

Evaluation of a virtual pet visit system with live video streaming of patient images over the Internet in a companion animal intensive care unit in the Netherlands

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Abstract

Objective – To evaluate the impact of a virtual pet visit system (“TelePet” System, TPS) on owners and staff of a companion animal ICU.

Design – Longitudinal interventional study (2010–2013).

Setting – Companion animal ICU at a university veterinary medical teaching hospital.

Study Populations – Pet owners, ICU technicians.

Interventions – The introduction of the TPS, with live video streaming of patient images over the Internet, in a companion animal ICU.

Measurements and Main Results – Pet owners experienced TPS as a valuable extra service. Most TPS users (72.4%) experienced less anxiety and felt less need (40.4% of TPS users) to visit their hospitalized pet in person. Most users (83.5%) shared TPS access with their family. The introduction of the TPS did not improve overall owner satisfaction, except for the score on “quality of medical treatment.” Seven of 26 indicators of owner satisfaction were awarded higher scores by TPS users than by TPS nonusers in the survey after the introduction of the system. However, the lack of randomization of owners might have influenced findings. The enthusiasm of the ICU technicians for the system was tempered by the negative feedback from a small number of owners. Nevertheless they recognized the value of the system for owners. The system was user friendly and ICU staff and TPS users experienced few technical problems.

Conclusions – As veterinary healthcare is moving toward a more client-centered approach, a virtual pet visit system, such as TPS, is a relatively simple application that may improve the well-being of most owners during the hospitalization of their pet.

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Abbreviation

TPS TelePet System

Introduction

Most companion animal owners regard their pets as their friends and part of the family.^{1,2} Companion animals bring family members together and increase family cohesion.^{3,4} The importance of pets to their owners is exemplified by the increased willingness of owners to invest in their pet’s welfare and veterinary care.^{5,6} These changes in the owner-pet relationship may mean that owners want to be more involved with the care of

their pet when it is admitted to a veterinary facility, such as an ICU.

The parents of hospitalized premature newborns experience traumatic stress and anxiety when separated from their infant.⁷ In the last 2 decades, a system of video streaming of hospitalized newborns over the Internet, often advertised under names such as “TeleBaby,” has been developed in neonatal ICUs in Europe.^{8,a,b} These systems enable parents to have unlimited visual contact with their hospitalized newborn baby, thereby supporting parent-child bonding and reducing parental anxiety. Because of the intensified owner-pet relationship and owners’ concern about the nonmedical well-being of their pet in the ICU, we thought that live video streaming of patient images in a virtual pet visit system (termed the “TelePet” system [TPS]) might provide owners with comfort and support during the hospitalization of their pet. The TPS is intended as an additional measure of owner support while their pet is hospitalized.

The purpose of this study was to evaluate the experience of owners whose pet was admitted to a veterinary ICU equipped with TPS, a virtual pet visit system with live video streaming of patient images over the Internet. We hypothesized that the introduction of TPS would have a positive effect on the owners’ perception of the hospital organization. Additionally, the experience of the ICU technicians, the primary TPS operators, was evaluated to determine how they were affected by introduction of the system.

Materials and Methods

The protocol was approved by the research ethics board of the Faculty of Veterinary Medicine. Owners were informed and agreed to participate in this study by responding to the survey. The study was performed at the companion animal ICU of the veterinary medical teaching hospital of the Department of Clinical Sciences of Companion Animals, Faculty of Veterinary Medicine, Utrecht University. The organization has a closed ICU.⁹ Owners were surveyed before and after TPS introduction; ICU technicians were surveyed once, after TPS introduction (Figure 1). The virtual pet visit system TPS was adopted from an existing system of video streaming of images of newborns over the Internet.^c The TPS consisted of a set of digital cameras that sent images via a secure connection to a server that runs the program software. The system was accessible through a standard web browser on a dedicated computer located in the ICU nursing station (Figure 2). The system offered 3 levels of access that varied by login: an administrator level to access all menus and to configure the system, a controller level to fill out predefined patient data fields and set login information for owners, and a user level to login and

