people, there is therefore a high density of cats in Hong Kong. Unfortunately, not all cats are owned and homed. Currently, there are both government and non-government organizations helping the un-owned or abandoned/stray cat population. Traditionally, these may include municipal shelters and a mixture of rescue group facilities and foster homes.

Shelters can be defined as those that provide a temporary home for dogs, cats, and other animals that are offered for adoption and may receive charitable funding (Shelter Terminology, Association of Shelter Veterinarians). With societal development, many novel cat holding facilities have evolved. In Hong Kong, these include cat cafes, “shared office” type facilities that double up as cat adoption centers, commercial offices and even a bookshop that acts as a cat sanctuary. In this study we refer to all types of cat holding facilities/units as “shelters” given the extreme heterogeneity of provision (Association of Shelter Veterinarians Shelter Terminology 2017).

The management and practices of cat shelters vary substantially and there is no “shelter registry” or strict regulation/licensing system to guide husbandry practices in Hong Kong. Hence, the welfare of the animals held within these premises is completely contingent on the organization’s processes and can be a welfare concern (Rioja-Lang et al 2019).

The “Guidelines for Standards of Care in Animal Shelters” published by the Association of Shelter Veterinarians covers generalized aspects of cat care (Newbury et al 2010). The
“Rescue Group Best Practice Guide” published by the Humane society (Humane society USA PetSmart 2017) and the International Society for Feline Medicine (ISFM) Guidelines (Sparkes et al 2013) are similar, laying out the basic principles of care across different cat holding facilities with substantial focus on population control. International Cat Care (UK) has recently launched their “Cat friendly solutions for unowned cats”, targeting the logistic of care for this particular group of cats. (International cat care 2021). In Hong Kong, the Agriculture, Fisheries and Conservation Department (AFCD) has issued some general information on good cat care practice, with forthcoming public consultation on duty of care and how to enhance the provisions for the prevention of cruelty for specific animal species (Agriculture Fisheries & Conservation Department, HKSAR n.d.). Currently, there are no definitive international guidelines on how to optimize cats’ welfare through husbandry practices and also how to monitor cats’ health in shelters.

Welfare Assessment Indicators

The wealth of animal welfare assessment literature primarily stemmed from the Welfare Quality consortium for farm animals (Mellor 2015a, 2015b, 2016a, 2016b; Mellor & Beausoleil 2015). Reliable health assessments need to be species-specific and ideally non-invasive. Previous studies have used behavioural observations and physiological measures of stress to reflect cats’ health (Kry & Casey 2007; Rochlitz 2014). Currently, no single indicator can be reliably used to reflect the overall welfare of a cat. Nonetheless, physical parameters such as coat condition and body condition score (BCS) have both been found to be stable over time and have inter-rater reliability (Arhant et al 2015; Zito et al 2019), and BCS is also consistently used as a welfare indicator for different farm animals and companion animals (Wemelsfelder & Mullan 2014; Barnard et al 2015; Zito et al 2019).
Cats in shelters can be easily stressed (McCobb et al 2005) and stress can be translated into poor appetite and reduced immunity with a higher risk of infection, with the first sign usually including oculo-nasal discharge. Indeed, an association between stress-induced weight loss and upper respiratory infection (URI) in cats has been reported (Tanaka et al 2012). In addition, a poor coat condition is also related to stress in cat shelters (Arhant et al 2015). As such, weight loss resulting in a lower than normal body weight, infection and poor coat condition can all potentially be considered as reliable physical indicators of a cat experiencing stress.

Currently little is known about the health and welfare of cats in unregulated shelter environments which are common in Hong Kong. Many of these unregulated shelters rely not only on financial donations, but also material donations of food and cat litter. In addition, many factors may remain unmanaged, including environmental issues such as noise from other animals, frequent addition of unfamiliar cats, failure to provide hiding places or perches/scratch posts, unfamiliar human encounters, and a lack of regular supply of food and litter substrates. Because variations in housing and husbandry practices may affect cats’ health (Ottway & Hawkins, 2003; Gourkow & Fraser, 2006; Ng, 2011), we sought to characterise the welfare situation of cats housed in unregulated cat shelters in Hong Kong. Specifically, we aimed to assess the factors that are important in determining the health and welfare of Hong Kong’s shelter-housed cats.

