The Veterinary Journal 227 (2017) 15–22

Contents lists available at ScienceDirect

The Veterinary Journal

journal homepage: www.elsevier.com/locate/tvjl

Original Article

An observational study of the relationship between Capacity for Care as an animal shelter management model and cat health, adoption and death in three animal shelters

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ARTICLE INFO

Article history:
Accepted 4 August 2017

Keywords:
Adoption
Animal shelter
Animal welfare
Capacity for Care
Length of stay

ABSTRACT

Animal shelters struggle to function at their 'right size' in terms of physical, staffing and outcome capacity, especially with seasonal fluctuations in cat intake. To address this, a Capacity for Care (C4C) management model was devised to balance health and welfare requirements of all animals while maintaining or improving goals for positive outcomes, such as adoption or transfer. In this observational study of three shelters, applying the C4C management system gave each organization an optimal average daily shelter cat population target (to be achieved through proactive length of stay management) and helped each shelter to increase the size of their feline housing units. Pre- and post-C4C implementation data were evaluated to determine impact on average monthly isolation ward populations and cat outcomes such as adoptions and shelter deaths (euthanasia/died). Improved outcomes including increased adoption probability, decreased shelter death probability and fewer cats requiring infectious disease isolation were seen after C4C institution. Results suggest that implementation of this management model could help other shelters achieve similar results.

Introduction

Optimizing the capacity for animal housing is essential to any successful shelter management plan. The number of animals housed on a daily basis will have a direct impact on resource requirements, ability to maintain animal health and well-being, and the shelter's ability to meet key goals and performance measures such as adoption rates. Holding space must be sufficient to accommodate animals in urgent need of shelter at any given time, while adoption space must accommodate both the needs of animals and preferences of adopters. The optimal daily population in an animal shelter meets the health and welfare requirements of all animals, while maintaining or improving on the shelter's goals for adoption or other positive outcomes.

Having too few animals can impede the organization's ability to meet key goals. A shelter with room to put animals up for adoption for only short periods (e.g. a day or two), might not provide sufficient time for animals to be seen and selected by potential adopters. Adopters also have varied preferences with regard to age, size, coat length, color and behavior and thus, ideally, a range of choices should be available to meet the preferences of most adopters (Weiss et al., 2012). A low daily population, even if associated with improved animal welfare, would represent an unacceptable trade-off for many shelters if this resulted in failure to meet community needs, decreased adoptions or more euthanasia.[1]

Having too many animals is equally problematic. Crowding can contribute to increased risk of contagious disease spread (Edinboro et al., 1999; Edinboro et al., 2004; Dinnage et al., 2009; Holt et al., 2010) and decreased welfare for individual animals (Gourkow, 2001). This is especially concerning if the number of animals exceeds staff's ability to provide proper care. In the worst case scenario, increased disease and stress associated with crowded conditions increases operational and animal health care costs and result in fewer adoptions or increased euthanasia (Hurley, 2008).

'Rightsizing' addresses the need for a limit on the maximum daily population and has been described as an organization's

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[1] See: http://www.nathanwinograd.com/?p=8320 (accessed 1 August 2017).

http://dx.doi.org/10.1016/j.tvjl.2017.08.003

capacity for care (Newbury et al., 2010). In 2012, the British Columbia Society for the Prevention of Cruelty to Animals (BC SPCA) implemented a management model based on this concept and called it Capacity for Care (C4C). The BC SPCA model primarily related to a calculated optimal daily population based on meeting the organization's goal of anticipated adoptions ('adoption-driven capacity') and improved housing to meet the Association of Shelter Veterinarians Guidelines for Standards of Care in Animal Shelters (ASV Guidelines) for both cage and group-housed cats. Improvements in cage housing were achieved via placement of a pass-through between two existing cages (a 'portal'), effectively doubling the floor space of each enclosure. This reduced the amount of available cage housing by approximately 50%.

Contrary to concerns of helping fewer cats with a reduced number of housing units, key outcome measures reportedly improved. Adoptions increased by 15% and the average length of stay (LOS) decreased from 40 to 22 days (personal communication/2016 Board Report) after C4C was implemented. The number of cats in isolation went from 16 (maximum capacity in the ward) on any given day to an estimated total of 10–15 for the entire year, suggesting that individual cat health also improved[2] (CFHS, 2012).

The Canadian Federation of Humane Societies (CFHS) reviewed the BC SPCA's model and developed a program to replicate the success in other Canadian shelters. Although capacity for care has been variably defined[3] (Swanson, 2015), CFHS's definition, which we used in the current study, is a management model that: (1) optimizes the number of cats who are housed in the shelter at any one time; (2) manages LOS; and (3) provides high quality housing. This model creates conditions necessary to provide shelter animals with five essential freedoms, thereby improving the welfare of individual animals. Strategies to achieve these goals will vary by shelter but can include managing intake, utilizing daily population rounds, implementing changes to medical treatment and sanitation protocols, and altering the adoption process.