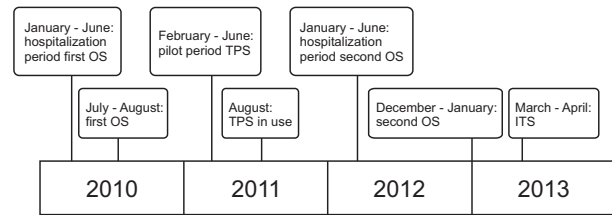


Figure 1: Timeline showing when pets were hospitalized, when the first and second owner surveys (OS) were carried out, when a preliminary evaluation of the “TelePet” system (TPS) during a pilot period was performed, when the TPS officially was introduced, and when ICU technicians were surveyed on their experience with the TPS.

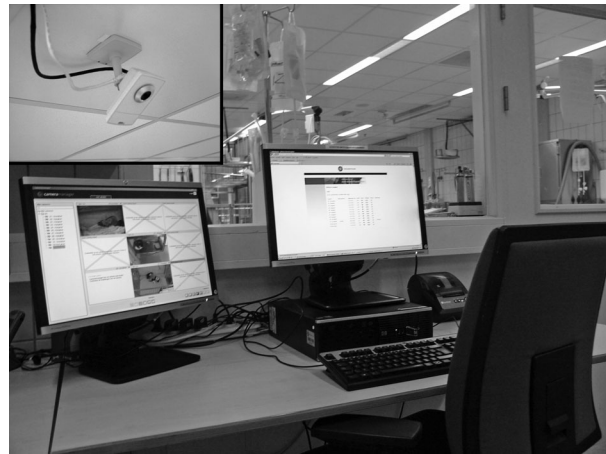


Figure 2: The “TelePet” system consists of a computer console used by the staff to control access and set user specific access codes for the owners. The cameras also offer the staff an alternative view of patients. Inset: webcam as installed on all cages in the ICU; also a mobile webcam is available, such as for use in the mechanical ventilator station.

view the stream of a single, linked camera, and a few data fields. The controller level offered an overview of all active camera images and offered the staff an extra (digital) view of ICU patients (Figure 2). The TPS was operated by ICU staff, primarily ICU technicians. The cameras could be inactivated by the computer program or manually by switching off the camera at the individual cage. Although technically possible, sound was not broadcast for privacy considerations. All 14 patient cages in the ICU were equipped with a digital camera that produced a fixed image of the whole cage; during the pilot study only 2 cages were equipped with cameras. One camera could be moved, as needed, to locations such as an oxygen cage, a mechanical ventilation station, or the isolation ward. Maximally 8–9 cameras were active at any time; this is the maximum number of ICU patients in the clinic.

Following admittance of their pet to the ICU, owners were offered the TPS service. The staff set the login data in the program to the assigned camera and sent the owner an email with login details, a copy of the user manual and rules of conduct. Owners could login using a password-protected portal via a web browser. The login screen contained a short introduction to the system and named the sponsors.^d Owners could pass on the login name and password to friends or family, as multiple viewers can access the streams at a time. A dedicated phone number was available to owners to contact the staff in case of problems with the system. Owner access was possible throughout the day and night and was controlled by the ICU staff.

Owner surveys

A pet owner survey (see Supplemental Digital Content 1) was developed to assess owners' views before and after TPS introduction. Owners were questioned on how they experienced certain aspects related to the hospitalization of their pet, especially concerning owner-staff interactions. The response to these types of inquiries has been demonstrated to reflect overall owner satisfaction.¹⁰ Most questions were scored on a mainly ordinal, Likert scale, with the wording of each scale point differing between questions.¹¹ The 5-point scale offered individuals the ability to report neutral, moderate, and extreme opinions.¹² Questions about demographics and the TPS were nominal and could be answered by ticking 1 or more boxes; the total number of answers varied per question. Participants could provide written feedback about the different aspects of the survey.