Methods

Selection of cat shelters for the study
Because there is no publicly available registry for cat shelters in Hong Kong, we recruited cat shelters via:

1. The local Inland Revenue Department’s list of charitable organisations, with the words “cat”, “animal”, and “pet” searched in both languages (Chinese and English) (Inland Revenue Department HKSAR, n.d.)

2. Volunteer network referrals

Each shelter was invited with a letter which included a brief summary and logistics of the study. Shelter visits and data collection were conducted between June 2019 and November 2019.

Criteria for entering the study included:

1. Shelters with definite catteries

2. Premises that hold at least 10 cats that were adopted or rescued.

3. Cats were recruited if they have been in the shelter for more than four weeks. Cats entering shelters take about two weeks to adjust, therefore a four-week period had been identified as a suitable cut-off time-point considered as a “long stay” (Rochlitz 2014).

Shelters holding cats for less than four weeks only, or cats staying in shelters for less than four weeks were excluded in this study.

Consents for recruitment into the current study were obtained from the shelter representatives.

No financial incentive was offered for participation in this project, and participants could withdraw from the study at anytime. Many of the shelters expressed specifically that the cats were not to be handled or disturbed; hence the cats were assessed using welfare indicators that could be observed.
Data collection

The shelter representative or contact person was interviewed via the use of a questionnaire (see appendix) which included information on shelter managerial characteristics (e.g. funding support of the shelter, record keeping, staff numbers) and husbandry practices (e.g. frequency of feeding, litter change, disinfection, etc). Regular feeding was defined as food provided daily at roughly similar time points and removed after a set interval. “Non-regular feeding” was considered to be those shelters which provided ad lib feeding or free feeding where food is accessible for 24h.

Any information that could not be obtained from the questionnaire was gathered during the visit. Using our previous unpublished data (Kong et al 2018), a sample size of 15 cats per shelter would allow us to have 90% to estimate the mean BCS of all the cats housed within the same shelter, assuming that the mean and standard deviation of the BCS were 2.5 and 2.7, respectively, and an alpha value of <0.05 was taken as significant. Thus, upon visiting, 15 cats were randomly chosen for observation of their body condition score, coat condition and presence of oculo-nasal discharge.

Cats were included in the study if they had stayed in the shelter for more than four weeks. Cats that were un-neutered, sick (in isolation or in quarantine or with chronic oculo-nasal disease), kittens, pregnant cats and cats in hiding or where the face was not visible were not included. Randomisation was performed with the rolling of a die. The first cat seen by the assessor on entry to the premises was taken as subject number one. Then a die was rolled to generate a number. Eg three. The third cat seen from the first subject was then chosen as the second subject. For shelters with free roaming cats, a convenience sample of cats was obtained. For shelters with group housing and free roaming cats, the same cat would not be
chosen twice. For shelters that held fewer than 15 cats, all cats that fulfilled the inclusion
criteria were assessed.

A single assessor (S-KK) visited all cat shelters and performed all the assessments. The
estimated age/breed/sex of the randomly selected cats were recorded. The body condition
score of each cat recruited into the study was assessed using the “Body and Muscle Condition
Score” (International Cat Care, n.d.), where the body condition was scored and grouped into
categories: 1=“very thin”, 2=“thin”, 3=“normal”, 4=“overweight” and 5= “obese”.

Oculo-nasal discharge was graded as “none/low” (no clinical discharge or mild clinical signs
involving a single site), “mild” (clinical signs involving more than one site, mild , purulent
ocular or nasal discharge without any other signs, or severe clinical infection involving one
site), or “moderate to severe”(severe clinical signs involving one site in addition to purulent
ocular or nasal discharge, or mild clinical signs involving one or more site and presence of
sneezing during examination) (Tanaka et al 2012). Cat’s coat condition was dichotomised as
either “shiny” or “dull” (Arhant et al 2015).