High quality housing is a critical component of C4C, because poor quality housing has been linked to substantial health and welfare risks for shelter cats, including: increased anxiety and fear; stress-related changes in behavior such as aggression and destruction; and suppression of eating, elimination, grooming, exploration, and play (Carlstead et al., 1993; Overall and Dyer, 2005; Gourkow and Fraser, 2006; Ellis, 2009; Tanaka et al., 2010). Shelters are urged to meet or exceed space guidelines of 1.02 m^2 [11 ft^2] of floor space and 1.67 m^2 [18 ft^2] of floor space for individually and group-housed cats, respectively (Newbury et al., 2010).

Appropriate housing is defined by the ASV Guidelines as providing sufficient space for normal postural adjustments, allowing separate areas for elimination away from areas for eating and sleeping, and permitting enrichment such as hiding spaces, resting shelves and the opportunity for stretching, ambulation, and play. Meeting these guidelines for housing space and enrichment can be accomplished with one of two approaches. Shelters can either provide more space per individual cat by lowering the in-shelter population and modifying the existing housing, or replace existing housing with larger units while maintaining the same daily population. Most animal shelter facilities do not have empty space awaiting the latter scenario.

During the summers of 2014 and 2015, the University of California — Davis Koret Shelter Medicine Program (UCD KSMP) worked with the CFHS, which chose animal shelters who had volunteered to implement the C4C model. Two shelters per year participated in the C4C consultations.

The focus of the consultations was to calculate each shelter's optimal daily feline population in both holding and adoption areas based on historic intake and adoptions. The existing housing was then modified to match this number while providing each cat with a minimum of 0.81 m^2 [8.7 ft^2] if housed individually and 1.67 m^2 [18 ft^2] per cat when group housed. This was accomplished primarily by installing portals in single-compartment housing units to create double-compartment units.[4]

While it is understood that the housing, LOS and population size in an animal shelter can have profound health and welfare effects (Edinboro et al., 1999; Kessler and Turner, 1999; Gourkow, 2001; Patronek and Sperry, 2001; Dinnage et al., 2009; Edinboro et al., 2009; Gouveia et al., 2011; Holt et al., 2010; Tanaka et al., 2010), the impacts of utilizing the specific shelter management model Capacity for Care (C4C) has not been formally analyzed. The aim of this observational study was to evaluate data from several shelters before and after implementation of the C4C management model and determine the impact on isolation ward populations and cat outcomes (adoptions and euthanasia/died).

Materials and methods

Capacity for Care consultations

Shelters self-selected to participate in the CFHS C4C pilot project as part of a national initiative to improve cat welfare (CFHS, 2016). Participation involved a three-day site visit by UCD KSMP veterinarians (authors Karsten, Wagner, and Hurley). During the visit, we worked with shelter staff to calculate each shelter's optimal cat population by month. Variables used in these calculations included historic intake, on site adoptions and other outcomes from the two previous years, along with determining a realistic target LOS based on factors such as required stray holding period, adoption hours and timing of required pre-adoption processes such as surgical sterilization. We discussed housing modifications and management strategies to help get to this number while providing humane housing to all cats. The recommended management strategies emphasized methods to reduce LOS to adoption or other positive outcomes (time from intake to each outcome). Four shelters were involved in the pilot project; however, one shelter was unable to meet the project recommendations at the time of publication and thus was not included in the analysis. See Appendix for more details on the methods of C4C implementation. For full details of how the participating shelters implemented C4C at their shelters see the CFHS Capacity for Care (C4C) Case Studies 2016 Update[5] (CFHS, 2016).

Description of participating animal shelters in the CFHS pilot project

All three Canadian shelters (A, B, and C) are private, nonprofit, open-admission agencies that contract with at least one municipality to provide animal control and sheltering services. Their annual cat intake ranged from approximately 1000 for two of the shelters to 2500 for the largest shelter.

Data collection

Implementation was defined as a shelter consistently maintaining their optimal shelter population as calculated by UCD KSMP, completing housing modifications, and using housing correctly to achieve recommended husbandry standards. Correct housing use was defined as having portal doors open with two compartments per cat in cage/condo housing units, and providing at least 1.67 m^2 [18 ft^2] per cat in group housing rooms.

Each participating shelter submitted at least two year's data prior to implementation, and one to two years post implementation, which extended through August 2016. Consultations occurred in the spring/summer of 2014 and 2015. All three shelters used PetPoint (Pethealth Inc., Rolling Meadows, IL), a web-hosted data management system designed specifically for use in shelters and rescues.

Cat housing (number, size, and type of unit) and use (e.g., whether portal doors were kept open or closed) data were collected from each shelter before and after

[2] See: A Comprehensive Report on the Cat Overpopulation Crisis (accessed 1 August 2017)

[3] See: http://millioncatchallenge.org/resources/capacity-for-care (accessed 1 August 2017)

[4] See: http://sheltermedicine.com/library/resources/cat-portals-order-information-and-instruction-for-installation (accessed 1August 2017).

[5] See: Capacity for Care (C4C) Case Studies — cloudfront.net (accessed 1 August 2017).

implementation. Most of the increases in cat housing size and reduction in number of housing units came from installing portals between smaller cat cages.