The survey administered to the first set of owners, prior to TPS introduction, consisted of 36 questions divided into 3 sections: demographic variables (10 questions), the hospital in general (6), and the ICU specifically (20). Questions about the hospital in general concerned accessibility, waiting times, pet handling, quality of staff-client interactions, and costs. The questions about the ICU concerned the handling of the pet, quality of staff-client interactions from admission to discharge, communication between the ICU veterinarian and the owner, quality of medical care provided, emotional support of the owner during pet hospitalization, communication with staff during visits to the facility, and costs.

The TPS was piloted (Figure 1) and a short owner survey was carried out via Internet^e to check technical aspects and to get an impression of the potential effect of the system on owners. The survey administered to the second set of owners, following TPS introduction, consisted of the same questions mentioned above plus 30 questions about the TPS. These questions were based

on those used to evaluate similar systems in neonatal ICUs in the Netherlands.¹³ The questions concerned login frequency; location from which the system was logged into (eg, home, work); quality of the user manual; effect of the TPS on the owner's mood; technical quality of the camera image; malfunctions and other technical aspects; distribution of the logon information among family, friends, and colleagues; and willingness to pay for use of the TPS.

The surveys were printed and distributed by mail. The distribution method was based on the Dillman method. The Dillman Total Design Method is a survey method that consists of up to 3 carefully chosen time points to remind nonresponders in order to improve the response rate.¹⁴

One reminder was sent, accompanied by a newly printed survey form, 3 weeks after the first survey. The maximum response time allowed was 6 weeks.

ICU technician survey

The ICU technician survey consisted of 22 questions concerning the technicians' opinions about the importance of the system to owners, the time necessary to connect owners to the TPS, technical problems, owners' response to use of the TPS and its footage, privacy issues in relation to the system, and any recommendations that they would make regarding the system. This survey was distributed via Internet;^e the ICU technicians had 6 weeks to respond.

Statistical analysis

The effect of the TPS on owners' opinions about certain aspects of the hospitalization that could reflect overall owner satisfaction (eg, sections on aspects of the hospital and ICU) was studied by comparing responses before and after introduction of the TPS (surveys of first and second sets of owners). Because 24.5% of owners did not choose to use the TPS at the time of the second survey, the data from the first owner survey were compared only with those for the owners who did use the TPS in the second survey. The responses of the TPS users were also compared with those of the nonusers in the second owner survey. As answer options in some questions were rarely chosen by the participants, it was difficult to find a numerical solution for the model. In these cases, the 5-point scale was turned into a 3-point scale by combining answer options 1 and 2, as well as 4 and 5. Ordinal as well as nominal responses were analyzed with an ordinal logistic regression model.^f An ANOVA model was used for scale responses. The dependent variables in these models were the questions regarding owner satisfaction and the predictors were the variables defining the different pet owner groups, such as demographic variables.

A P value < 0.05 was considered statistically significant. The data from the pilot study were not statistically analyzed, nor were data from the second survey relating to technical TPS aspects or data from the technician survey.

Results

Survey responses

The first survey was sent to 322 pet owners and was completed by 215 (66.8%) owners; the second survey was sent to 396 owners and was completed by 208 (52.5%) owners. Of the latter, 157 (75.5%) owners had used the TPS. Thirteen ICU technicians were sent the online survey and 11 (84.6%) completed it.

Demographic variables of the owners are summarized in web Table 1 (see Supplemental Digital Content 2). Variables concerned owner and pet characteristics, and information related to the hospitalization. The mean duration of ICU hospitalization was shorter for the pets of owners who participated in the first owner survey than for the pets of owners who used the TPS in the second survey ($P = 0.003$). In the second survey, the pets of TPS users had a longer hospitalization than the pets of TPS nonusers ($P < 0.001$). The pets of TPS nonusers were younger (5.3 ± 4.3 years versus 6.3 ± 3.9 years, $P = 0.030$) and more pets of TPS nonusers died in ICU ($P = 0.002$) than pets of TPS users.