In addition, cleanliness of the premises was graded as good, moderate or poor. Cleaning
involved “sweeping and dusting followed by washing with a detergent to leave a clean
surface” whereas disinfection involved “applying a disinfectant agent to an already clean
surface to kill micro-organisms such as viruses, ringworms spores and bacteria” (Haughl
1998). The cleanliness was considered good when there were no visible debris on the floor,
moderately clean when there was some visible debris on the floor. Poor cleanliness was when
the premises were dirty with substantial visible debris, and mould in the environment (Arhant
et al 2015). Odour (of cat urine) of the premises was rated as strong, mild, or none on first
entry.

**Ethics approval**
This project was approved by the University of Edinburgh Human (Research) Ethical Review Committee and School of Veterinary Medicine Ethical Review Committee (HERC_349_19).

**Statistical analysis**

Data collected were analysed using SPSS for Windows (version 22, IBM, USA). In this study, three outcomes — body condition score, upper respiratory tract signs (ocular-nasal discharge) and coat condition — were considered as the main outcomes of interest. For ease of interpretation, all three outcomes were dichotomised in the multivariable logistic regression analysis and a body condition score more than or equal to three was considered as satisfactory (although body condition scores of four or five are considered problematic, in this case under nutrition/poor condition was considered a more pressing issue). One-way analysis of variance (ANOVA) was first used to assess whether regular feeding and veterinary check-ups were associated with a higher BCS. Predictors related to husbandry practices that could have affected cats’ health conditions were then further analysed by multivariable logistic regression with Generalised Estimating Equation (GEE) (Wang 2014) to account for potential clustering effect within each shelter. All analyses were two-tailed and a p value <0.05 was considered significant.

**Results**

The characteristics and the other relevant parameters of each cat shelter are described in **Table 1**.

**Shelter management characteristics**
Of the 45 shelters recruited, 18 did not respond and three responded but did not fulfil the inclusion criteria. Of the 24 cat shelters (with 314 cats) included in our analysis, four were foster homes, three were rescue group holding facilities, six were sanctuaries, and 11 were shelters with charity status. Some of the latter 11 shelters also housed animals other than cats, mostly dogs. Cat movement in/out of the premises- addition of new cats; “live exit”- whether adopted or moved to another shelter; or died – naturally or euthanized over 12 months (on date of visit) were reported in 17 shelters (71%). Management policies — including documentations on admission/ isolation, adoption, cleaning guidelines, disaster protocols, and staff training records — were complete in 12 (50%), incomplete in three (12%), and absent in 9 shelters (38%).

Health records were complete only in 13 shelters (54%); health records were either incomplete (n=10, 42%) or absent (n=1, 4%) in other shelters. For those shelters with complete health records, all the cats were vaccinated and dewormed. For shelters where the records were incomplete or absent, the vaccination/deworming status of the cats were unknown.

Of the eight shelters (33%) that provided regular veterinary checks for the residing cats, the shelter representatives were unable to elaborate what type of veterinary care was provided.

Most of the time, in addition to one employed staff member, there were two volunteers looking after the cats in each location.

**Husbandry practices**

Daily cleaning was conducted in two (17%) shelters, and in 20 shelters (83%) cleaning of the cat holding area was performed more frequent than once daily. Disinfection was carried out less than once daily in nine shelters (38%), daily in nine (38%) and more than once daily in
six shelters (24%). Cats were regularly fed (at fixed times with the food bowls removed between meals) in 13 shelters (54%). The same brand of food was offered to cats in 14 shelters (58%).

Of the 181 cats in the 14 shelters offering same-brand food, 73% (144/181) had a body condition score of more than three, compared to 53% (70/133) of cats that were not fed the same brand of food (133 cats in 10 shelters).

Water was changed daily in 29% (7/24) of the shelters and more than once daily in 17% (17/24). Litter was changed less frequent than once daily in 4% (1/24), daily in 33% (8/24) and more than once daily in 63% (15/24) of the shelters; 83% (20/24) of the facilities used the same brand of cat litter. The mean number of litter boxes per cat was 0.6 (standard deviation 0.3), and the mean number of cats per litter box was 1.5 (standard deviation 2.0).