Data in the PetPoint reports were reviewed for quality and consistency. The dataset analyzed contained the following information for each live cat intake: intake month, intake year, outcome (adoption, euthanasia/died), LOS, and time of intake (before or after implementation of C4C). Because cats were categorized based on intake date before or after implementation, some cats LOS spanned implementation and these were categorized as pre-implementation LOS for the purposes of this analysis.

Data included all cats admitted to the shelters alive with an outcome occurring between August 1, 2012 and August 31, 2016, leading to 17,634 observations across the three shelters. The 1.8% (313 observations) of cats whose LOS spanned implementation were included in the pre-implementation category.

Shelter average daily population data: Healthy cats and isolation cats

Historical daily in-shelter cat population counts were retrieved from the 'Animals: Inventory History' report, which shows the number of animals in their physical location whether on- or off-site on any one day. In-shelter populations were identified and tabulated for both the total shelter population and the isolation population. This report was run for every Thursday at all three shelters from August 2012–October 2016. Thursday was chosen to reflect the expected weekly peak in shelter population.

Statistical methods

Negative binomial regression models were used to analyze the monthly average in-shelter and isolation population counts pre- and post-implementation while controlling for year; results are presented as model predicted counts.

Logistic regression was used to analyze the association between time of implementation of the C4C model and the probabilities of adoption and euthanasia; results are presented as odds ratios (OR) and 95% confidence intervals (95% CI); OR > 1 indicate a higher odds of adoption or shelter death (died/euthanasia) after implementation compared to before.

The Cox proportional hazards regression model was used to analyze the association between the time to adoption following implementation of the C4C model compared to the time to adoption prior to this intervention due to unequal follow-up of shelter cats over time following entrance to the shelter. Results are presented as hazard ratios (HR) and 95% confidence intervals (95% CI); HR > 1 indicates a faster rate of adoption after the implementation compared to before. Cats available for adoption who were euthanized or died in the shelter or were still present at the end of the study were considered censored observations for this analysis. Likelihood ratio tests were used to evaluate improvement in model fit between main effects models and those including interactions between individual shelters and implementation.

P-values < 0.05 were considered statistically significant. Data were analyzed with commercial statistical software (Stata IC/13.1, StataCorp LP, College Station, TX).

Results

Cat housing

A summary of the cat cage housing pre- and post-implementation of C4C at the three shelters, along with the calculated average and maximum housing units needed are displayed in Table 1. In addition to the housing units described, it had been common practice during the summer to house cats in additional areas, such as in staff offices and temporary crates or in cages with portal doors closed. No such temporary housing was required to meet peak needs after implementation of C4C. See Appendix for additional details on the housing changes at the shelters.

Average in-shelter population

The calculated optimal population was lower than the pre-implementation average in-shelter population for nearly every month at all three shelters and on a yearly average, was lower by 44%, 28% and 17% at Shelter A, B, and C, respectively (Table 2). When the calculated optimal population was compared to the

Table 1
Comparison of the cat cage housing at each of the participating shelters before and after implementation of C4C/completion of housing modifications.

Shelter	Cage housing units before implementation[b]	Cage housing units after implementation[b,c]	Reduction in cage housing units	Calculated average cages needed[d]	Calculated maximum cages needed[d]
Shelter A	146[a]	85	41.8%	57	75
Shelter B	46	41	10.9%	30	48[e]
Shelter C	65	36	44.6%	24	39[e]

[a] Plus additional temporary housing units of unknown number — these were not tracked during study period.
[b] All double compartment housing units were counted as a single unit.
[c] Portal door remained open after implementation.
[d] Calculations were made assuming one adult cat per cage housing unit and two kittens per cage housing unit.
[e] For one month the calculated maximum was higher than the available number of housing units — meaning the shelters would have to shorten their LOS or house more than two kittens per housing unit during that month.

Table 2
Comparison of the cat monthly average shelter population at each shelter for the year before and after implementation of C4C and compared to their calculated optimal population.

	Shelter A — May 2015			Shelter B — June 2014			Shelter C — October 2014		
Month	Before	After	Calculated optimal population	Before	After	Calculated optimal population	Before	After	Calculated optimal population
1	116	64	(May) 89	60	37	(June) 37	50	26	(October) 30
2	137	96	95	58	56	59	54	27	33
3	181	74	120	65	40	32	49	23	23
4	207	74	116	61	53	38	31	18	23
5	234	86	117	65	40	52	27	24	19
6	247	77	107	63	39	41	34	26	18
7	206	113	76	49	31	38	28	16	24
8	134	63	66	42	28	29	24	47[a]	25
9	100	48	62	35	23	26	34	31	33
10	82	32	41	34	15	16	45	35	43
11	68	28	54	34	19	26	40	33	52
12	72	32	60	21	16	31	27	42	44

[a] 69 cats were seized from a hoarding case over two weeks in May 2015.