Owners' experience of the TelePet system

The answers to closed questions about the owners' experience with the TPS are summarized in Tables 1 and 2. Answers to open questions often dealt with the impact the use of the TPS had on the owner.⁵ Words and phrases used in the open answers included "reassuring," "comforting," "peace of mind," "supportive," "in (virtual) contact," "involved," "insight," "loving care," and "attention." But some owners also mentioned in respect to their own emotions "restlessness" and "constant occupation" in relation to the use of the TPS.

Effect of the "TelePet" system on client impressions of the hospital organization

The responses to 7 of the 26 questions related to the organization of the hospital in general (3) and of the ICU specifically (4) revealed statistically significant differences between the owners in the first survey and the TPS users in the second survey (Web Table 2; see Supplemental Digital Content 3). The owners in the first survey were more positive than the TPS users in the second survey regarding "waiting times at hospital (in general)" ($P < 0.001$), "treatment of pet owner by employees" ($P = 0.004$), "ratio medical care and costs at hospital (in general)" ($P = 0.006$), "personal time spent by ICU

veterinarian with owner" ($P = 0.004$), "emotional support for pet owner during ICU hospitalization" ($P < 0.001$), and "discharge instruction from ICU and hospital" ($P = 0.001$). The TPS users in the second survey were significantly more satisfied with the quality of medical treatment and care as compared to owners who replied to the first survey ($P = 0.036$). In the second survey, TPS users were more satisfied than TPS nonusers about the ICU hospitalization of their pet (Web Table 3; see Supplemental Digital Content 4) in relation to "treatment of pet by employees (in general)" ($P = 0.047$), "service of ICU staff toward pet owner" ($P = 0.039$), "written information about ICU received when pet was hospitalized" ($P = 0.012$), "verbal explanation of medical condition of pet while hospitalized" ($P = 0.030$), "handling of the pet by ICU employees" ($P < 0.001$), "procedure of discharge after hospitalization" ($P = 0.002$), and "discharge instructions from ICU and hospital" ($P < 0.001$).

ICU technicians' experiences with the TelePet system

Table 3 summarizes the responses of the ICU technicians.⁵ Ten of the 11 ICU technicians considered their privacy minimally invaded by the TPS. On average, the webcam was switched off during 50% of cage visits, but this varied widely among individual technicians. The main reasons to switch it off were personal and students' privacy, and in anticipation of patient handling in combination with restraint measures or other actions that might have a negative impact on or be misinterpreted by the owner. In about 30% of cage visits the technician forgot to turn the camera on again after their visit, according to the technicians' statements due to the pressure of work. In about 55% of the cage visits the technicians forgot the camera was switched on while busy with the patient in the cage.

On average, ICU technicians were contacted by an owner about the TPS footage in 1 of 3 shifts. Owners mainly called about the absence of live video (ie, the camera had not been switched on after a cage visit) or to comment on how their pet was treated or handled. The technicians experienced negative feedback from owners in 1 of 5–10 contact moments, and 7 technicians found this upsetting. The technicians thought that 1 of 11–15 owners did not want to use the TPS because they were afraid of becoming too anxious as a result of the footage.