**Cat health data**

Almost all cats in the study were Domestic Short Hair (DSH) (96%). The premises were deemed clean in 71% (17/24), moderately clean in 25% (6/24), and poor in 4% (1/24). Odour of cat urine was strong in 4% (1/24), mild in 50% (12/24) and absent in 38% (9/24).

Most cats have a BCS of three (170/314 [54%]), and 110 cats (35%) had a BCS of less than three. Only 34 cats (11%) had a BCS more than three. Oculo-nasal discharge and a dull coat were noted in 28% (88/314) and 16% (51/314) of the cats, respectively.

In shelters where regular feeding (n=167, 53%) and regular veterinary checks (n=96, 30%) were provided, cats were more likely to have a higher BCS (regular feeding: mean 2.9 with standard deviation 0.7 vs ad hoc feeding: mean 2.7 with standard deviation 0.7, one-way ANOVA p=0.017; and regular veterinary checks: mean 3.0 with standard deviation 0.6 vs
without regular veterinary checks: mean 2.7 with standard deviation 0.8, one-way ANOVA p=0.001) (Figure 1 and 2).

The results of the multivariable model showed that cats with a satisfactory BCS were associated with (a) regular veterinarian checks (odds ratio [OR 8.21, 95% confidence interval [CI] 2.97-22.7; p=0.001, (b) frequent disinfection than once per day (OR 2.37, 95CI 1.06-5.31; p=0.038) and (c) regular change of water more frequent than once per day (OR 5.30, 95%CI 2.24-12.5; p=0.001). Cats with oculo-nasal discharge were less frequently observed in premises with (a) regular veterinarian checks (OR 0.35, 95%CI 0.16-0.77; p=0.014) and (b) regular change of water more frequent than once per day (OR 0.38, 95%CI 0.17-0.81; p=0.013). Regular feeding was the only predictor associated with a reduced risk of dull coat (OR 0.10, 95%CI 0.04-0.29; p=0.008) (Table 2).

The overall key findings of the predictors of cats’ health housed in the unregulated cat shelters are summarised in Table 3.

Discussion

The predictors of cat health reported in both model A and B in the current study were consistent and similar to a smaller study conducted by the first author (Kong et al 2018). Namely, regular veterinary input, regular disinfection, regular change of water and regular feeding were associated with better health, as defined by a higher but not the highest body condition score; less oculo-nasal discharge, and the coat being less dull. These results have some health implications for shelter cats.
Feline URI is one of the commonest diseases in cat shelters (Steneroden et al 2011a) and the second highest reason for euthanasia (Bannasch & Foley 2005). As such, it is a major welfare concern.

Previous studies have identified a number of factors that may reduce the development of URI, including:

1. Veterinary services on site (Bannasch & Foley 2005)
2. Regular vaccination (Binns et al 2000)
3. Increase length of stay (Edwards et al 2008 – duration 50 days)
4. Quarantine and isolation area available (Edwards et al 2008)
5. Intake housing/ floor space more than eight square feet (Wagner et al 2018)
6. Less movement between cages during first week in shelter (Wagner et al 2018)

As per Bannasch & Foley (2005), the present study found that with an increased frequency of veterinary check-up, the number of cats with oculo-nasal discharge decreased. This may be due to the associated proxy (or surrogate) measures such as better vaccination and prompt detection and treatment of medical illnesses. We noted that only 33% (8/24) of the cat shelters in Hong Kong instigate regular veterinary checks for the cats, and only two shelters have in-house veterinary services provided. These results suggest that shelters in an unregulated space may not seek appropriate veterinary care, the reasons for this require further investigation but may include financial resources or a lack of awareness of the problem. The situations in UK and United States of America (USA) appear to be better; 85% of vets surveyed in a UK study stated they provided vet services (free or discounted) for animal charities (Stavisky et al 2017) and 99.6% of shelters surveyed in USA had some form
of relationship with a veterinary practice (Laderman-Jones et al 2016). Laderman-Jones et al (2016) also reported that most shelters preferred to have an on-site veterinary service and 97% of shelters regarded veterinary input as essential.