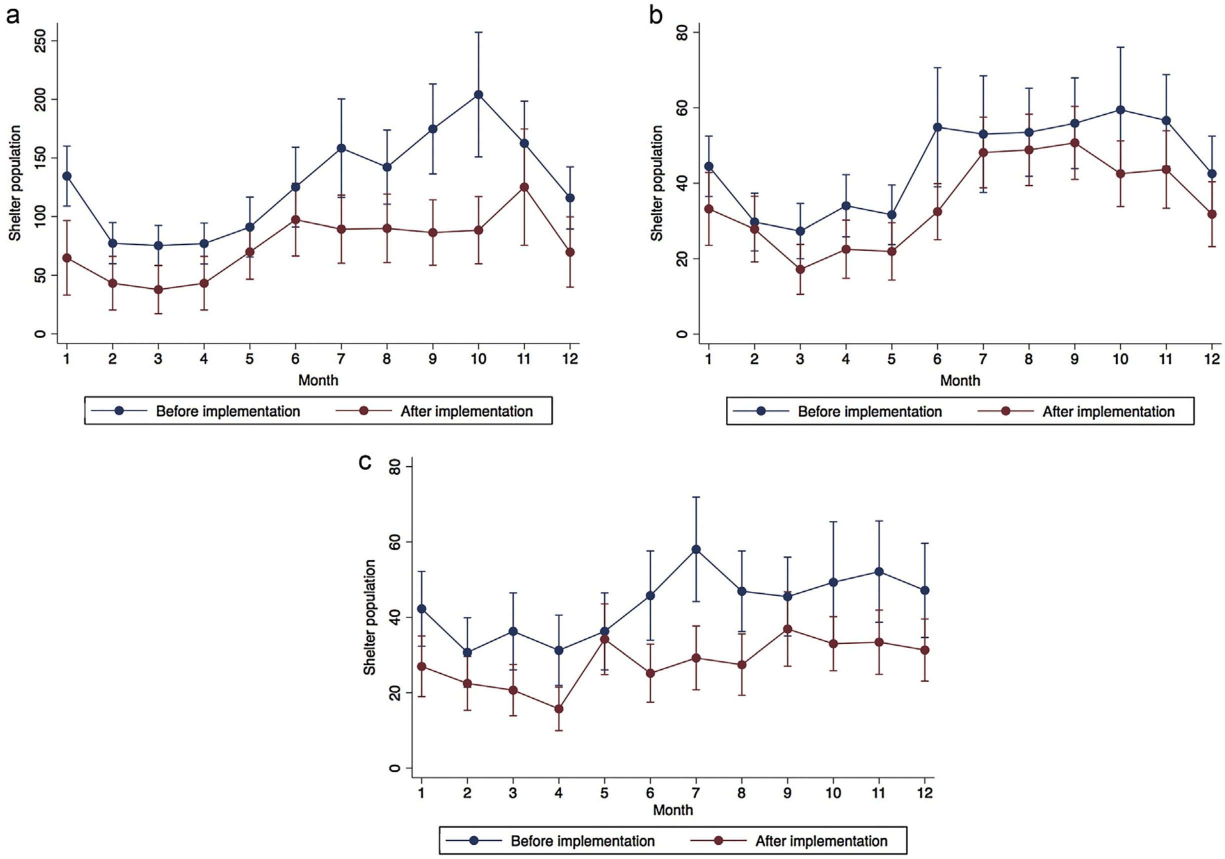

Fig. 1. Negative binomial model results showing the predicted total in shelter monthly average population in Shelter A (a), Shelter B (b), and Shelter C (c) prior to implementation of the C4C model compared to after implementation.

post-implementation average in-shelter population, all three shelters met their goal for at least 75% of the year. The difference between pre- and post-implementation of the C4C management model in the total in-shelter population was found to be significant at all three shelters (Figs. 1a–c; $P < 0.05$).

Isolation population

The isolation populations decreased at all three shelters after implementation of the C4C management model by 84%, 46%, and 39% at shelters A, B, and C respectively ($p < 0.05$) (Figs. 2a–c; Table 3).

Length of stay

The overall average length of stay decreased by 31%, 11% and 9% at Shelters A, B and C respectively (Table 4). The average length of stay to adoption decreased after implementation of C4C for all three shelters (Shelter A HR 2.00, 95% CI 1.98–2.22, $P < 0.001$, Fig. 3a; Shelter B HR 1.75, 95% CI 1.61–1.89, $P < 0.001$, Fig. 3b; Shelter C HR 1.17, 95% CI 1.08–1.27, $P < 0.001$, Fig. 3c).

Probability of adoption and shelter death

Cats had a higher probability of adoption after implementation of C4C at all three shelters (Shelter A OR 1.32, 95% CI 1.20–1.46, $P < 0.001$; Shelter B OR 1.7, 95% CI 1.48–1.94, $P < 0.001$; Shelter C OR 1.82, 95% CI 1.59–2.09, $P < 0.001$; Fig. 4).

Cats had a lower probability of being euthanized or dying after implementation of C4C at all three shelters (Shelter A OR 0.50, 95% CI 0.44–0.55, $P < 0.001$; Shelter B OR 0.52, 95% CI 0.45–0.60, $P < 0.001$; Shelter C OR 0.32, 95% CI 0.26–0.38, $P < 0.001$; Fig. 5).