Discussion

Many human hospitals use closed-circuit television systems that enable hospitalized mothers to view their newborns admitted to a neonatal ward. The increasing possibilities of Internet have led to the video streaming of images to locations outside the hospital.⁸ In 2009,

Table 1: Summary of the response to questions with an ordinal level of measurement concerning the “TelePet” system (TPS) as part of the second owner survey

Aspect	Question	Agree* (%)	Neutral* (%)	Disagree* (%)
Owner's "attitude"	TPS adds value (152) [§]	95.4	3.3	1.3
	Importance of sharing TPS footage with others (153)	74.5	40.4	6.6
	Less need to visit the hospital (151)	40.4	40.4	19.2
	Less concern about pet's physical condition (153)	65.4	25.4	9.2
	Reduced feeling of stress (152)	72.4	19.1	8.5
	Great difficulty switching TPS off (152)	60.5	25.0	14.5
	Enough trust about privacy protection (153)	73.2	26.8	0.0
	Very willing to recommend TPS to others (152)	97.4	1.3	1.3
	Strong urge to call ICU as a result of TPS footage (153)	20.9	32.0	47.1
Technical use	Willing to pay for TPS service (153)	58.8	25.6	15.6
	Clarity of user manual for TPS (151)	90.6	9.4	0.0
	Few technical problems with the use of TPS (152)	94.1	5.9	0.0
	Good quality of display (153)	86.9	10.5	2.6
	Good overall view of the cage (152)	84.9	10.5	4.6
	Frequency pet in cage high enough (151)	89.3	9.2	1.5

*On a 5-point Likert scale, “agree” (positive attitude) refers to answer options 1 or 2, “neutral” to option 3, and “disagree” (negative attitude) to options 4 or 5.

[§]Total number of respondents per question.

^{||}Great difficulty switching TPS off means that users found it emotionally difficult to stop watching the TPS footage.

more than 50% of all hospitals in the Netherlands provided parents and relatives Internet access to enable them to virtually visit a newborn.¹⁵ The video streaming of hospitalized newborns gives parents a feeling of control and reduces the anxiety associated with mother-child separation.¹⁶ A pet owner can be similarly affected when a pet is hospitalized. A virtual visit system could help owners to feel more involved and connected with their pet during its hospitalization and reduce owner anxiety. However, while with parents and their newborn the aim of a virtual visit system is to support a developing bond, with owners and their pet the aim is to sustain an already existing owner-pet relationship.

The response rate to the first survey was higher (almost 70%) than that to the second survey (53%). Although no acceptable response rate has been defined, nonresponse bias increases with more nonresponders.^{17,18} The response rate to the second owner survey was lower than the mean response rate (66%) of questionnaires sent by post in an analysis of 210 publications.¹⁸ The lower response might have been caused by the time of year the survey was held, with December and January being among the busiest months of the year. Furthermore, in contrast to the Dillman method, the survey had only 2 instead of the suggested minimum of 3 contact moments between surveyor and respondent.¹⁴

It was originally our intention to compare the opinions of the owners in the first survey with those of the owners in the second survey. Unfortunately, the introduction of the TPS was delayed, so that the second survey was carried out more than 2 years after the first survey. Fur-

thermore, we had envisioned that all owners would use the TPS, but almost 25% of owners did not. It is unclear why some owners did not use the TPS, but it may have been due to the significantly shorter stay in the ICU of the pets of the TPS nonusers relative to that of the pets of the TPS users. In the second survey, owners gave this as a reason why they made minimal use of the TPS (Table 2). The shorter stay also gave staff less time to set up the TPS connection. Therefore, we performed an additional analysis to compare TPS users with TPS nonusers, using data from the second owner survey.

Most owners were very satisfied with the TPS, with almost 75% mentioning that the system reduced their stress and concerns about the physical condition of their pet. The narrative of an owner who took part in the pilot study gives an impression of what the TPS may offer pet owners:

“It was very pleasant to see her during her stay in the ICU. Unfortunately, she died during her admission! We were also able to follow the care-giving a bit and it was very nice that she was not alone!! Later she had to be moved to the oxygen cage and the camera was turned off, but you contacted us immediately, so we remained informed. We had an agreeable experience despite our great sorrow. Thank you for this.”

The anxiety owners feel when separated from their pet and the effect of the TPS on this emotion is similar to the experience of parents with hospitalized newborn children.¹⁹ The importance of TPS to owners may be indicated by the intensity of its use: 42.3% of respondents were logged on almost continuously and 60.5% found it emotionally difficult to turn off the TPS footage.