The multiple roles veterinarians play in shelters have been outlined by the Association of Shelter Veterinarians (2014 Feb). Apart from providing direct and preventive medical care (vaccination/ surgery/ euthanasia/ trap neuter return programmes); the veterinarians also have a supervisory role in infection control and in education, training and forensics which, in Hong Kong, appear to be underdeveloped. Steneroden et al, (2011a) found that only 6% of shelters in USA involved the veterinary surgeon in their infection control practices.

This study found that presence of more volunteers/carers was associated with better health for cats (in the multivariable Model A). This may be due to the fact that increasing social interaction decreases stress in shelter cats (Rehnberg et al 2015; Vitale & Udell 2019). Indeed, cats had been shown to prefer human contact over inanimate objects (Shreve et al 2017). It may also increase the likelihood of earlier recognition of problems, allowing timely intervention; or be associated with the size, wealth and popularity of the shelter.

In support of this, a recent study investigating the incidence of URI in shelter cats found that those cats that were handled more frequently had less incidence of URI (Burns et al 2020). Whether more volunteers/ carers were associated with better disinfection was not studied.

Certainly, if managed properly, more manpower would help in everyday running of the shelter, including cleaning and taking the cats to the veterinarians for check up. However, the management of volunteers poses problems such as consistency of practice/ burnout/ infection control/ training/ turnover etc; which is beyond the scope of this discussion. (Neumann 2010, Steneroden et al 2011b, Guenther 2017)
Our study highlights the importance of regular disinfection, which was associated with a better body condition score, less oculo-nasal discharge and less likely to have a dull coat.

One cause of URI in cat shelters is from viruses. The pathogens were prevalent in comparable amounts in different cat holding facilities ((McNamus et al 2014). Most cats are carriers of the viruses with FCV (feline calici-virus) being shed continuously and the virus can live in the environment for up to a month (Möstl et al 2013). FHV (feline herpes virus) is shed when cats are stressed. The virus survives in the environment for a few days. URI pathogens can be transmitted via a variety of routes. Although direct contact and aerosol transmission are in many cases the most important, for environmentally resistant pathogens such as FCV, or when hygiene is poor, fomite spread can be extremely important in transmission. Hence regular disinfection with disinfectant is one of the essential components of infection control.

Poor premise hygiene (reflected in intensity of odour of the premises) has been associated with increased risk of URI (Helps et al 2005). Baumworcel et al showed that viral loads are higher in shelters that were not purposefully designed as shelters (Baumworcel et al 2019). Many of the shelters in the present study were of this type.

In order for infection control to be effective, adherence to good policies and training of shelter workers are both paramount. A guideline on the prevention of infection in cat shelters was published by the European Advisory Board on Cat Disease (Möstl et al 2013). Four main areas were addressed:

1. Housing – isolation and quarantine areas should be available and separate from main residency

2. Protocols should be written and available (infection control/ management)

3. All cats should be vaccinated on admission
4. Hygiene – regular staff training recommended

In a survey on 157 shelters in the USA, Steneroden et al, (2011a) found 15% of responding shelters had written protocols on infection control whereas 75% had policies on disinfection and cleaning. In the present study, policy documentation (including infection control) was only complete in 50% of shelters, and absent in 38%. Improper vaccination strategies predisposes to URI (Crawford et al, Maddies University n.d.). Shelter workers’ knowledge on infection control was not investigated in this study. This may warrant further research given the importance of infection on animal’s wellbeing in shelters.

Increasing the number of cats per litter box and the intensity of odour of the premises are indirectly associated with the cleanliness of the premises, which again have been shown to affect cat’s health (Arhant et al 2015). Litter box conflict also causes undue stress for cats (Gourkow 2016, Ellis et al 2017). However, there is no evidence to guide us how to define the optimal number of cats per litter box, either in the home setting or in a shelter. The number of litter boxes required is commonly regarded as “number of cats plus one”. In a survey on pet cats in the United Kingdom, the mean number of cats per litter box was 1.7 (Grigg et al 2019). In our study, the mean number of cats per litter box was 1.5; less than that described by Grigg.