Summary of raw data

A summary of the 12 month average percent change in intake, number of adoptions, number of shelter deaths, average LOS, total care days (each day an animal spends in the shelter) and number of cats housed in isolation at each shelter for the year prior to implementation of C4C compared to the year after is displayed in Table 4. See Appendix for detailed monthly data from all three shelters.

Discussion

In this observational study, implementation of Capacity for Care (C4C) and the accompanying increased housing size and lower daily population reduced the population in isolation, shortened the length of stay (LOS) to adoption, increased the probability of adoption and lowered the probability of shelter death (euthanasia/death).

Our observations parallel those found in other multi-animal environments. Lower stocking density has been linked to positive health and welfare consequences in species ranging from fish to poultry to livestock; including decreased stress, increased immunity and lower disease rates (Telezhenko et al., 2012; El-Tarabany, 2015; Tsiouris et al., 2015; Yarahmadi et al., 2016). Ultimately, lower stocking density may paradoxically increase production; for example, when higher growth rates, increased survival, increased reproductive success and decreased costs

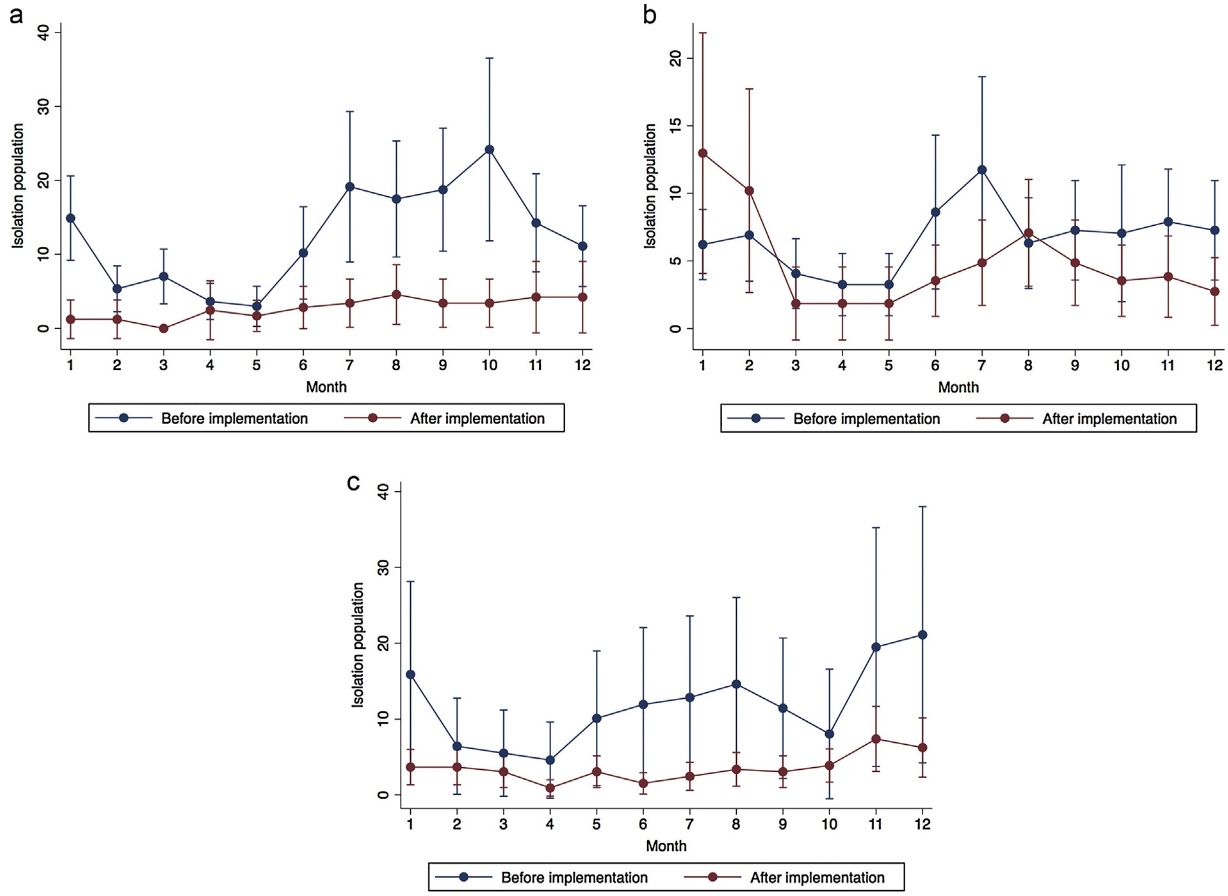

Fig. 2. Negative binomial model results showing the predicted monthly average isolation population in Shelter A (a), Shelter B (b), and Shelter C (c) prior to implementation of the C4C model compared to after implementation.

outweigh the loss of having fewer animals present (Gehlbach et al., 1966; Lee et al., 2012; Abudabos et al., 2013; El-Tarabany, 2015; Lee et al., 2016).