Table 2: Summary of the response to questions with a nominal level of measurement concerning the “TelePet” system (TPS) as part of the second owner survey

Question	(%)	Question	(%)
Did not use TPS because (135)*		Used TPS to (156)	
-not relevant: used TPS	64.6	-see pet	96.8
-TPS not offered	14.1	-check whether pet is handled well	1.9
-no hardware to run system	0.7	-check whether treatment is given well	1.3
-TPS did not work on PC	0.0		
-other	20.7		
Minimal use TPS because (117)		Gave access to TPS to following people (151)	
-not relevant	75.2	-family members in the household	60.3
-not interested	0.0	-other family members such as brothers, sisters, uncles, and aunts	23.2
-short hospitalization period	11.1	-good friends	9.3
-not enough time to use TPS	0.9	-acquaintances	0.7
-footage quality was disappointing	2.6	-everyone who was interested	4.6
-camera was turned off many times	0.9	-other	2.0
-could not see pet in cage	3.4		
-TPS use affected me negatively	6.0		
Location TPS used (157)		Contacted ICU regarding TPS footage (153)	
-at home on PC	95.5	-yes	24.2
-at friends/acquaintances on PC	1.3	-no	75.8
-at work on PC	1.3		
-via Internet on smart phone	1.9		
Have read user manual TPS (151)		Contacted ICU in this way (149)	
-yes	74.2	-not relevant: did not contact ICU	32.9
-no	25.8	-during regular telephone consultation	54.4
		-during a visit at the ICU	2.7
		-using the special TPS phone number	4.7
		-other	5.4
Intensity use TPS (156)		Amount of money willing to pay per hospitalization for TPS service (148)	
-Continuously: extra waking up at night	21.8	€0	17.6
-Continuously while awake	27.6	€1–€2	12.2
-As much as other work allowed	20.5	€2–€4	9.5
-Few times a day	25.6	€4–€6	16.2
-Once a day	0.6	€6–€8	3.4
-Few times during hospitalization Period	3.8	€8–€10	23.6
		> €10	17.6

*Total number of respondents per question.

Furthermore, most owners would be willing to pay for the system, with more than 40% being willing to pay €8 per hospitalization period. In this study, TPS use was not charged separately but a fixed amount was added to the daily basic rate for ICU hospitalization regardless of whether or not the client used TPS. Owners were not specifically informed about the extra charge for the TPS (€2.5 per day).

The TPS footage had a negative impact on 6% of owners, and some asked for the system to be disconnected. The ICU technicians had also formed the impression that a similar number of owners did not want to use the system. Of the 20.9% of owners who contacted the ICU as a result of the TPS footage, only 5.4% used the dedicated phone number to contact an ICU technician; most owners waited and discussed the TPS during their regular

contact moments with the staff. However, feedback on the use of the system was not only negative and many owners expressed their satisfaction with the system. In human medicine, this technology is not considered a replacement for physical visits to the hospital but an important adjunct to help parents relax at home.^{13,19} Owners reported that the presence of the virtual visit system in the ICU reduced their need to physically visit their pet, although ICU staff did not consider the number of owner visits to have decreased significantly following introduction of the system. This discrepancy might be because although owners were less anxious about their pet, they still wanted to visit it. As with parents who use a virtual baby visit system,¹⁹ the owners' main reason to use the TPS was the need to see their pet and not to check on the quality of care provided to their pet.