The number of key resources (litter boxes/ scratch posts, etc) and inappropriate access to these resources have been quoted as welfare concerns (Rioja-Lang et al 2019).

One factor affecting cat health is regular feeding; which is associated with better cat health. Food preference may be one reason why cats have lower body condition score in some shelters. Shelters are stressful for cats. Thorne (1982) found that when cats are stressed, they chose familiar items to eat. An inconsistent supply/type of food creates another source of
stress. When faced with novelty food items, many cats also under-eat (Bradshaw et al 1996). Other factors which may have contributed to this finding include inter-cat relationship during mealtimes, food competition, food preference and the consistency of food supply which was not thoroughly examined.

The present study found that regular feeding instead of ad libitum feeding was associated with a higher body condition score. This is in contradiction to current literature which associated ad libitum feeding with obesity (Russell et al 2000; Serisier et al 2013). Scarlett’s study (1994) on risk factors for developing obesity in pet cats was the only study that found ad libitum feeding not being associated with obesity. The feline obesity literature revolved around pet cats and used questionnaires to analyze risk factors in the cat’s home environment. The studies also used single food source. The shelter environment is stressful for cats and the food source varied, even with shelters that fed the cats ad libitum, the variability of the food may have contributed to the difference in findings, not excluding the confounding factor of group housing.

Most literature examining body condition score and associated illnesses used pet cats, with an emphasis on obesity. Low body condition scores are associated with diseases including chronic kidney disease, gastro-intestinal diseases, thyroid and heart illnesses. (Scarlett & Donoghue 1998; Freeman et al 2016; Peterson et al, 2016). Stavisky et al (2017) looked at the prevalence of feline leukaemia virus at two cat shelters in the United Kingdom and found cats with lower body condition score were more likely to have the virus.

Feeding as a husbandry practice (feeding schedule not described) was included in various studies on cat shelters but was found not to be significant in affecting cat welfare (Arhant et al 2015; Eriksson, Loberg, & Andersson 2009; Hirsch, Andersson, & Loberg 2014). The presentation of food in shelters (same time, same place, same mode) has also been criticized
for prohibiting foraging behaviour in cats. This often results in boredom which may manifest as over or under eating (Stella & Croney 2016; Sadek 2018). Stress eating has also been described in cats (McMillan 2013). The shelter environment is stressful, and feeding is not a social event for shelter cats (Finka 2020). Whether the manner of feeding (ad lib/regular) affect shelter cat health is affected by multiple factors (for example group vs single housing, history of being surrendered or stray cat, intercat relationship, etc), and the fact that cats are versatile and can be adaptable to a flexible diet (Zoran & Buffington 2011; Buffington 2015). This complicates the issue of singling out feeding as a sole factor in affecting shelter cat’s health.

It is envisioned that our study could contribute to improving the welfare of shelter cats locally, similar to the descriptive survey of animal shelters by Hirsch which was conducted in Sweden where the husbandry practices and management were recorded with an aim to improve the welfare of shelter cats (Hirsch et al 2014).

The mean body condition score of the cats in this study was three; 32% of cats had a body condition score less than three, 11% had a body condition score of four and above (scattered across all types of holdings). This agrees with Zito et al (2019) where managed and unmanaged/stray cats in New Zealand were found to have satisfactory health. Hence the feeding schedule and consistency of food supply may have an impact on cats’ health in shelters, but this warrants further studies.

Having regulations or guidelines may serve to improve the welfare of the shelter cats. As yet there are no international guidelines on cat shelter management, but many countries have “best practice” or “code of practice” for cats (USA, Canada, UK, Australia, Lithuania); and “shelter” comes under the umbrella of “cat carer”. The American Association of Feline Practitioner has a positional statement on the welfare of shelter cats (AAFP 2009).
The American Society for the Prevention of Cruelty to Animals (ASPCA) and the Association of Shelter Veterinarian has also published guidelines (Newbury et al 2010) on general shelter management. With reference to farm animals, Dale (2009) argues that codes and regulations may not necessarily protect the farm animals in New Zealand and Australia; and often succumbed to economic pressure and political red tape. In Zito’s study looking at managed and unmanaged stray cats in New Zealand; most cats observed were of satisfactory health. Hence it seems with or without regulations; cats fare well, at least in Zito’s study. Across the globe, education of the general public seemed to be a common theme in improving the welfare of all animals, not just cats (NCNMS 2020).