Our results also parallel what the BC SPCA described in their shelter with a decrease in the number of cats housed in their isolation ward and an increase in adoptions once C4C was implemented.

The overall LOS decreased and LOS to adoption decreased at all three shelters after implementation of the C4C model. Reduced LOS was both a means to achieve C4C, and a possible result of C4C attainment. For instance, it was necessary for some shelters to reduce LOS in order to be able to house all cats with a reduced number of housing units.

Specific recommendations emphasized reducing LOS to adoption, as this was the most common and desired outcome for the study shelters (e.g. placing friendly cats directly into adoption rather than holding them in areas inaccessible to the public). This reduction allowed the shelters to continue operating at or below their calculated optimal population, which also allowed better use of enlarged housing units. The improved housing might have, in turn, supported further decreases in LOS. In one study, cats housed in basic single housing had a median LOS to adoption of 12.5 days compared to five days for cats housed in enriched housing (Gourkow and Fraser, 2006). Additionally, LOS was likely reduced since URI treatment time in shelter was reduced.

The probability of adoption increased at all three shelters, likely due to fewer choices for adopters, changes in the adoption process, and improved housing. Research suggests that limiting choices increase both the likelihood and ease of making a decision[6] (Iyengar and Lepper, 2000). Recommendations to remove adoption barriers such as long applications, waiting periods and reference checks were made at all three shelters. Additionally, the more spacious housing might have encouraged cats to be more active, thereby increasing the probability of adoption (Fantuzzi et al., 2010).

Table 3
Comparison of the monthly average number of cats housed in isolation at each shelter for the year before implementation of C4C to after implementation.

Month	Shelter A		Shelter B		Shelter C	
	Before	After	Before	After	Before	After
1	4	3	11	4	6	3
2	10	4	15	9	13	2
3	22	3	12	8	15	1
4	25	2	10	8	7	2
5	24	3	9	2	2	6
6	28	3	10	3	3	6
7	16	4	7	2	1	1
8	17	4	7	11	1	2
9	12	1	10	2	3	2
10	7	1	7	2	5	2
11	9	0	3	1	8	6
12	1	2	1	1	2	6
Ave	15	3	9	4	5	3

[6] See: http://aspcapro.org/research/less-more-adoption-floor-0 (accessed 1 August 2017).

Table 4
Summary of the 12 month average actual and percent *change* in shelter metrics at each shelter for the year prior to implementation of C4C compared to the year after.

Shelter	Intake	Adoptions	Shelter deaths[a]	Average LOS	Total care days	Isolation population
A	−742 (−29%)	−427 (−24%)	−103 (−33%)	−11 (−31%)	−45,334 (−51%)	−12 (−84%)
B	35 (4%)	31 (5%)	−39 (−16%)	−3 (−11%)	−3200 (−13%)	−3 (−46%)
C	0 (0%)	16 (3%)	−136 (−61%)	−3 (−9%)	−1240 (−5%)	−2 (−39%)

[a] Cats with an outcome of euthanasia or died.