Table 3: The opinion of ICU technicians (11) on the use of the “TelePet” System (TPS)

Aspect	Question	Strongly agree* (%)	Agree* (%)	Neutral* (%)	Disagree* (%)	Strongly disagree* (%)
Experience	Importance of role of TPS in ICU	9.1	27.3	45.5	18.2	0.0
	Value TPS as a service to owners	9.1	45.5	36.7	9.1	0.0
	Owners find it important to access TPS	9.1	72.7	18.2	0.0	0.0
	Owners are enthusiastic about TPS	0.0	63.6	36.4	0.0	0.0
	TPS in combination with other work is a burden	0.0	27.3	45.4	27.3	0.0
	Contact with an owner is often negative	18.2	9.1	36.4	27.3	9.1
	I regularly watch live footage on the monitor while in the office to keep an eye on patients	18.2	18.2	45.4	9.1	9.1
Technical aspects	Technical aspects of TPS are easy	27.3	45.4	27.3	0.0	0.0
	There are almost never technical problems with TPS	45.4	45.4	9.2	0.0	0.0
	It takes little time to set up the connection for the owner	0	27.3	54.5	9.1	9.1
Recommendation	Would recommend TPS to other wards in the department	18.2		45.5		36.4
	Would recommend TPS to other ICUs abroad	36.4		54.5		9.1

*On a 5-point Likert scale, “strongly agree” (positive attitude) refers to answer option 1, “agree” to option 2, “neutral” to option 3, “disagree” option 4, and “strongly disagree” (negative attitude) option 5.

Owners shared the footage with others, especially family members at home (60.3%) or elsewhere (23.2%). This phenomenon has also been observed among the parents of hospitalized infants, with the virtual baby visit system helping parents to verbalize and share emotions with relatives,¹⁹ and this can also be expected with owners.

We hypothesized that the TPS would increase overall owner satisfaction with the care provided. Satisfaction can be a reliable and valid measure of the quality of medical care. Surveys have often been used in studies on the quality of human healthcare to evaluate satisfaction because it is predictive of other important health care outcomes.^{20–24} Surveys of satisfaction are rare in veterinary medicine and this is the first study of the effect of a virtual visit system with live video streaming of patient images over the Internet on user satisfaction in either veterinary or human medicine. Comparison of the responses to the first and second owner surveys suggests that the introduction of the TPS did not improve owner satisfaction. However, the TPS users in the second survey may have been less satisfied overall as they were less satisfied with aspects directly related to ICU and with the hospital in general than the owners who completed the first survey. The owners in the second survey were less satisfied with the cost/benefit balance with regard to the cost of veterinary care. The pets of TPS

users in the second survey were hospitalized for longer, which may have increased costs. Furthermore, the Dutch economy had declined during the interval between the 2 surveys, with household expenditure decreasing by 1.2–2.5%.^h Many other unknown time effects may have influenced results, which may have masked any positive effect of the TPS on owner satisfaction.

A comparison between the owner group of the first survey with the TPS nonuser group in the second survey could potentially give more insight into the effect of time on owner satisfaction. However, this analysis would also have suffered from limitations as a result of lack of randomization such as differences in demographic variables, and a relative small size of the TPS nonuser group (51 versus 215 owners in the first survey). Furthermore, the extent of the impact of time versus the effect of TPS introduction on general owner satisfaction would still remain uncertain.

In the second survey, the TPS users were more satisfied about a number of aspects than were the TPS nonusers, and particularly about the ICU rather than the hospital in general. This suggests that the 2 owner groups did not differ in their attitude and expectations toward the hospital in general. The differences seem to be due to a better experience with the ICU, which suggests that the TPS had a positive effect on owner satisfaction. However, these results should be interpreted with caution,

as patient-owner pairs were not randomized to TPS use. Moreover, demographic data suggest that the shorter stay of the pets of TPS nonusers was the result of the animals dying early during their ICU stay (44.0% versus 15.4% died in the ICU). Thus the fact that their pet died in the ICU and the shorter contact with ICU staff (who might not have had the opportunity to establish a relationship with owners) might have adversely influenced TPS nonuser satisfaction with the ICU.