This study has some limitations, which are in and of themselves integral to its findings. Operating an animal organisation in Hong Kong does not require a license and therefore there is no registry of cat shelters making it infeasible to gain a representative sample. The inter-facility assessments variations also present a substantial hurdle meaning only the most common factors could be reliably assessed at each site (e.g. BCS). Full parameters were difficult to assess due to a lack of availability of formal records and assessment tools specifically tailored to a heterogeneous shelter environment.

Confounding factors relating to stress in cats were not addressed in the present study, in part because the over-arching impacts of major variations in practices had not been quantified. For example, group against individual housing (reflecting accessibility of resources), non-randomly selected subjects in some shelters, cat population turnover causing undue stress for cats, presence of enrichment in the cat enclosure and their utilisation (Ottway & Hawkins 2003; Gourkow & Fraser 2006; Eriksson et al 2009; Moore & Bain 2013; Vinke et al 2014; Hirsch et al 2014; Finka et al 2014; Hirsch 2016; Ellis et al 2017). Pheromone therapy was used in one shelter, its effect was not included in our analysis (Shreve & Udell, 2017;
Chadwin, Bain & Kass 2017). For feeding regime, factors which may have influenced the association between feeding regime and body condition score were not examined. These include the amount and type of food fed, consistency of food supply, meal duration, inter-cat relationship and food competition. Length of stay per cat was also not recorded. Gouveia (Gouveia et al 2011) found that increased length of stay in shelters was associated with decreased feeding in 46 cats that had been in a shelter for over seven years. Cat nutritional status prior to admission was not examined – although all cats studied have been in the shelter for over four weeks and cats take about two to five weeks to settle in a new environment (Rochlitz 2014).

Even though oculo-nasal discharge has been used in some studies as a reflection of cat health (Tanaka et al 2012; Arhant et al 2015), it has not been fully validated. Feline upper respiratory tract infection remains a clinical diagnosis and not all cats exhibiting oculo-nasal discharge will progress to full upper respiratory tract infection. The severity of the signs were recorded (none/low, mild, moderate/severe) and then dichotomised to presence or absence of signs for ease of interpretation. More objective grading systems for upper respiratory tract infections are available (Litster et al 2012, McNamus 2014) and would have offered greater clarity to our results. Examining the chosen cat’s health record, where available, may provide a more objective supplementary parameter in determining cat health although, again, many of the venues either had no records or only had ad hoc veterinary provision.

Welfare implications and conclusion

Relinquishment to shelters potentially constitutes a compromise of animal welfare. Shelter animals are often more in need of better care but may receive substandard care (e.g. expired food and medicines) (Turner et al 2012). This is especially problematic in unregulated shelter environments, as resources and expertise may often be limited. The development of
respiratory tract infection is the second most common reason for euthanasia for cats in shelters (after over-crowding). Shelter cats are vulnerable if they are housed in a variable, unregulated shelter environment in which suboptimal care can be common (Rioja-Lang et al 2019). The results of this study concur with what we know from the current literature. It is envisioned that with the expansion of shelter medicine and the public’s awareness of animal welfare, a guideline to standardize the care delivered to cats housed in Hong Kong’s shelters could be developed which may be pertinent to other unregulated systems. A local shelter registry, licensing system with regular inspections for compliance with acceptable standards will have the potential to safeguard the welfare of cats housed in shelters.

Conflict of interest

Main author is an unpaid board member of an animal shelter.
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Legend of figures

Figure 1. Bar chart showing the distribution of the body condition scores of the cats stratified by whether there was regular feeding regimen in the shelter

Figure 2. Bar chart showing the distribution of the body condition scores of the cats stratified by whether there was regular veterinary check-ups in the shelter