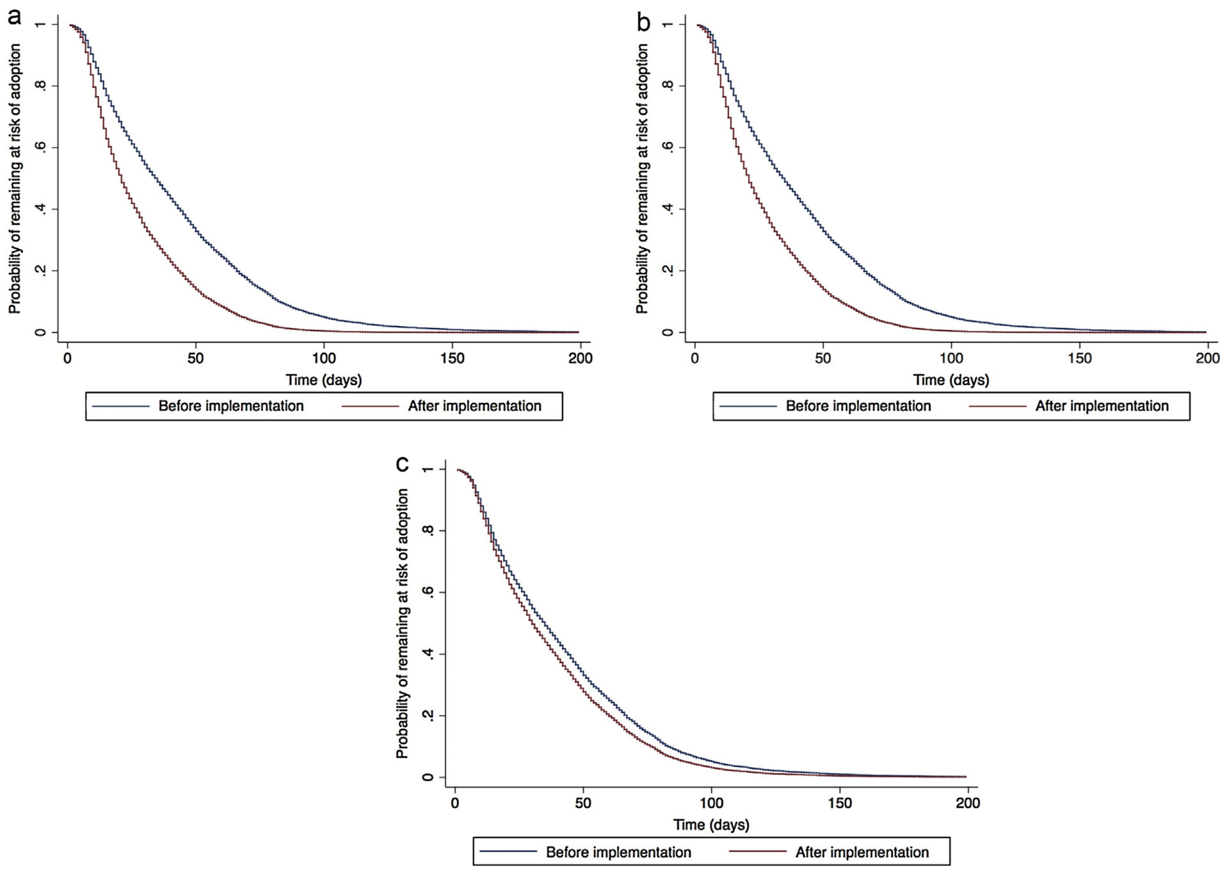

Fig. 3. Cox regression model results showing the time to adoption at Shelter A (a), Shelter B (b), and Shelter C (c) prior to implementation of the C4C model compared to after implementation.

Although the total cat adoptions increased at Shelters B and C, they decreased at Shelter A. This decrease at Shelter A was associated with a 29% decrease (748 cats) in intake in the year post-implementation compared to the year prior; consequently fewer cats were available for adoption. This is likely a reflection of the managed intake process implemented by Shelter A that offered community members assistance instead of shelter admission. In spite of the decrease in total cat adoptions, the proportion of admitted cats that were adopted rose by 5%.

Lowering capacity has frequently raised fears that shelter death, particularly euthanasia, will increase. However, at all three shelters, the probability of shelter death decreased, in spite of the decreased number of housing units and lower daily population. In part, this may simply have been the consequence of the increased probability of adoption.

The shorter LOS to adoption may also have contributed directly to the reduced probability of euthanasia. When LOS in the shelter is reduced, more cats can be cared for over time with a lower daily population. For example, if a shelter takes in ten animals a day and on average each animal stays 20 days, the average daily shelter population will be 200 animals. If the LOS can be shortened to ten

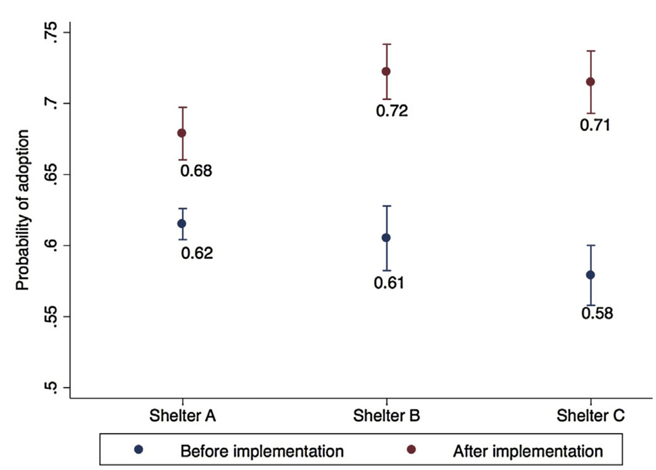

Fig. 4. Margins plot showing the probability of a cat having an outcome of adoption prior to implementation of the C4C compared to after implementation at all three shelters (A, B, and C).

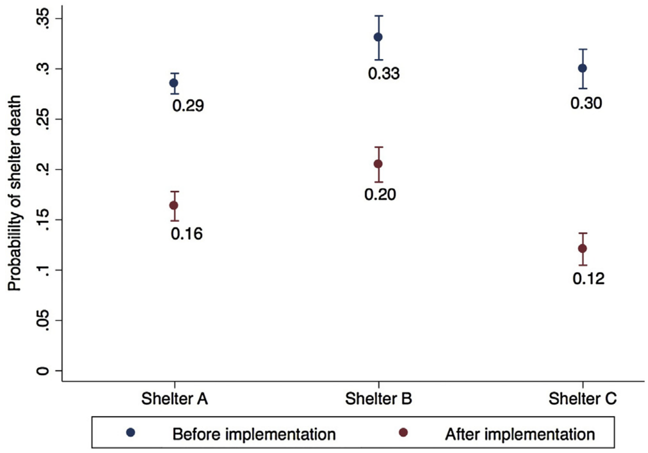

Fig. 5. Margins plot showing the probability of a cat having an outcome of shelter death (euthanized or died) prior to implementation of the C4C model compared to after implementation at all three shelters (A, B, and C).

days on average, the daily shelter population will be 100 animals. The same number of animals will pass through the shelter in each scenario. As previously mentioned, for all three shelters, adoption was the most common outcome for cats. Reducing the time to this outcome would be expected to functionally maintain or increase the shelters' throughput capacity and reduce any risk of euthanasia as a result of fewer housing spaces.