ICU technicians recognized the importance of the system to owners. A similar positive attitude has also been reported in neonatal ICU nurses.¹³ The technicians' narratives demonstrated that this positive attitude was tempered by the negative feedback they received from a small group of dissatisfied owners. Although owner contact was limited and the vast majority of owners were pleased with the system, the main feedback ICU technicians received was when owners were dissatisfied with the TPS or the footage. As the survey indicated that owners had few technical problems with the TPS, the main reason owners called ICU technicians would appear to be that they were upset by what they had seen on the TPS footage.

The technicians who considered that the TPS contributed little to overall patient care had a more negative experience with the system and the owners. It is essential to bear nursing concerns in mind when implementing technological innovations.²⁵ Three main factors have been formulated for the successful adoption of a virtual baby visit system: (1) acceptance by the healthcare professionals that the system is a part of the healthcare process, (2) healthcare professionals and patient relatives act as if the camera is not there, and (3) healthcare professionals are aware that creating the opportunity to be connected is introducing the choice not to be connected.¹³ Most ICU technicians did not consider their privacy to have been invaded by the TPS, which might have been because they could decide when the cameras were switched on or off. They also experienced few technical problems with the system, and most would recommend the system to other veterinary ICUs.

This investigation has limitations. The study design was longitudinal, which may have introduced a time bias wherein owner opinions were affected more by economic and hospital factors than by the TPS. Comparison between TPS users and TPS nonusers from the second survey time period helped to mitigate this bias, and suggested the TPS provided benefit. This study was not randomized. After the TPS was introduced, all owners were offered TPS service because it had generated media attention and we anticipated owners to have heard about the system. We were concerned that denying TPS access could have a negative impact. We also expected that almost all owners would use the TPS in the second survey

and had not anticipated a relatively large group of owners who did not use the TPS. The explanation might be in the difference between the hospitalization period of infants and pets. A hospitalization period of hours to days offers limited time for the installation and use of the TPS, whereas infants may be hospitalized for weeks to months. Finally, by its nature, this study could not be blinded. Given these limitations, we were unable to prove a positive effect of the TPS on overall owner satisfaction. However, these results may be most gainfully employed to encourage randomized trials on this topic.

Conclusions

This is the first report in veterinary medicine on the experience of pet owners and ICU technicians with a virtual pet visit system in a companion animal ICU. Furthermore, this is the first reported attempt in either human or veterinary medicine to evaluate the effect of a virtual patient visit system on overall user satisfaction. Most pet owners and ICU technicians experienced the TPS as a valuable extra service. Owners reported that the TPS reduced their stress and anxiety about their hospitalized pet. However, some TPS users found watching the footage upsetting, and so the system might not be appropriate for all pet owners. It would be interesting to investigate whether there are cultural differences in appreciation of a virtual pet visit system.¹⁶ The enthusiasm of the ICU technicians for the TPS was tempered by the negative feedback from a small number of owners. With veterinary healthcare moving toward a more client-centered approach, the authors suggest that a virtual pet visit system is a relatively simple application to improve the well-being of owners during the hospitalization of their pet.

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Footnotes

^a University Medical Centre Utrecht (UMCU). Telebaby (<http://geboortecentrum.umcutrecht.nl/nl/magazine>) (accessed January 26, 2016).

^b Medical University of Innsbruck. Babywatch (<http://www.babywatch.at/>) (accessed January 26, 2016).

^c TelePet system software, Cameramanager, Amsterdam, the Netherlands.

^d www.uu.nl/telepet.

^e SurveyMonkey, SurveyMonkey Europe S.A.R.L., Luxembourg, Luxembourg.

^f IBM SPSS Statistics 21.0, IBM Corporation, Armonk, NY.

^g A copy of the answers to open questions from pet owners and ICU technicians is available on request from the authors.

^h StatLine: GDP, production and expenditures. The Hague/Heerlen, the Netherlands: CBS Statistics Netherlands, 2013 (<http://statline.cbs.nl/statweb>).

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Supporting Information

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