In addition to the effects of improved housing and decreased LOS, a healthier population might have reduced the probability of shelter death. In many shelters, feline upper respiratory infection (URI) in particular is a common risk factor for euthanasia (Bannasch and Foley, 2005; Dinnage et al., 2009). Longer LOS has been identified as a significant risk factor for URI in shelter cats (Edinboro et al., 1999; Dinnage et al., 2009).

In this study, isolation population was used as an indirect measure of URI incidence and prevalence. Recommendations for all three shelters included moving cats to isolation for URI only if treatment (e.g. antibiotics) beyond supportive care was needed. Therefore the decrease in isolation numbers may have partially resulted from this management change rather than a true reduction in the number of cats becoming ill. However, each shelter also reported substantial improvements in cat health (CFHS, 2016). For instance, one shelter reported that their isolation area had been repurposed to uses other than housing sick cats; another stated that 'cats are not coming in healthy and then getting sick'. This is consistent with the BC SPCA's report of a dramatic decrease in isolation population (CFHS, 2012).

Because housing, daily population and LOS changed in concert with one another, we could not determine which factor played the greatest role in supporting the positive results we observed. It is likely that each element played a role and both additively and synergistically. For example, shorter LOS will reduce the daily population, which in turn allows housing to be used as intended (portal doors open). The larger, double-compartment housing could then have contributed to better health and improved presentation for adoption, which would tend to reduce LOS.

A limitation of this observational study was that changes to housing were not consistent across shelters. For instance, over half the housing (54%) at Shelter B already met the recommended guidelines prior to any intervention, so fewer changes to housing units were made and there was a smaller reduction in the number of housing units available (only 11%) compared to the other two shelters (over 40%). The reduced LOS associated with manage-mentchanges allowed Shelter B to minimize the use of remaining housing that did not meet recommendations, with the exception of short term management of intake fluctuations. Therefore, the reported improvements in outcomes might have been more linked to a decreased LOS, reduced daily population, and improved use of existing housing rather than changes to the housing per se.

Ultimately, C4C is a three-fold intervention because LOS, housing and daily population are linked and influence each other. While the observations reported here support the idea that these may be effective in various combinations with an emphasis more on one element or another, they do not confirm to what extent any single change can be effective as a standalone intervention.

In addition to the limitations in determining which of the three elements of C4C led to the reported outcomes, this observational study was not designed prospectively and did not have a contemporaneous control group. Therefore, other potential contributing factors were not assessed. Broad climatic and socioeconomic factors, as well as shelter-specific factors unrelated to C4C, could have affected the results documented in this study. If the timing of such effects coincided with the implementation of C4C, this could have led to over- or under-estimation of the impact of the intervention (depending on the direction of effect). However, because each shelter's pre-implementation served as a comparison to the post-implementation outcomes, the results suggest that the differences were not simply the continuation of existing trends. Additionally, although timing of implementation and region of the country varied, all participating shelters experienced similar positive results from implementing C4C and, most notably, euthanasia did not increase at any of the shelters. To the extent that lower daily population and appropriate housing are considered desirable ends in themselves, there seems to be no contraindication to pursuing this management model. Further prospective, controlled, studies would be desirable to track possible confounding factors and evaluate the direct effect of each strategy implemented.

The data analyzed did not capture important factors such as effects on staff and costs. Some of these impacts were anecdotally described in the CFHS Capacity for Care (C4C) case studies report (CFHS, 2016), and included reduced time needed to clean cages, more time for socializing with cats, and greatly improved staff morale.

Conclusions

Many animal shelters struggle to manage crowded facilities, resulting in poor population health and undesired outcomes. While shelters might be hesitant to implement C4C out of fear that housing fewer cats may result in increased euthanasia, the results of our study suggest the opposite may be true. Implementing C4C was associated with significantly lower daily populations, shorter LOS to adoption, increased probability of adoption and decreased probability of euthanasia in these particular shelters. The implementation of the C4C management model might help other shelters achieve similar results.

Conflict of interest statement

None of the authors of this paper has a financial or personal relationship with other people or organizations that could inappropriately influence or bias the content of the paper.

Acknowledgements

The UC Davis Koret Shelter Medicine Program is supported in part by a grant from the Koret Foundation.[7] The Paul and Lea Levine

[7] See: http://koret.org/.

Foundation provided support for this project. We wish to thank the management and staff at all of the participating animal shelters. Without their leadership and vision, none of this would have been possible. Lastly we wish to thank the Canadian Federation of Humane Societies for developing the pilot project for Capacity for Care in Canada, which was supported, in part, by a grant from the Summerlee Foundation.[8]

Appendix: Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.tvjl.2017.08.003.

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[8] See: http://summerlee.org/.